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Atmospheric Transport Modeling and Input Data for Phase I of the Hanford Environmental Dose Reconstruction Project

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July 1991

Prepared for the Technical Steering Panel

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FOR PHASE I OF THE HANFORD ENVIRONMENTAL DOSE
RECONSTRUCTION PROJECT

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Pacific Northwest Laboratory
Richland, Washington 99352

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This document has been reviewed
and approved by the Technical Steering Panel.

John E. Till, Chairman
Technical Steering Panel
Hanford Environmental
Dose Reconstruction Project

July 2, 1991
Date

PREFACE

This report summarizes the information used in modeling atmospheric transport and diffusion for Phase I of the Hanford Environmental Dose Reconstruction (HEDR) Project. It also lists the results of the atmospheric transport calculations that were provided for use in dose estimation. The report does not contain a description of the atmospheric model or an analysis of the results of the atmospheric calculations.

Atmospheric transport and diffusion calculations were made with a Lagrangian trajectory, Gaussian puff model. Rationale leading to selection of this modeling approach is discussed in another document (Ramsdell 1991). At the time that this report was written, it was not the intent to document the MESOILT2 code because it was an interim code. However, after this report was written, it became clear that documentation of MESOILT2 was essential. MESOILT2 is described in detail in a separate report (Ramsdell and Burk 1991). As a result, details of the model description were deleted as this report was revised for publication.

The atmospheric transport and diffusion calculations that are the subject of this report were made in late June and early July 1989. They were made using the best meteorological data available at that time. The results of the atmospheric model calculations were electronically transferred to other HEDR staff for use in calculations leading to the Phase I dose estimates that were published in July 1990.

The primary objective of the Phase I calculations was to demonstrate that sufficient data existed and that models could be developed to permit reconstruction of doses resulting from operations at the Hanford Site and that the calculations were practical. This objective was achieved. However, analysis of the results of the dose calculations indicated a need to restructure the overall dose calculation procedure. The interface between the atmospheric model and the dose model is one of the areas that needed restructuring. The treatment of uncertainty in the atmospheric model is another. Finally, several changes to MESOILT2 are required to enhance the technical credibility of the model.

The atmospheric model is undergoing a significant revision at this time. The model revisions will address many of the concerns expressed by the reviewers of this report. When the model revisions are complete, the model will be fully documented and model sensitivity and uncertainty will be evaluated. The model revision and documentation are scheduled to be completed in 1991; model sensitivity and uncertainty studies will be conducted in the following years.

The appendix to this document is a record of TSP comments and Battelle's responses; the TSP has reviewed and approved these responses to their comments. Comment numbers appear in the left margin next to the paragraph in which the corresponding comment was addressed. Changed text is shown in italics. In addition to responses to TSP comments, some text was changed to correct errors or to provide clarification.

SUMMARY

The Hanford Environmental Dose Reconstruction (HEDR) Project has been established to evaluate the doses people may have received from radionuclides released to the environment from operations that began at the Hanford Site in 1944. The project is being conducted by the Pacific Northwest Laboratory (PNL), operated by Battelle Memorial Institute, under the direction of an independent Technical Steering Panel.

The initial phase of the project is a demonstration of the feasibility of the technical approach recommended by PNL. This approach involves the use of computer models and environmental monitoring data to estimate concentrations of radionuclides in the atmosphere and on the ground as a function of location and time.

35 *A Lagrangian-trajectory, Gaussian puff atmospheric transport and diffusion model was selected for use in Phase I of the HEDR Project. The model, MESOILT2, and a post-processing code, PHASEII, used to estimate averages and uncertainty of predicted air concentrations and surface contamination are described in detail in a separate report (Ramsdell 1991). This report describes the input to the model for Phase I calculations and lists the results of the atmospheric model calculations that were used in subsequent dose calculations.*

33 *Meteorological data for 1983 through 1987 were used as model input because data for 1944 through 1947 were not ready for use at the time the atmospheric model calculations were made. Transport and diffusion calculations were made for all 60 months assuming that the same amount of iodine-131 was released each month. The results of the monthly calculations were averaged to obtain typical dispersion factors for each census division for each calendar month (i.e., January, February, etc.). Uncertainty in the dispersion factors was estimated on the basis of spatial variability within the census divisions, the year-to-year variations for each month, and an estimate of the uncertainty of the model calculations for each month based on comparison with measured data.*

Specific dispersion factors were calculated for monthly time-integrated air concentrations, monthly-average deposition rates, and month-end surface contamination. These dispersion factors, which are listed in tables in the report, were passed to others for use in dose calculations. They calculated time-integrated air concentrations, deposition rates, and surface contamination for December 1944 through December 1947 for the dose estimated by multiplying the appropriate dispersion factor by the amount of iodine-131 released during the month.

Meteorological data for the period of release will be used in future calculations as such data become available. A set of calculations was made after July 1989 using 1944 through 1947 meteorological data. Figure 2.7 of the HEDR Air Pathway Report (PNL 1991) compares iodine-131 concentrations on sagebrush in Benton and Franklin county census divisions calculated using the 1983-1987 and 1944-1947 meteorological data sets. The comparison does not indicate that use of the 1983-1987 data resulted in gross errors in dose estimates.

CONTENTS

PREFACE	iii
SUMMARY	v
INTRODUCTION	1
ATMOSPHERIC TRANSPORT MODELING	3
ATMOSPHERIC MODELING DOMAIN	3
METEOROLOGICAL DATA	5
RELEASE LOCATION AND SOURCE TERM	8
MODEL COMPUTATIONS	13
MODEL RESULTS	19
REFERENCES	47
APPENDIX - SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES	A.1

FIGURES

1	Phase I Atmospheric Modeling Domain	5
2	Sources of Meteorological Data for Phase I	8
3	HEDR Census Divisions	14

TABLES

1	Meteorological Stations Providing <i>the 1983-1987</i> Data Used in the HEDR Phase I Study	9
2	MESOILT2 Grid Node Associated with HEDR Census Divisions	15
3	Computational Results for January	22
4	Computational Results for February	24
5	Computational Results for March	26
6	Computational Results for April	28
7	Computational Results for May	30
8	Computational Results for June	32
9	Computational Results for July	34
10	Computational Results for August	36
11	Computational Results for September	38
12	Computational Results for October	40
13	Computational Results for November	42
14	Computational Results for December	44

INTRODUCTION

The Hanford Environmental Dose Reconstruction (HEDR) Project has been established to evaluate the doses people may have received from radionuclides released to the environment from operations which began at the Hanford Site in 1944. The project is being conducted by the Pacific Northwest Laboratory, operated by Battelle Memorial Institute, under the direction of an independent Technical Steering Panel. At the Technical Steering Panel's direction, the Project is being conducted in phases. The first phase is a demonstration of the feasibility of the technical approach. This approach involves the use of both computer models and environmental monitoring data to estimate concentrations of radionuclides in the atmosphere and on the ground as a function of location and time. For Phase I, the dose reconstruction domain is Benton County, Washington and the nine adjacent counties in Washington and Oregon. December 1944 through 1947 was selected as the period of interest for Phase I for investigating atmospheric releases.

35 *A Lagrangian-trajectory, Gaussian puff atmospheric transport and diffusion model was selected for use in Phase I of the HEDR Project. The model, MESOILT2, and a post-processing code, PHASEII, used to estimate averages and uncertainty of predicted air concentrations and surface contamination are described in detail in a separate report (Ramsdell 1991). This report describes the input to the model for Phase I calculations and lists the results of the atmospheric model calculations that were used in subsequent dose calculations.*

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the census divisions, the year-to-year variations for each month, and an estimate of the uncertainty of the model calculations for each month based on comparison with measured data.

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Meteorological data for the period of release will be used in future calculations as such data become available. A set of calculations was made after July 1989 using 1944 through 1947 meteorological data. Figure 2.7 of the HEDR Air Pathway Report (PNL 1991) compares iodine-131 concentrations on sagebrush in Benton and Franklin county census divisions calculated using the 1983-1987 and 1944-1947 meteorological data sets. The comparison does not indicate that use of the 1983-1987 data resulted in gross errors in dose estimates.

The work described in this report was conducted in accordance with the requirements of ANSI/AMSE NQA-1 1986 Edition, Quality Assurance Program Requirements for Nuclear Facilities, as interpreted by PNL's Quality Assurance (QA) program. All procedures used to support this report were appropriately written and controlled in accordance with PNL QA program requirements. Records that support the data in this report were created and stored in accordance with applicable HEDR record control procedures.

16 Following completion of development, MESOILT2 was placed under configuration control and subjected to computational tests outlined in MESOILT2 Software Testing Plan. The software tests covered data input and output, as well as numerical calculations. The results of the tests were examined by the programmer and an independent reviewer. They indicated that the program was operating as intended and that the calculations were correct.

ATMOSPHERIC TRANSPORT MODELING

33,35 *The HEDR Phase I atmospheric and diffusion calculations were made with*
36 *MESOILT2 (Ramsdell and Burk 1991). The model was developed for Phase I by*
 modifying the MESOI model (Ramsdell et al. 1983) and including some of the
 features of the MESORAD model (Scherpelz et al. 1986, Ramsdell et al. 1988).
 MESOILT2 is a Lagrangian puff model that simulates transport and diffusion of
 a continuous plume by dividing the plume into discrete increments, which are
 referred to as puffs.

Puffs are generated every 15 minutes. They move with the wind and grow
 larger in response to wind turbulence. Puffs remain active and are tracked
 until they leave the model domain unless their mass is depleted by deposition
 or they merge with another puff. When the radii of two consecutive puffs
 become approximately equal to one half the separation between them, the puffs
 are merged and tracked as a single puff (Ramsdell et al. 1983).

10 *As the puffs move, material is deposited on the ground when the puff*
 comes in contact with the surface (dry deposition). MESOILT2 is also capable
 of simulating deposition when there is precipitation (wet deposition). How-
 ever, this feature was not used in Phase I calculations. Once material is
 deposited on the ground it is removed from the puff, and is tracked as surface
 contamination. MESOILT2 calculates decay in the atmosphere and on surfaces
 for radionuclides that have half-lives of less than 1 year. Decay is calcu-
 lated for iodine-131, which is the radionuclide of primary interest in
 Phase I.

ATMOSPHERIC MODELING DOMAIN

 A square atmospheric transport modeling domain, 160 mi (256 km) on a
side centered at 46° 37' 30" N latitude, 119° 00' W longitude was selected for
Phase I. Physically, the center of the domain is about 25 mi (40 km) east of
the 200 Areas of the Hanford Site. Most of the atmospheric releases of
iodine-131 occurred in the 200-East and 200-West Areas. The domain extends
from the Cascade Mountains east to approximately the Washington-Idaho border.
The southwest corner of the domain is near The Dalles, Oregon, and the north-
east corner is near Spokane, Washington.

Air concentrations and surface contamination were computed at 931 nodes within the domain. The spacing between nodes is about 5 mi (8 km). This separation was established on the basis of the desired domain size and the structure of the model from which MESOILT2 was developed. The spacing proved adequate to define average time-integrated air concentrations and surface contamination for the census divisions for which doses were calculated. However, analysis of the Phase I results indicates that computing doses from the census division data must be reevaluated.

Positions in the model domain are identified by Cartesian coordinates. The lower left corner of the domain has coordinates 1,1; the lower right corner has coordinates 31,1; and the upper right corner has coordinates 31,31.

The atmospheric modeling domain covers the 10-county Phase I study area except for the western portions of Kittitas, Yakima, and Klickitat Counties, the northern portion of Grant County, and the southern portions of Morrow and Umatilla Counties. The relationship between the atmospheric modeling domain and the 10-county area is shown in Figure 1. County names are shown in the figure in light print, and selected population centers are shown in bold print.

The MESOILT2 domain was offset from the 10-county area for three reasons. The first reason is that the prevailing wind patterns at Hanford have westerly components, which carry material released at Hanford to the east. Thus, offsetting the domain to the east increased the proportion of the domain that is downwind of Hanford in the prevailing atmospheric transport directions. The second reason is that winds with easterly components, which carry material to the west, are infrequent, are generally light, and do not persist for long periods. The third reason is that the terrain to the west of the MESOILT2 domain is mountainous. Concentration and deposition estimates for the western boundary of the MESOILT2 domain were assumed to be conservative estimates of the concentrations and deposition in the portion of the 10-county region to the west of the model domain.

FIGURE 1. Phase I Atmospheric Modeling Domain

METEOROLOGICAL DATA

10

Observed meteorological data are used in MESOILT2 to make transport and diffusion calculations. Transport is based on wind data, and diffusion is based on wind data, atmospheric stability, and mixing-layer thickness.

Wind data from all measurement locations are used to estimate the wind fields that are used to compute puff movements. An initial estimate of the wind field is made from the observed wind data using $1/r^2$ interpolation. This initial wind field is adjusted to account for expected terrain effects based

on the changes in elevation of the topography and steepness of the slope of the terrain determined from topographic data.

Diffusion of material in puffs is calculated on the basis of atmospheric stability and the distance traveled by the puff. Vertical diffusion is limited by a specification of a mixing-layer thickness.

25 Atmospheric stability and mixing-layer thickness are assumed to be uniform throughout the model domain. They are estimated using data from the Hanford Meteorological Station (HMS). These assumptions are realistic on the average. However, in specific cases, the assumptions will be in error. More realistic assumptions will be made in the revised model.

26 The HMS data may be used to set precipitation for the model domain. However, the precipitation was not considered in Phase I. It will be considered when the model is run with actual release and meteorological data.

38 The primary period of interest for atmospheric transport for Phase I is December 1944 through 1947. Meteorological data for this earlier period are not generally available on magnetic media (magnetic tapes or disks). Hanford meteorological data prior to 1955 were available only as original paper records. Similarly, most of the meteorological data obtained from the National Climatic Data Center (NCDC) for the period prior to 1948 were only available as paper or microfiche copies of the original data entry forms.

Addition of the pre-1955 Hanford meteorological data to the computer data base was initiated at the beginning of the HEDR Project. Entry of meteorological data through 1949 has been completed. Meteorological data for other stations for 1944 through 1947 were ordered from the NCDC for use in the Phase I study. However, these data were not received in time to be used in the Phase I atmospheric transport calculations.

When it became obvious that the 1944 through 1947 meteorological data would not be ready for use in the Phase I calculations, two alternative approaches for estimating iodine-131 air concentrations and surface contamination were considered. The two alternatives considered were 1) to use the 1944 through 1947 data for Hanford and a straight-line Gaussian model and 2) to use data from another period and MESOILT2. While the first alternative

would use data from the period of interest, the second alternative was selected because it provided a better test of the overall atmospheric modeling process.

The *Phase I model calculations were made with meteorological data for 1983 through 1987* because more meteorological data are readily available for this period than are available for other periods. The available data include routine observations for 12 locations in eastern Washington, northeastern Oregon and northern Idaho in addition to data from the Hanford Telemetry System, which provides wind measurements at more than 20 locations on and adjacent to the Hanford Site. Figure 2 shows the locations of the meteorological stations providing data for the Phase I atmospheric transport calculations. Primary meteorological stations are shown by triangles in the figure and the stations in the Hanford Telemetry System are shown by dots. The station names, abbreviations, locations, and MESOILT2 grid coordinates are listed in Table 1.

- 11 *Entry of available wind data for 1944 through 1947 was completed in late fall of 1989. MESOILT2 was rerun using these data. Figure 2.7 of the Air Pathway Report (PNL 1991) shows a comparison of iodine-131 concentrations on sagebrush in Benton and Franklin counties calculated using the 1944-1947 and 1983-1987 meteorological data. The results of the two sets of calculations are very similar. This similarity is likely the result of assuming a continuous, uniform release of iodine-131 for each month.*

MESOILT2 can use meteorological data observed at either hourly or 3-hour intervals. If hourly data are used, the meteorological conditions are assumed to persist for the entire hour; there is no temporal interpolation within the hour. If, however, 3-hourly meteorological data are used, winds, atmospheric stability, and precipitation are updated each hour using linear interpolation between the meteorological observations. The Phase I model runs were made using 3-hourly meteorological data. Hourly data were available for most of the locations, but not all of the data were on magnetic media. Therefore, a decision was made to use 3-hour data in the calculations. Those data not already available on magnetic media were manually entered into the HEDR meteorological data base for use in the Phase I calculations, and all data were checked for reasonableness.

FIGURE 2. Sources of Meteorological Data for Phase I

RELEASE LOCATION AND SOURCE TERM

Phase I atmospheric transport modeling is primarily concerned with iodine-131 releases that took place from December 1944 through 1947. These releases were associated with the fuels separation processing in B and T

TABLE 1. Meteorological Stations Providing the 1983-1987 Data Used in the HEDR Phase I Study

Station Name	Abbrev.	Latitude			Longitude			Elev. (m)	MESOILT2 Grid Coordinates	
		Deg	Min	Sec	Deg	Min	Sec		X	Y
PROSSER BARRICADE	PROS	46	23	31	119	24	40	146	12.08	12.76
EMERG. OPS. CENTER	EOC	46	23	33	119	32	10	378	10.88	12.77
ARMY LOOP ROAD	ARMY	46	29	19	119	32	53	172	10.77	14.10
RATTLESNAKE SPRINGS	RSPG	46	30	22	119	41	56	207	9.33	14.35
EDNA	EDNA	46	35	15	119	23	50	122	12.21	15.48
200 EAST AREA	200E	46	33	23	119	31	14	204	11.03	15.05
200 WEST AREA	200W	46	32	35	119	39	41	201	9.69	14.86
WAHLUKE SLOPE	WAHL	46	44	7	119	50	11	258	8.02	17.53
FAST FLUX TEST FAC.	FFTF	46	25	49	119	21	31	168	12.58	13.29
YAKIMA BARRICADE	YAKB	46	34	41	119	43	30	242	9.08	15.35
300 AREA	300A	46	21	50	119	17	8	122	13.27	12.37
WYE BARRICADE	WYEB	46	28	56	119	23	34	168	12.25	14.02
100 NORTH AREA	100N	46	41	16	119	32	58	146	10.76	16.87
WASH PUB PWR SUP	WPPS	46	28	12	119	20	34	137	12.73	13.85
FRANKLIN COUNTY	FRNK	46	25	3	119	14	12	268	13.74	13.12
GABLE MOUNTAIN	GABL	46	35	53	119	27	36	331	11.61	15.63
RINGOLD	RING	46	32	42	119	14	13	189	13.74	14.89
RICHLAND	RICH	46	18	4	119	18	1	119	13.13	11.50
SAGE HILL	SAGE	46	39	21	119	17	58	300	13.14	16.43
RATTLESNAKE MTN	RMTN	46	23	40	119	35	37	1087	10.33	12.80
HANFORD MET. STA.	HMS	46	33	47	119	35	54	222	10.29	15.14
PASCO	PASC	46	15	48	119	6	18	122	15.00	10.97
100 F AREA	100F	46	38	6	119	27	4	123	11.69	16.14
GABLE MTN WEST	GABW	46	36	35	119	33	23	305	10.69	15.79
YAKIMA	YKM	46	34	0	120	32	0	326	1.37	15.19
PENDLETON	PDT	45	41	0	118	51	0	459	17.43	2.91
STAMPEDE PASS	SMP	47	17	0	121	20	0	1209	-6.27	25.15
LEWISTON	LWS	46	23	0	117	1	0	439	34.93	12.64
SPOKANE	SKA	47	38	0	117	32	0	718	30.00	30.01
WALLA WALLA	ALW	46	6	0	118	17	0	362	22.84	8.70
MOSES LAKE	MWH	47	12	0	119	19	0	376	12.98	23.99
THE DALLES	DLS	45	37	0	121	9	0	72	-4.52	1.99
WENATCHEE	EAT	47	24	0	120	12	0	243	4.55	26.77
EPHRATA	EPH	47	18	0	119	32	0	388	10.91	25.38
OMAK	OMK	48	26	0	119	32	0	260	10.91	41.13
COLVILLE	CVL	48	32	0	117	53	0	575	26.66	42.52

plants, which are in the 200-East and 200-West Areas, respectively. Prior to 1948, iodine-131 was released from these plants directly to the atmosphere with gases produced during dissolution of the reactor fuels (Ballinger and Hall 1991).

40, 41 Off gases from B and T plants were released to the atmosphere through 200-ft (60-m) stacks that have a 5-ft (1.52-m) inside diameter. The nominal flow in the stacks is 25,000 ft³/min (11.7 m³/s) (Smith 1950). Ballinger and Hall (1991, Figure 4.1) show that off gases were combined with ventilation air. With exhaust fans operating, the stack flow could reach 65,000 ft³/min (30.7 m³/s).

18, 27 B and T Plant stacks are separated by a distance of about 5 mi (8 km).
41 However, for the purpose of demonstration of the technical approach in Phase I, the releases were assumed to take place from a single, imaginary stack located midway between the two stacks. A height of 200 ft (61 m) and a flow of 20,000 ft³/min (9.4 m³/s) were assumed. No attempt was made to estimate plume rise during the Phase I calculations. However, the stack flow was used to set the initial magnitudes of the diffusion coefficients to avoid an atmospheric concentration of iodine-131 that exceeded the concentration in the stack.

MESOILT2 has the capability to vary the release rate hour by hour. In Phase I this capability was not used for two reasons. The first, and overriding, reason is that sufficient data on release times and rates were not available. The second reason is that the meteorological data for the release period were not available. Release data currently available include dates and generally permit estimation of release times to within one of two shifts, and meteorological data for the 1944-1947 period are now available. Consequently, future calculations will be made using the actual release and meteorological data.

The only viable alternative to using the actual release data was to assume a uniform, constant release rate for each month. This assumption had two probable effects. It likely resulted in a contamination pattern that was more wide spread than occurred. It is also likely that this assumption somewhat reduced the magnitude of the contamination in the prevailing downwind direction. However, the comparison of predicted iodine-131 concentrations in sagebrush with observed values shown in the MESOILT2 documentation does not indicate that this postulated reduction in contamination is significant.

The release rate assumed for the Phase I study was 1000 curies (Ci) of iodine-131 per month. This source term was entered as an hourly release equal to 1000 Ci divided by the number of hours per month. As a result, the source term used in the computation varied from month to month. This release rate was selected to keep atmospheric iodine-131 concentrations above the MESOILT2 low concentration threshold. During post-processing, all monthly atmospheric concentrations and surface contamination values were normalized by dividing by 1000 Ci. Normalization permits users of the MESOILT2 output to estimate concentrations and surface contamination for specific months by multiplying the normalized values by the amount of iodine-131 released during the month.

MODEL COMPUTATIONS

MESOILT2 performs computations on a month-by-month basis. At the end of each month, a set of computer files is written that contains the results of the model calculations. However, there are a number of active puffs remaining in the domain at the end of each month. These puffs contribute to the time-integrated air concentration and surface contamination in the following month. Consequently, the information on these puffs must be carried forward into the calculations for the next month. MESOILT2 does this by creating a file at the end of the month that contains characteristics of all puffs that are still on the grid. This file, which includes puff numbers, positions, dimensions and masses, becomes input to the computations for the next month.

The MESOILT2 computations are made at nodes on a 31 x 31 Cartesian grid although dose estimates are to be made for the HEDR census divisions shown in Figure 3. A post-processor computer program, *PHASEII*, converts the MESOILT2 output to the monthly time-integrated atmospheric concentrations, deposition rates, and month-end surface contaminations for the HEDR census divisions. *The PHASEII program is listed in Appendix B of the MESOILT2 documentation (Ramsdell and Burk 1991).*

Conversion of the node values to census division averages involves averaging the values at nodes in and near the census divisions. Table 2 lists the nodes in the model domain that are associated with each census division. The process also involves averaging the values for each of the five years. As a result, the census division values are averages over both time and space.

FIGURE 3. HEDR Census Divisions

TABLE 2. MESOILT2 Grid Node Associated with HEDR Census Divisions. The MESOILT2 nodes are given by their coordinates. The first number in each pair is the x-coordinate (east-west), and the second is the y-coordinate (north-south).

Census Div.	MESOILT2 NODES									
AD1	25,25	26,25	25,24	26,24	25,23	26,23	25,22	26,22		
AD2	20,25	21,25	22,25	23,25	24,25	18,24	19,24	20,24	21,24	
	22,24	23,24	24,24	18,23	19,23	20,23	21,23	22,23	23,23	
	24,23	21,22	22,22	23,22	24,22					
AD3	17,25	18,25	19,25	20,25	17,24	18,24				
AD4	17,24	18,24	17,23	18,23	17,22	18,22	17,21	18,21	17,20	
AD5	18,22	19,22	20,22	21,22	18,21	19,21	20,21	21,21	18,20	
	19,20	20,20	21,20	18,19	19,19	20,19	21,19			
AD6	21,21	22,21	23,21	24,21	22,20	23,20				
AD7	25,22	26,22	24,21	25,21	26,21	24,20	25,20	26,20	24,19	
	25,19	26,19	25,18							
AD8	22,20	23,20	22,19	23,19	24,19	20,18	21,18	22,18	23,18	
	24,18									
AD9	17,19	18,19	19,19	17,18	18,18	19,18	20,18	17,17	18,17	
	19,17									
AD10	13,20	14,20	15,20	16,20	17,20	13,19	14,19	15,19	16,19	
	17,19	13,18	14,18	15,18	16,18	17,18				
BE1	10,13	10,12	11,12	10,11	11,11					
BE2	9,17	10,17	11,17	12,17	8,16	9,16	10,16	11,16	12,16	
	9,15	10,15	11,15	12,15	13,15	9,14	10,14	11,14	12,14	
	13,14	10,13	11,13	12,13	13,13					
BE3	14,11	14,10	15,10	15, 9						
BE4	14,10	15,10	16,10	14, 9	15, 9	16, 9	15, 8			
BE5	8,16	8,15	8,14	8,13	9,13	8,12	9,12	8,11	9,11	
	10,11	8,10	9,10	10,10	11,10	8, 9	9, 9	10, 9	11, 9	
BE6	8,11	9,11	8,10	9,10	8, 9	9, 9				
BE7	12,12	13,12	14,12	13,11	14,11	14,10				
BE8	8, 9	9, 9	10, 9	11, 9	12, 9	13, 9	14, 9	8, 8	9, 8	
	10, 8	11, 8	12, 8	13, 8	14, 8	15, 8	16, 8	8, 7	9, 7	
	10, 7	11, 7	12, 7	13, 7	14, 7	15, 7	16, 7	8, 6	9, 6	
	10, 6	11, 6	8, 5							
BE9	11,12	12,12	11,11	12,11	13,11	12,10	13,10	14,10	12, 9	
FR1	13,17	14,17	15,17	16,17	17,17	18,17	19,17	13,16	14,16	
	15,16	16,16	17,16	18,16	13,15	14,15	15,15	16,15	17,15	
	18,15									
FR2	20,17	21,17	22,17	23,17	19,16	20,16	21,16	22,16	23,16	
	19,15	20,15	17,14	18,14	19,14	16,13	17,13	18,13	19,13	
	16,12	17,12	18,12	16,11	17,11					

TABLE 2. (contd)

Census Div.	MESOILT2 NODES									
FR3	13,11	14,11	15,11	14,10	15,10	16,10				
FR4	14,15	15,15	16,15	14,14	15,14	16,14	14,13	15,13		
FR5	14,13	15,13	14,12	15,12	14,11	15,11				
GR2	13,31	14,31	15,31	16,31	13,30	14,30	15,30	16,30		
GR3	12,29	13,29	14,29	15,29	16,29	11,28	12,28	13,28	14,28	
	15,28	16,28	11,27	12,27	13,27	14,27	15,27	16,27		
GR4	13,27	14,27	15,27	16,27	13,26	14,26	15,26	16,26	14,25	
	15,25	16,25	15,24	16,24	15,23	16,23				
GR5	11,27	11,26	12,26	10,25	11,25	12,25	10,24	11,24	12,24	
	10,23	11,23								
GR6	8,27	9,27	10,27	7,26	8,26	9,26	10,26	11,26	7,25	
	8,25	9,25	10,25	7,24	8,24	9,24	7,23	8,23	9,23	
	10,23									
GR7	12,23	13,23	14,23	12,22	13,22	14,22				
GR8	12,26	13,26	14,26	12,25	13,25	14,25	12,24	13,24	14,24	
	13,23	14,23								
GR9	14,23	13,22	14,22	15,22	13,21	14,21	15,21			
GR10	15,22	16,22	14,21	15,21	16,21	14,20	15,20	16,20		
GR11	7,23	8,23	9,23	10,23	7,22	8,22	9,22	10,22	11,22	
	12,22	13,22	7,21	8,21	9,21	10,21	11,21	12,21	13,21	
GR12	7,21	8,21	7,20	8,20	9,20	10,20	11,20	12,20	13,20	
	7,19	8,19	9,19	10,19	11,19	12,19				
GR13	7,18	8,18	9,18	10,18	11,18	12,18	7,17	8,17	9,17	
GR14	10,26	11,26	12,26	10,25	11,25	12,25	10,24	11,24	12,24	
KI1	2,25	2,24	3,24	4,24	5,24	6,24	2,23	3,23	4,23	
	5,23	6,23	3,22	4,22	5,22	6,22	3,21	4,21	5,21	
	6,21									
KI2	1,25	2,25	1,24	2,24						
KI7	1,24	2,24	1,23	2,23	1,22	2,22				
KI8	3,21	4,21	2,20	3,20	4,20	5,20	6,20	3,19	4,19	
	5,19	6,19	7,19	3,18	4,18	5,18	6,18	7,18		
KI9	1,22	2,22	3,22	1,21	2,21	3,21	1,20	2,20	3,20	
KI10	1,21	1,20	2,20	1,19	2,19	2,18				
KL1	3, 8	4, 8	5, 8	6, 8	7, 8	1, 7	2, 7	3, 7	4, 7	
	5, 7	6, 7	7, 7	1, 6	2, 6	3, 6	4, 6	5, 6	6, 6	
KL2	7, 6	2, 5	3, 5	4, 5	5, 5	6, 5	7, 5	3, 4	4, 4	
KL3	1, 6	2, 6	1, 5	2, 5	1, 4	2, 4				
KL4	1, 8	2, 8	3, 8	1, 7	2, 7					
WA1	21,15	22,15	23,15	20,14	21,14	22,14	23,14	20,13	21,13	
	22,13	23,13	20,12	21,12	22,12	23,12	21,11	22,11		
WA2	19,12	20,12	18,11	19,11	20,11	18,10	19,10	18, 9	19, 9	
WA3	17,11	18,11	16,10	17,10	18,10	17, 9	18, 9	17, 8	18, 8	
WA4	20,10	19, 9	20, 9	18, 8	19, 8	20, 8				
WA5	20,11	21,11	22,11	20,10	21,10	22,10	20, 9	21, 9	22, 9	
WA6	23,11	24,11	22,10	23,10	24,10	22, 9	23, 9			
WA7	24,10	25,10	26,10	24, 9	25, 9	26, 9	24, 8	25, 8	26, 8	

TABLE 2. (contd)

Census Div.	MESOILT2 NODES								
WA8	23, 9	24, 9	22, 8	23, 8	24, 8	22, 7	23, 7	24, 7	
WA9	20, 8	21, 8	22, 8	20, 7	21, 7	22, 7			
WA10	22, 9	23, 9	22, 8	23, 8	22, 7	23, 7			
YA1	2,17	3,17	4,17	5,17	6,17	7,17	2,16	3,16	4,16
	5,16	6,16	7,16	8,16					
YA2	1,19	2,19	1,18	2,18	1,17	2,17	1,16	2,16	
YA5	1,16	2,16	1,15	2,15					
YA6	2,15	3,15	4,15	6,15	7,15	8,15	5,14	6,14	7,14
	8,14								
YA7	1,15	2,15	1,14	2,14	3,14	4,14	5,14	1,13	2,13
	3,13	4,13	5,13	1,12	2,12	3,12			
YA9	6,14	7,14	8,14	6,13	7,13	8,13	7,12	8,12	7,11
	8,11								
YA10	7,11	6,10	7,10	8,10	5, 9	6, 9	7, 9	8, 9	
YA11	1,12	2,12	4,12	5,12	1,11	2,11	3,11	4,11	5,11
	6,11	1,10	2,10	3,10	4,10	5,10	6,10	1, 9	2, 9
	3, 9	4, 9	5, 9						
M01	10, 6	11, 6	7, 5	8, 5	9, 5	10, 5	11, 5	7, 4	8, 4
	9, 4	10, 4	11, 4	7, 3	8, 3	9, 3	10, 3		
M02	11, 2	12, 2	13, 2	10, 1	11, 1	12, 1	13, 1		
M03	10, 3	11, 3	7, 2	8, 2	9, 2	10, 2	11, 2	7, 1	8, 1
	9, 1	10, 1							
UM1	19, 7	20, 7	21, 7	19, 6	20, 6	21, 6	22, 6	23, 6	20, 5
	21, 5	20, 4							
UM2	21, 8	22, 8	23, 8	21, 7	22, 7	23, 7	21, 6	22, 6	23, 6
UM3	13, 6	14, 6	15, 6	12, 5	13, 5	14, 5			
UM4	16, 7	17, 7	18, 7	16, 6	17, 6	18, 6	19, 6	15, 5	16, 5
	17, 5	18, 5	19, 5	17, 4	18, 4	19, 4	18, 3		
UM5	21, 7	22, 7	23, 7	21, 6	22, 6	23, 6	21, 5	22, 5	23, 5
UM6	17, 4	18, 4	19, 4	17, 3	18, 3	19, 3	17, 2	18, 2	19, 2
UM7	12, 4	13, 4	12, 3	13, 3	14, 3	15, 3	16, 3	12, 2	13, 2
	14, 2	15, 2	16, 2	17, 2	18, 2	14, 1	15, 1	16, 1	17, 1
	18, 1								
UM8	21, 4	22, 4	23, 4	19, 3	20, 3	21, 3	22, 3	19, 2	20, 2
	21, 2	22, 2	19, 1						
UM9	12, 5	13, 5	14, 5	12, 4	13, 4	14, 4			
UM10	23, 3	24, 3	22, 2	23, 2	24, 2	20, 1	21, 1	22, 1	23, 1
	24, 1								
UM11	20, 8	21, 8	22, 8	20, 7	21, 7	22, 7	21, 6	22, 6	
UM12	12, 7	13, 7	14, 7	12, 6	13, 6	14, 6	12, 5	13, 5	
UM13	23, 7	24, 7	25, 7	22, 6	23, 6	24, 6	25, 6	24, 5	25, 5
UM14	22, 5	23, 5	24, 5	22, 4	23, 4	24, 4	25, 4		

MODEL RESULTS

MESOILT2 was used to compute the monthly time-integrated atmospheric concentrations, monthly deposition rates, and month-end surface contamination at nodes within the model domain for each month from January 1983 through December 1987. The calculations provide data on typical atmospheric transport and diffusion for the study area that can be used to estimate potential air concentrations, deposition rates, and surface contamination from December 1944 through 1947 when combined with estimates of the actual release magnitudes. In Phase I of the study, the pairing of release data and the atmospheric transport and diffusion calculations will be done in another HEDR Project task. In later phases, the release data will be used as input to the atmospheric model.

Dimensions of several of the census divisions are smaller than can be resolved on the MESOILT2 grid. Computations for these divisions are made using nodes surrounding the division. *In each of these cases, there was little variation in the computed values at the nodes surrounding the census division. As a result, inability to resolve the census division did not hinder the process of estimating air concentrations and surface contamination in the census division.* Similarly, there are two instances where it is not possible to distinguish between two divisions (Ellensburg and Kittitas Division 9, Walla Walla Division 9, and College Place). In each case, a single set of computations is used to characterize the atmospheric transport and deposition for both points. Finally, there are several census divisions that are entirely off the MESOILT2 grid. In each of these cases, the average air concentrations, deposition rates, and surface contamination in the divisions should be lower than in nearby divisions for which computations have been made.

29 Examination of early MESOILT2 *output* indicated that monthly time-integrated concentrations at nodes within a small area have an approximately log-normal distribution. *Analysis of the Phase I results indicates that this assumption is not generally appropriate. On the basis of the log-normal assumption, the logarithms (base 10) of the time-integrated concentrations, deposition rates and surface contaminations were used in computing census*

division averages. Nodes in the MESOILT2 domain that did not experience any airborne concentrations or deposition during specific months were not considered in computing the census division values because the logarithm of zero is undefined. To avoid biasing the averages by including logarithms of extremely small values, threshold values were established. Values below the threshold were assumed to be zero and were ignored in the census division calculations. The threshold value assumed for time-integrated concentrations was 1.0×10^{-14} (Ci-s)/m³. For deposition rates, the threshold value was 1.0×10^{-20} (Ci/m²)/s, and for surface contamination the threshold value was 1.0×10^{-16} Ci/m².

The PHASEII post-processor computer program computes the variances of the monthly values at the nodes associated with each division as well as the average values. These variances are a measure of the uncertainty of the census division values resulting from spatial variations in the MESOILT2 output each year and from the year-to-year variations in the meteorological conditions. A second variance has been added to each computed variance to account for basic uncertainties in atmospheric transport and dispersion modeling. The variance of the differences of the logarithms of predicted and observed concentrations in the data set discussed by Ramsdell (1991, Appendix C) is 0.13. This variance is associated with predictions of monthly average concentrations of a noble gas. Variances in predicted concentrations and surface contamination for a depositing material are likely to be larger than for nondepositing material. Therefore, variance of 0.26 has been assumed to represent basic modeling uncertainty.

Finally, the post-processing program normalizes all monthly atmospheric concentrations and surface contamination values to a 1 Ci release. This normalization permits estimation of the time-integrated concentrations, deposition rates and surface contamination for a specific month by multiplying the reported values by the actual monthly release.

Tables 3 through 14 contain the atmospheric transport modeling results for the census divisions for Phase I. Each table lists the census divisions and the average and standard deviation (square roots of the variance) of the time-integrated air concentrations, monthly-average deposition rates, and month-end surface contamination for each division. *Logarithms presented in*

the tables are direct listings of files generated by the PHASEII program. These files were transmitted electronically to others for use in the dose calculations.

The results in Tables 3 through 14 are typical values and are not final HEDR estimates. The final estimates will be based on actual release data and concurrent meteorological data.

TABLE 3. Computational Results for January. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-10.15197	0.57441	-18.57985	0.57449	-12.61925	0.59709
AD2	-10.28782	1.29403	-18.55376	0.92372	-12.71122	1.21705
AD3	-9.93091	1.55912	-18.12964	1.04850	-12.32723	1.48397
AD4	-10.12580	1.42610	-18.42792	1.16042	-12.52606	1.32240
AD5	-10.20640	1.11739	-18.63427	1.11742	-12.62571	1.00363
AD6	-10.66556	1.75045	-18.91208	1.46370	-13.08766	1.61824
AD7	-10.56948	1.72384	-18.70481	1.22846	-13.05411	1.60053
AD8	-10.29150	1.17038	-18.71938	1.17041	-12.75071	1.05142
AD9	-9.69502	0.73491	-18.12290	0.73489	-12.12589	0.67761
AD10	-9.30515	0.74771	-17.73302	0.74790	-11.76698	0.67784
BE1	-8.39489	0.61419	-16.82277	0.61418	-10.86271	0.60307
BE2	-7.79503	0.76935	-16.22291	0.76932	-10.27509	0.79495
BE3	-8.14036	0.53965	-16.56824	0.53965	-10.63684	0.55113
BE4	-8.33021	0.54511	-16.75809	0.54505	-10.81201	0.55897
BE5	-9.52384	1.21981	-17.89374	1.09359	-12.14002	1.23953
BE6	-10.29237	1.46701	-18.56883	1.22767	-12.94341	1.44033
BE7	-7.92393	0.54651	-16.35181	0.54645	-10.43322	0.55316
BE8	-9.70893	1.64170	-17.93603	1.25137	-12.31159	1.67329
BE9	-8.22518	0.58502	-16.65306	0.58507	-10.75054	0.60634
FR1	-9.11467	0.84369	-17.54254	0.84367	-11.54341	0.78387
FR2	-9.49968	0.93892	-17.92755	0.93888	-11.85453	0.87665
FR3	-8.14882	0.55898	-16.57669	0.55901	-10.64049	0.56905
FR4	-8.67165	0.76907	-17.09953	0.76912	-11.06400	0.71366
FR5	-8.15271	0.61651	-16.58059	0.61649	-10.61261	0.60752
GR2	-10.76531	1.01417	-19.19319	1.01410	-13.30512	0.95008
GR3	-10.88795	1.61715	-19.05810	1.20625	-13.38668	1.56683
GR4	-10.42454	1.67226	-18.61443	1.28555	-12.86380	1.55974
GR5	-11.14198	1.81367	-19.31120	1.55725	-13.80392	1.94076
GR6	-11.26440	1.86922	-19.37806	1.48570	-13.81228	1.97996
GR7	-9.85076	0.95239	-18.27864	0.95237	-12.21785	0.90303
GR8	-10.78870	1.78338	-18.94316	1.43775	-13.21154	1.79375
GR9	-9.32422	0.65556	-17.75209	0.65554	-11.72994	0.58971
GR10	-9.33413	0.70045	-17.76200	0.70060	-11.75204	0.62659
GR11	-10.21687	1.30875	-18.64475	1.30874	-12.78592	1.40538
GR12	-9.50630	1.38074	-17.93417	1.38071	-12.04371	1.42472
GR13	-8.67626	0.72708	-17.10413	0.72710	-11.19471	0.79705
GR14	-11.14128	1.70644	-19.45979	1.59140	-13.80083	1.88470
KI1	-11.12438	1.88725	-19.29122	1.58060	-13.76820	1.83183
KI2	-11.40591	2.67191	-18.60155	0.55972	-13.62702	1.77644
KI7	-12.31210	2.85132	-19.26469	1.78265	-14.74576	2.43279
KI8	-10.40978	1.42847	-18.77276	1.32781	-13.01203	1.42870
KI9	-11.79843	1.97150	-19.76818	1.54718	-14.41791	1.80675
KI10	-12.68366	1.91807	-20.38654	1.37937	-15.27615	1.87120

TABLE 3. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-12.08374	1.92741	-20.09815	1.58685	-14.77357	1.92538
KL2	-11.97676	2.28182	-19.69351	1.56385	-14.25952	1.90392
KL3	-12.78660	1.79898	-20.91735	1.50162	-15.23445	1.63836
KL4	-13.09519	1.75029	-20.81571	1.15021	-15.86126	1.82931
WA1	-9.95341	0.80329	-18.38128	0.80330	-12.26655	0.73811
WA2	-9.31538	0.82527	-17.74325	0.82528	-11.72151	0.80443
WA3	-8.70533	0.62292	-17.13321	0.62294	-11.12731	0.61699
WA4	-9.12346	0.73408	-17.55134	0.73399	-11.52544	0.71621
WA5	-9.73731	0.76199	-18.16518	0.76202	-12.13587	0.76717
WA6	-10.10952	0.69618	-18.53740	0.69616	-12.44275	0.68036
WA7	-10.38593	0.65784	-18.81381	0.65780	-12.67225	0.62223
WA8	-9.81930	0.75410	-18.24717	0.75409	-12.14759	0.75696
WA9	-9.37132	0.76567	-17.79919	0.76572	-11.73182	0.73178
WA10	-9.70040	0.75540	-18.12828	0.75547	-12.04228	0.76319
YA1	-10.91831	1.74677	-19.11138	1.45957	-13.53538	1.80827
YA2	-13.05000	1.82788	-20.65008	1.24270	-15.73034	1.78180
YA5	-12.86569	1.31376	-20.96326	0.99835	-15.69398	1.16112
YA6	-10.57660	1.62520	-18.79700	1.31870	-13.29039	1.67739
YA7	-12.22334	1.34222	-20.55053	1.24229	-15.03351	1.38762
YA9	-10.25700	1.56971	-18.46576	1.15209	-12.98646	1.57648
YA10	-11.20826	1.90860	-19.23755	1.37024	-13.81086	1.70131
YA11	-12.44404	1.75110	-20.49102	1.41659	-15.12203	1.70521
MO1	-10.52137	1.54546	-18.73410	1.16662	-13.20607	1.62852
MO2	-10.75296	1.54173	-19.18083	1.54176	-13.47446	1.71410
MO3	-11.24679	2.16472	-18.94606	1.29706	-13.87762	2.20185
UM1	-9.19309	0.70551	-17.62097	0.70541	-11.57760	0.68893
UM2	-9.52948	0.78660	-17.95735	0.78660	-11.87345	0.76426
UM3	-9.51279	0.74079	-17.94066	0.74082	-12.15221	0.86397
UM4	-8.88993	0.56319	-17.31780	0.56339	-11.34073	0.57950
UM5	-9.48158	0.78767	-17.90945	0.78764	-11.83759	0.76714
UM6	-9.11024	0.57403	-17.53812	0.57393	-11.53027	0.58567
UM7	-9.96766	0.95805	-18.39553	0.95802	-12.54857	1.07867
UM8	-9.22254	0.60886	-17.65041	0.60887	-11.61478	0.61442
UM9	-9.83209	0.85976	-18.25997	0.85976	-12.52211	0.99244
UM10	-9.59050	0.70453	-18.01838	0.70453	-12.01197	0.69566
UM11	-9.38243	0.77261	-17.81031	0.77256	-11.74584	0.74138
UM12	-9.49963	0.75946	-17.92751	0.75937	-12.16740	0.88053
UM13	-9.74152	0.77972	-18.16940	0.77968	-12.05338	0.77525
UM14	-9.62055	0.79428	-18.04843	0.79424	-11.98300	0.78807

TABLE 4. Computational Results for February. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-10.47975	0.68574	-18.86647	0.68540	-12.86166	0.71994
AD2	-10.17679	0.58807	-18.56351	0.58816	-12.57822	0.63550
AD3	-9.82326	0.57924	-18.20998	0.57798	-12.22847	0.61411
AD4	-9.82295	0.68963	-18.20968	0.68834	-12.21373	0.75790
AD5	-9.95648	0.60961	-18.34320	0.60977	-12.36434	0.64739
AD6	-10.04030	0.56682	-18.42703	0.56719	-12.45253	0.58239
AD7	-10.05999	0.59641	-18.44671	0.59666	-12.44056	0.59793
AD8	-9.84142	0.55985	-18.22813	0.55980	-12.18628	0.54944
AD9	-9.60532	0.63227	-17.99205	0.63261	-11.95793	0.61788
AD10	-9.17846	0.67132	-17.56518	0.67089	-11.53134	0.67698
BE1	-8.58768	0.67460	-16.97440	0.67459	-11.07874	0.62563
BE2	-7.85519	0.77246	-16.24191	0.77238	-10.29728	0.76866
BE3	-8.22741	0.55023	-16.61413	0.55009	-10.73541	0.55729
BE4	-8.38660	0.55803	-16.77332	0.55783	-10.87530	0.55333
BE5	-9.41518	1.01850	-17.80190	1.01789	-11.87952	0.97326
BE6	-9.94303	1.32849	-18.32975	1.32727	-12.42472	1.22269
BE7	-8.01694	0.56483	-16.40366	0.56458	-10.50002	0.56986
BE8	-9.47827	1.25240	-17.78991	1.08150	-12.01871	1.28208
BE9	-8.31859	0.63070	-16.70531	0.63012	-10.80865	0.61498
FR1	-8.95355	0.67429	-17.34027	0.67459	-11.29477	0.66441
FR2	-9.24205	0.72075	-17.62876	0.72091	-11.59252	0.70319
FR3	-8.23839	0.55185	-16.62511	0.55151	-10.71823	0.54648
FR4	-8.51753	0.62878	-16.90425	0.62932	-10.88768	0.61920
FR5	-8.15990	0.54290	-16.54662	0.54303	-10.58476	0.54787
GR2	-10.21422	0.69327	-18.60094	0.69236	-12.69135	0.71746
GR3	-9.93029	0.63312	-18.31701	0.63252	-12.41519	0.68155
GR4	-9.62815	0.59472	-18.01487	0.59436	-12.07582	0.66389
GR5	-9.72949	0.66043	-18.11621	0.65849	-12.18994	0.73202
GR6	-9.86674	0.67920	-18.25346	0.67784	-12.32641	0.71881
GR7	-9.32408	0.59470	-17.71081	0.59395	-11.73819	0.64882
GR8	-9.58250	0.63230	-17.96922	0.63167	-12.02715	0.72390
GR9	-9.26239	0.57512	-17.64912	0.57446	-11.68518	0.62616
GR10	-9.36731	0.61511	-17.75403	0.61421	-11.77855	0.66495
GR11	-9.43785	0.69824	-17.82457	0.69673	-11.86456	0.72097
GR12	-9.20497	0.99035	-17.59169	0.98956	-11.64678	1.00628
GR13	-8.81709	1.02923	-17.20395	1.02948	-11.28271	1.05917
GR14	-9.75856	0.64168	-18.14529	0.64000	-12.22143	0.72105
KI1	-11.41109	1.49442	-19.73138	1.41385	-13.94037	1.43835
KI2	-12.01625	1.20531	-20.39992	1.20529	-14.61349	1.31126
KI7	-11.83507	1.02078	-20.21874	1.02075	-14.43792	1.11761
KI8	-10.94832	1.73997	-19.15877	1.49185	-13.46699	1.67359
KI9	-11.38401	0.91769	-19.76768	0.91767	-14.00017	1.00083
KI10	-11.58982	1.04512	-19.97349	1.04512	-14.20484	1.14908

TABLE 4. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.40012	1.73965	-19.44127	1.28691	-13.86582	1.78628
KL2	-10.75917	1.33844	-19.14538	1.34106	-13.29696	1.57344
KL3	-11.33662	0.90739	-19.72029	0.90737	-13.75639	1.07663
KL4	-11.58687	0.55253	-19.97054	0.55250	-14.01238	0.64599
WA1	-9.58805	0.59917	-17.97476	0.59891	-11.89251	0.59734
WA2	-8.98508	0.57364	-17.37181	0.57436	-11.37569	0.56620
WA3	-8.69163	0.52720	-17.07835	0.52718	-11.12679	0.53698
WA4	-8.98415	0.54252	-17.37087	0.54314	-11.41847	0.55209
WA5	-9.32713	0.57627	-17.71385	0.57748	-11.74819	0.57617
WA6	-9.59388	0.56350	-17.98060	0.56414	-11.97468	0.56858
WA7	-9.81141	0.57245	-18.19813	0.57367	-12.18631	0.60231
WA8	-9.45999	0.57473	-17.84671	0.57603	-11.88658	0.59127
WA9	-9.16716	0.53295	-17.55388	0.53328	-11.58156	0.53579
WA10	-9.36470	0.55483	-17.75142	0.55622	-11.79813	0.56019
YA1	-10.75911	1.92663	-18.90967	1.60366	-13.28062	1.91144
YA2	-12.55860	1.47862	-20.72481	1.23016	-15.16803	1.51389
YA5	-14.33762	1.31672	-22.06963	0.77579	-16.94953	1.27185
YA6	-10.52172	2.12130	-18.62173	1.71693	-13.04882	2.10532
YA7	-13.03272	1.76158	-20.85967	1.47687	-15.54096	1.80926
YA9	-9.86352	1.19845	-18.25024	1.19768	-12.37701	1.13918
YA10	-10.42200	1.58547	-18.80926	1.58437	-12.99450	1.56378
YA11	-11.11982	1.37472	-19.43115	1.26953	-13.60221	1.48493
MO1	-10.78753	1.50772	-19.06641	1.37114	-13.44882	1.70608
MO2	-10.23800	0.81706	-18.62473	0.81846	-12.77060	0.92020
MO3	-11.11198	1.52414	-19.42618	1.44024	-13.74840	1.71305
UM1	-9.14413	0.53713	-17.53085	0.53695	-11.61205	0.55005
UM2	-9.27928	0.53909	-17.66600	0.53959	-11.70409	0.54586
UM3	-9.26177	0.67796	-17.64849	0.67766	-11.81382	0.73622
UM4	-8.92319	0.56363	-17.30991	0.56330	-11.43688	0.58004
UM5	-9.29147	0.53834	-17.67819	0.53837	-11.73022	0.54620
UM6	-9.08273	0.55944	-17.46945	0.55876	-11.60255	0.57417
UM7	-9.65365	0.68935	-18.04037	0.68918	-12.19280	0.78089
UM8	-9.22896	0.55225	-17.61567	0.55176	-11.73623	0.58008
UM9	-9.57389	0.68253	-17.96061	0.68232	-12.15436	0.76010
UM10	-9.46601	0.55690	-17.85273	0.55660	-11.96386	0.58298
UM11	-9.18467	0.53428	-17.57139	0.53451	-11.60811	0.54009
UM12	-9.28740	0.68040	-17.67412	0.68004	-11.85191	0.71638
UM13	-9.50535	0.55126	-17.89207	0.55192	-11.92333	0.57331
UM14	-9.47973	0.57656	-17.86645	0.57645	-11.90970	0.58011

TABLE 5. Computational Results for March. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-9.89389	0.53266	-18.32177	0.53279	-12.36057	0.57331
AD2	-9.81849	0.53589	-18.24636	0.53590	-12.22383	0.57264
AD3	-9.72150	0.55219	-18.14938	0.55209	-12.06841	0.57099
AD4	-9.52306	0.54640	-17.95093	0.54656	-11.90734	0.55120
AD5	-9.52311	0.53205	-17.95099	0.53199	-11.92985	0.55182
AD6	-9.56186	0.53026	-17.98973	0.53035	-11.98742	0.54873
AD7	-9.58217	0.52872	-18.01004	0.52882	-12.04107	0.54055
AD8	-9.38238	0.53095	-17.81026	0.53110	-11.80974	0.52953
AD9	-9.15643	0.53721	-17.58430	0.53724	-11.58002	0.53925
AD10	-8.95411	0.57102	-17.38199	0.57089	-11.40661	0.57323
BE1	-8.55982	0.57531	-16.98769	0.57526	-11.09741	0.58362
BE2	-7.87104	0.71973	-16.29892	0.71966	-10.36371	0.73614
BE3	-8.26508	0.54285	-16.69295	0.54289	-10.82812	0.52995
BE4	-8.41457	0.53989	-16.84245	0.53996	-10.99286	0.53816
BE5	-9.09817	0.67184	-17.52604	0.67191	-11.59906	0.66615
BE6	-9.41641	0.61923	-17.84428	0.61928	-11.88154	0.60388
BE7	-8.06601	0.55328	-16.49389	0.55327	-10.60367	0.54939
BE8	-9.19929	0.69592	-17.62717	0.69583	-11.66879	0.63280
BE9	-8.41058	0.58566	-16.83846	0.58564	-10.95731	0.58091
FR1	-8.65853	0.61945	-17.08641	0.61947	-11.08760	0.60481
FR2	-8.99822	0.59840	-17.42609	0.59843	-11.40602	0.60696
FR3	-8.26365	0.54490	-16.69152	0.54494	-10.83087	0.55466
FR4	-8.38486	0.58784	-16.81274	0.58775	-10.76835	0.58429
FR5	-8.20931	0.55172	-16.63718	0.55178	-10.66921	0.55898
GR2	-9.94069	0.59298	-18.36857	0.59297	-12.45181	0.69427
GR3	-9.78857	0.59087	-18.21645	0.59078	-12.29583	0.67763
GR4	-9.60691	0.58763	-18.03478	0.58770	-12.05206	0.66047
GR5	-9.53230	0.59413	-17.96017	0.59428	-12.01091	0.64066
GR6	-9.53511	0.61487	-17.96299	0.61493	-12.05764	0.61963
GR7	-9.20677	0.56751	-17.63464	0.56749	-11.66078	0.58588
GR8	-9.47356	0.59359	-17.90143	0.59366	-11.96342	0.65848
GR9	-9.14483	0.55610	-17.57271	0.55605	-11.55571	0.54818
GR10	-9.13802	0.55716	-17.56590	0.55715	-11.52782	0.55774
GR11	-9.15123	0.60306	-17.57911	0.60287	-11.61389	0.59553
GR12	-8.77756	0.64112	-17.20543	0.64116	-11.25877	0.65071
GR13	-8.58126	0.78471	-17.00914	0.78469	-11.13850	0.84761
GR14	-9.53776	0.58651	-17.96564	0.58666	-12.01973	0.63297
KI1	-10.53389	1.69564	-18.81269	1.49927	-13.00867	1.70416
KI2	-12.23033	1.90194	-20.29101	1.62321	-14.76942	1.92146
KI7	-12.02413	1.59373	-20.20664	1.38504	-14.54559	1.58917
KI8	-10.22453	1.54975	-18.58632	1.44220	-12.77569	1.53731
KI9	-11.52488	1.70555	-19.75377	1.51068	-13.98145	1.64576
KI10	-11.70460	1.83719	-19.81012	1.53266	-14.11918	1.74736

TABLE 5. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.04037	1.15195	-19.46824	1.15196	-13.45869	1.26073
KL2	-10.90574	0.97237	-19.33362	0.97235	-13.36844	1.06800
KL3	-11.94801	1.07760	-20.37589	1.07751	-14.43783	1.20027
KL4	-12.05910	1.21808	-20.48698	1.21812	-14.47895	1.35787
WA1	-9.26153	0.54950	-17.68940	0.54959	-11.66221	0.55162
WA2	-8.96202	0.54200	-17.38989	0.54202	-11.38330	0.56037
WA3	-8.73119	0.55526	-17.15907	0.55523	-11.26848	0.58338
WA4	-9.03457	0.56187	-17.46245	0.56181	-11.52015	0.59735
WA5	-9.19785	0.53040	-17.62573	0.53041	-11.61331	0.53181
WA6	-9.29430	0.52286	-17.72218	0.52282	-11.67140	0.51717
WA7	-9.40398	0.52168	-17.83185	0.52173	-11.76071	0.52027
WA8	-9.31097	0.54485	-17.73885	0.54469	-11.72695	0.54103
WA9	-9.22207	0.55445	-17.64994	0.55443	-11.69522	0.58692
WA10	-9.28674	0.54415	-17.71462	0.54407	-11.71303	0.54258
YA1	-10.20322	1.31426	-18.63109	1.31432	-12.69657	1.26816
YA2	-11.67733	1.70818	-19.74463	1.32114	-14.14859	1.74757
YA5	-11.72100	1.29632	-20.14887	1.29637	-14.26190	1.39491
YA6	-9.94016	1.29627	-18.36803	1.29632	-12.37587	1.27007
YA7	-11.31569	1.31637	-19.69189	1.25329	-13.76317	1.38402
YA9	-9.29590	0.74849	-17.72378	0.74840	-11.80480	0.76265
YA10	-9.87200	0.68451	-18.29987	0.68453	-12.28989	0.69171
YA11	-11.01191	1.33328	-19.40213	1.28389	-13.38869	1.40049
MO1	-9.92362	0.68259	-18.35150	0.68268	-12.33966	0.64455
MO2	-9.96374	0.76913	-18.39162	0.76908	-12.43898	0.74730
MO3	-10.23077	0.80091	-18.65864	0.80094	-12.72129	0.85088
UM1	-9.17726	0.54059	-17.60513	0.54055	-11.76876	0.55701
UM2	-9.28750	0.54859	-17.71538	0.54857	-11.76034	0.56563
UM3	-9.25649	0.56693	-17.68436	0.56687	-11.75982	0.54772
UM4	-8.90566	0.54541	-17.33354	0.54539	-11.51596	0.54840
UM5	-9.31560	0.53796	-17.74348	0.53795	-11.83013	0.55958
UM6	-9.07188	0.54937	-17.49976	0.54926	-11.68485	0.54638
UM7	-9.58420	0.61828	-18.01208	0.61834	-12.06606	0.58194
UM8	-9.27090	0.54969	-17.69878	0.54957	-11.88185	0.56032
UM9	-9.46500	0.56308	-17.89287	0.56306	-11.94547	0.53827
UM10	-9.59426	0.57575	-18.02213	0.57574	-12.15914	0.59776
UM11	-9.23819	0.54693	-17.66607	0.54684	-11.72816	0.58118
UM12	-9.27522	0.56754	-17.70310	0.56751	-11.77320	0.54723
UM13	-9.42798	0.57143	-17.85585	0.57153	-11.87246	0.57026
UM14	-9.52486	0.54579	-17.95274	0.54575	-12.03889	0.57036

TABLE 6. Computational Results for April. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(C_i-s)/m^2]/C_i$; deposition rate, $[(C_i/m^2)/s]/C_i$; surface contamination, $(C_i/m^2)/C_i$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-9.84679	0.53720	-18.26042	0.53727	-12.40221	0.54569
AD2	-9.78559	0.53772	-18.19923	0.53766	-12.33366	0.55370
AD3	-9.64194	0.53393	-18.05557	0.53396	-12.16963	0.53793
AD4	-9.52443	0.54969	-17.93807	0.54965	-12.04696	0.56111
AD5	-9.48206	0.57410	-17.89569	0.57417	-12.04260	0.58713
AD6	-9.55776	0.54661	-17.97139	0.54659	-12.14126	0.55245
AD7	-9.60453	0.54202	-18.01817	0.54207	-12.14704	0.55708
AD8	-9.42023	0.54651	-17.83387	0.54642	-11.94863	0.57575
AD9	-9.13681	0.55363	-17.55045	0.55352	-11.66693	0.58439
AD10	-9.01151	0.56314	-17.42515	0.56295	-11.51379	0.57247
BE1	-8.88859	0.61074	-17.30223	0.61074	-11.33331	0.61084
BE2	-8.06492	0.83850	-16.47856	0.83850	-10.51226	0.82258
BE3	-8.57981	0.58618	-16.99344	0.58622	-11.04291	0.61520
BE4	-8.68367	0.56862	-17.09731	0.56851	-11.17338	0.57955
BE5	-9.52284	0.68961	-17.93648	0.68949	-11.82189	0.66789
BE6	-9.75205	0.61579	-18.16568	0.61582	-11.99232	0.60933
BE7	-8.35231	0.59170	-16.76594	0.59171	-10.83418	0.60904
BE8	-9.64211	0.83725	-18.05574	0.83728	-11.98335	0.79826
BE9	-8.81184	0.60530	-17.22548	0.60535	-11.25947	0.59592
FR1	-8.63032	0.64066	-17.04395	0.64059	-11.15922	0.64524
FR2	-8.89924	0.64667	-17.31287	0.64671	-11.38473	0.66796
FR3	-8.47361	0.56342	-16.88725	0.56347	-10.94957	0.57796
FR4	-8.26721	0.58795	-16.68085	0.58785	-10.77425	0.60513
FR5	-8.15431	0.56708	-16.56795	0.56703	-10.63223	0.56204
GR2	-10.20766	0.61808	-18.62130	0.61792	-12.65890	0.62855
GR3	-9.97825	0.63194	-18.39188	0.63186	-12.43567	0.66523
GR4	-9.62548	0.55376	-18.03912	0.55369	-12.10405	0.57580
GR5	-9.87497	0.65281	-18.28861	0.65270	-12.35077	0.68109
GR6	-10.64263	1.48055	-19.00840	1.41604	-13.08290	1.51691
GR7	-9.30701	0.53802	-17.72065	0.53812	-11.75437	0.55763
GR8	-9.57140	0.57001	-17.98503	0.56996	-12.06063	0.60740
GR9	-9.25550	0.54311	-17.66913	0.54317	-11.70135	0.55620
GR10	-9.22914	0.56046	-17.64277	0.56048	-11.70789	0.57503
GR11	-9.73354	1.10497	-18.14718	1.10495	-12.14549	1.10680
GR12	-9.20101	0.94667	-17.61465	0.94668	-11.61717	0.96964
GR13	-9.01456	1.21324	-17.42819	1.21330	-11.43608	1.24355
GR14	-9.94580	0.69166	-18.35944	0.69165	-12.42496	0.72165
KI1	-10.06908	1.39593	-18.40109	1.25057	-12.31263	1.43660
KI2	-10.41675	0.70771	-18.83039	0.70773	-12.65192	0.61963
KI7	-10.65232	0.98373	-19.06595	0.98375	-12.78749	0.93582
KI8	-10.36914	1.47688	-18.78277	1.47690	-12.58298	1.54708
KI9	-10.73014	1.21218	-19.14378	1.21213	-12.80795	1.17919
KI10	-11.36117	1.56131	-19.77480	1.56128	-13.45199	1.52300

TABLE 6. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.12300	1.22403	-19.48976	1.15907	-13.38507	1.23366
KL2	-10.97777	1.29985	-19.28738	1.13270	-13.29439	1.33457
KL3	-11.90433	1.19327	-20.31797	1.19325	-14.25251	1.04390
KL4	-12.08423	0.91712	-20.49787	0.91704	-14.37008	0.84523
WA1	-9.11327	0.54092	-17.52691	0.54075	-11.56299	0.55508
WA2	-8.73820	0.53881	-17.15184	0.53880	-11.20114	0.54117
WA3	-8.64316	0.55473	-17.05680	0.55460	-11.11022	0.55272
WA4	-8.85222	0.53441	-17.26586	0.53436	-11.31861	0.52975
WA5	-8.96945	0.53847	-17.38309	0.53840	-11.42011	0.53917
WA6	-9.09694	0.54888	-17.51058	0.54890	-11.52677	0.55693
WA7	-9.17173	0.54661	-17.58536	0.54661	-11.61717	0.55774
WA8	-9.03066	0.53944	-17.44430	0.53948	-11.49044	0.53866
WA9	-8.98650	0.53111	-17.40014	0.53110	-11.45868	0.52845
WA10	-9.01848	0.53904	-17.43211	0.53908	-11.48032	0.53656
YA1	-10.74063	1.71145	-19.06989	1.61650	-12.99564	1.73970
YA2	-12.06096	1.74438	-20.32989	1.62600	-14.22067	1.76905
YA5	-12.19838	1.54374	-20.61202	1.54374	-14.43180	1.72414
YA6	-10.51821	1.68209	-18.80923	1.49883	-12.82806	1.71625
YA7	-11.37687	1.38091	-19.61766	1.16049	-13.56912	1.45832
YA9	-9.95111	1.01570	-18.36475	1.01573	-12.23833	1.12497
YA10	-10.37789	1.03706	-18.79152	1.03707	-12.59814	1.11702
YA11	-11.55229	1.33310	-19.92851	1.29540	-13.83329	1.51707
MO1	-10.31683	0.84952	-18.73047	0.84964	-12.62023	0.86747
MO2	-10.18912	0.62348	-18.60276	0.62338	-12.54046	0.64566
MO3	-10.39682	0.72779	-18.81045	0.72773	-12.72931	0.75361
UM1	-9.14614	0.54633	-17.55978	0.54631	-11.58655	0.54106
UM2	-9.05232	0.53558	-17.46595	0.53559	-11.52024	0.53449
UM3	-9.57509	0.59168	-17.98872	0.59171	-12.02711	0.63514
UM4	-9.19940	0.55543	-17.61304	0.55542	-11.66741	0.55581
UM5	-9.14446	0.54160	-17.55810	0.54162	-11.60066	0.54121
UM6	-9.35568	0.54485	-17.76931	0.54483	-11.82863	0.55198
UM7	-9.79177	0.60124	-18.20541	0.60115	-12.22664	0.63572
UM8	-9.39313	0.53744	-17.80677	0.53744	-11.84707	0.54721
UM9	-9.74623	0.59090	-18.15987	0.59086	-12.19278	0.64233
UM10	-9.60903	0.55646	-18.02266	0.55646	-12.06878	0.56828
UM11	-9.02081	0.53771	-17.43444	0.53775	-11.48855	0.53835
UM12	-9.61993	0.58943	-18.03357	0.58936	-12.04933	0.62378
UM13	-9.13853	0.54031	-17.55216	0.54030	-11.60129	0.53515
UM14	-9.32563	0.54048	-17.73927	0.54047	-11.76867	0.54031

TABLE 7. Computational Results for May. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-9.70957	0.52876	-18.13744	0.52871	-12.25809	0.52108
AD2	-9.61966	0.52964	-18.04754	0.52943	-12.17127	0.53275
AD3	-9.53195	0.52552	-17.95983	0.52558	-12.05107	0.54152
AD4	-9.36961	0.53075	-17.79749	0.53064	-11.91208	0.52689
AD5	-9.40110	0.53124	-17.82898	0.53113	-11.93019	0.53257
AD6	-9.51663	0.51836	-17.94451	0.51830	-12.05115	0.52176
AD7	-9.53568	0.51918	-17.96355	0.51915	-12.04152	0.53059
AD8	-9.37193	0.52127	-17.79981	0.52127	-11.85047	0.54164
AD9	-9.12689	0.53046	-17.55477	0.53044	-11.60700	0.53255
AD10	-9.00595	0.54349	-17.43383	0.54348	-11.51206	0.53319
BE1	-8.84820	0.58208	-17.27608	0.58201	-11.18855	0.61536
BE2	-8.09214	0.79459	-16.52001	0.79461	-10.53019	0.77918
BE3	-8.63201	0.54836	-17.05989	0.54834	-11.12828	0.54527
BE4	-8.78090	0.54444	-17.20878	0.54443	-11.25688	0.53980
BE5	-9.30005	0.61280	-17.72791	0.61304	-11.70529	0.66780
BE6	-9.46308	0.60852	-17.89095	0.60846	-11.88092	0.69094
BE7	-8.39581	0.56419	-16.82369	0.56428	-10.85149	0.56368
BE8	-9.37355	0.65381	-17.80143	0.65373	-11.77300	0.67923
BE9	-8.69281	0.55841	-17.12069	0.55843	-11.06891	0.56921
FR1	-8.62397	0.60552	-17.05185	0.60540	-11.14183	0.60634
FR2	-8.84975	0.59604	-17.27763	0.59615	-11.33360	0.61046
FR3	-8.53362	0.53813	-16.96149	0.53812	-11.00971	0.53670
FR4	-8.22440	0.55809	-16.65228	0.55811	-10.74463	0.57504
FR5	-8.21003	0.54570	-16.63791	0.54575	-10.67472	0.56374
GR2	-10.13939	0.59408	-18.56727	0.59402	-12.60797	0.58244
GR3	-9.81786	0.61309	-18.24573	0.61301	-12.25979	0.59854
GR4	-9.49628	0.55642	-17.92416	0.55644	-11.96325	0.55642
GR5	-9.53225	0.55840	-17.96013	0.55841	-12.00706	0.55766
GR6	-9.62281	0.55823	-18.05068	0.55822	-12.03806	0.54157
GR7	-9.21104	0.52807	-17.63892	0.52810	-11.68887	0.53567
GR8	-9.45544	0.55589	-17.88332	0.55589	-11.93208	0.56428
GR9	-9.16635	0.53077	-17.59423	0.53090	-11.64847	0.53239
GR10	-9.14720	0.53963	-17.57508	0.53965	-11.65259	0.53235
GR11	-9.21535	0.55846	-17.64322	0.55849	-11.65731	0.53938
GR12	-8.95686	0.60720	-17.38474	0.60731	-11.40359	0.59124
GR13	-8.82494	0.75474	-17.25282	0.75470	-11.27801	0.75889
GR14	-9.56402	0.54238	-17.99190	0.54233	-12.04314	0.54576
KI1	-10.62749	1.47981	-19.05537	1.47980	-13.14446	1.37116
KI2	-11.57445	1.99739	-20.00233	1.99736	-14.18542	1.81224
KI7	-11.59039	1.94493	-20.01827	1.94489	-14.20211	1.78354
KI8	-10.47192	1.35062	-18.89980	1.35064	-12.92897	1.31382
KI9	-11.66747	1.80674	-20.01320	1.75876	-14.19762	1.69633
KI10	-11.97972	1.79151	-20.30586	1.74265	-14.43767	1.72312

TABLE 7. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.17873	1.43282	-19.56198	1.37871	-13.49369	1.42751
KL2	-11.01656	1.30017	-19.44444	1.30007	-13.34380	1.36470
KL3	-11.63306	1.29231	-20.06093	1.29230	-13.91215	1.21926
KL4	-11.76572	1.57230	-20.02484	1.41201	-14.04347	1.56124
WA1	-9.04410	0.53520	-17.47198	0.53542	-11.53300	0.53835
WA2	-8.78651	0.53673	-17.21439	0.53664	-11.25075	0.56286
WA3	-8.70035	0.54202	-17.12823	0.54188	-11.16374	0.55653
WA4	-8.88767	0.53016	-17.31555	0.53015	-11.34491	0.54730
WA5	-8.97332	0.52981	-17.40120	0.52977	-11.43119	0.55483
WA6	-9.05232	0.52100	-17.48020	0.52097	-11.50290	0.53008
WA7	-9.14126	0.51757	-17.56914	0.51751	-11.60781	0.52122
WA8	-9.06618	0.51713	-17.49405	0.51706	-11.50853	0.52116
WA9	-9.00462	0.51960	-17.43250	0.51960	-11.45716	0.52485
WA10	-9.04461	0.51843	-17.47248	0.51833	-11.48675	0.52506
YA1	-10.21479	1.02713	-18.64267	1.02709	-12.65878	1.08475
YA2	-11.68214	1.46495	-20.11001	1.46500	-14.11968	1.43407
YA5	-11.21433	1.01470	-19.64221	1.01469	-13.65107	1.05473
YA6	-9.81878	0.91535	-18.24665	0.91532	-12.27897	0.94618
YA7	-10.79798	1.12838	-19.22586	1.12838	-13.24074	1.19790
YA9	-9.48755	0.68470	-17.91542	0.68469	-11.92004	0.70114
YA10	-10.01444	0.76721	-18.44232	0.76711	-12.40220	0.81732
YA11	-11.00362	1.26487	-19.43149	1.26485	-13.38285	1.34233
MO1	-9.95171	0.71870	-18.37958	0.71872	-12.30190	0.74834
MO2	-9.81888	0.57532	-18.24676	0.57539	-12.14497	0.56313
MO3	-10.07997	0.62461	-18.50785	0.62463	-12.38350	0.66315
UM1	-9.15679	0.52583	-17.58467	0.52587	-11.64351	0.53594
UM2	-9.07429	0.52258	-17.50216	0.52255	-11.52331	0.52638
UM3	-9.33809	0.55274	-17.76597	0.55272	-11.72321	0.55108
UM4	-9.22802	0.53536	-17.65589	0.53550	-11.73913	0.52996
UM5	-9.16595	0.52760	-17.59382	0.52749	-11.62814	0.53469
UM6	-9.41803	0.54601	-17.84590	0.54603	-11.92877	0.53029
UM7	-9.60766	0.55957	-18.03554	0.55939	-12.03875	0.55076
UM8	-9.40515	0.53259	-17.83302	0.53259	-11.91342	0.53243
UM9	-9.43064	0.54160	-17.85851	0.54157	-11.81717	0.54061
UM10	-9.52306	0.53956	-17.95094	0.53948	-12.01416	0.55231
UM11	-9.03831	0.52222	-17.46619	0.52220	-11.49297	0.52949
UM12	-9.33473	0.56372	-17.76261	0.56363	-11.70370	0.56026
UM13	-9.19995	0.52743	-17.62782	0.52741	-11.63494	0.52944
UM14	-9.35648	0.53077	-17.78436	0.53067	-11.81919	0.54688

TABLE 8. Computational Results for June. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^2]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-9.73460	0.58274	-18.14824	0.58269	-12.32297	0.63407
AD2	-9.73377	0.60170	-18.14741	0.60153	-12.28130	0.66665
AD3	-9.71607	0.61401	-18.12971	0.61398	-12.26428	0.71473
AD4	-9.50606	0.59544	-17.91970	0.59544	-12.00932	0.64112
AD5	-9.44702	0.58685	-17.86065	0.58684	-11.96030	0.60497
AD6	-9.50947	0.56383	-17.92311	0.56387	-12.06505	0.58180
AD7	-9.50747	0.54330	-17.92111	0.54325	-12.07805	0.56866
AD8	-9.37271	0.55130	-17.78635	0.55131	-11.91441	0.56487
AD9	-9.17186	0.57915	-17.58549	0.57912	-11.69495	0.58936
AD10	-9.03855	0.57755	-17.45219	0.57764	-11.51131	0.59541
BE1	-9.06887	0.65950	-17.48250	0.65956	-11.44558	0.63340
BE2	-8.08768	0.77670	-16.50131	0.77664	-10.53961	0.77621
BE3	-8.61946	0.55574	-17.03309	0.55578	-11.03383	0.56320
BE4	-8.75069	0.55036	-17.16432	0.55037	-11.17176	0.55358
BE5	-9.45354	0.71853	-17.86718	0.71838	-11.78683	0.69825
BE6	-9.71336	0.68616	-18.12700	0.68609	-12.01048	0.67125
BE7	-8.40610	0.56168	-16.81973	0.56165	-10.84229	0.56735
BE8	-9.59076	0.77760	-18.00440	0.77743	-11.95191	0.75513
BE9	-8.81708	0.61008	-17.23071	0.61007	-11.24585	0.59883
FR1	-8.62731	0.62564	-17.04094	0.62572	-11.13925	0.65015
FR2	-8.89465	0.60964	-17.30828	0.60969	-11.37012	0.62210
FR3	-8.53442	0.53996	-16.94805	0.53993	-10.96340	0.54638
FR4	-8.28293	0.57724	-16.69656	0.57722	-10.76505	0.60181
FR5	-8.23646	0.54479	-16.65009	0.54480	-10.67883	0.55283
GR2	-10.33588	0.55641	-18.74951	0.55652	-12.95775	0.66525
GR3	-10.02369	0.55971	-18.43732	0.55983	-12.63623	0.63394
GR4	-9.71786	0.58881	-18.13150	0.58871	-12.30036	0.67107
GR5	-9.67679	0.56538	-18.09043	0.56533	-12.27071	0.63122
GR6	-9.74192	0.57185	-18.15556	0.57172	-12.34570	0.58701
GR7	-9.45291	0.58170	-17.86654	0.58172	-11.99973	0.64553
GR8	-9.63751	0.57286	-18.05114	0.57295	-12.22799	0.65069
GR9	-9.36027	0.56309	-17.77391	0.56306	-11.86888	0.60552
GR10	-9.27647	0.56064	-17.69011	0.56073	-11.76130	0.58631
GR11	-9.28362	0.55917	-17.69725	0.55906	-11.82856	0.59321
GR12	-8.92886	0.57410	-17.34249	0.57422	-11.39702	0.57983
GR13	-8.61041	0.60818	-17.02404	0.60814	-11.04507	0.62906
GR14	-9.71589	0.55086	-18.12953	0.55084	-12.31151	0.61314
KI1	-10.26106	1.36136	-18.67470	1.36140	-12.76983	1.35556
KI2	-11.82566	2.12643	-19.85352	1.85646	-14.41498	2.14885
KI7	-11.61248	2.16094	-19.63054	1.88450	-14.15986	2.19389
KI8	-9.69331	1.11702	-18.10694	1.11694	-12.09997	1.12029
KI9	-10.70544	1.65945	-19.00954	1.51190	-13.16141	1.67390
KI10	-10.24858	1.28086	-18.66222	1.28087	-12.64245	1.27825

TABLE 8. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.17721	1.30055	-19.54541	1.24469	-13.45755	1.31470
KL2	-11.24272	1.44884	-19.65636	1.44886	-13.56911	1.44170
KL3	-11.53909	0.95223	-19.95273	0.95219	-13.81070	1.04970
KL4	-11.88782	1.26946	-20.14013	1.09469	-14.11938	1.29419
WA1	-9.08438	0.54885	-17.49801	0.54887	-11.56317	0.54268
WA2	-8.84001	0.53815	-17.25364	0.53820	-11.29116	0.54337
WA3	-8.73257	0.53230	-17.14621	0.53225	-11.18160	0.54283
WA4	-8.93427	0.52613	-17.34791	0.52607	-11.36522	0.53619
WA5	-9.03003	0.53480	-17.44366	0.53476	-11.47121	0.53812
WA6	-9.16264	0.52651	-17.57628	0.52654	-11.62604	0.53058
WA7	-9.27687	0.52200	-17.69050	0.52194	-11.76096	0.52562
WA8	-9.15506	0.52081	-17.56870	0.52062	-11.62042	0.53117
WA9	-9.08449	0.52027	-17.49812	0.52018	-11.52392	0.53300
WA10	-9.13203	0.52080	-17.54567	0.52074	-11.58712	0.53207
YA1	-9.76864	1.10624	-18.18228	1.10624	-12.14731	1.10093
YA2	-10.04597	0.75720	-18.45961	0.75724	-12.38621	0.75365
YA5	-10.22354	0.74279	-18.63718	0.74272	-12.55569	0.75047
YA6	-9.69280	1.15379	-18.10644	1.15380	-12.09609	1.18508
YA7	-10.53224	1.17997	-18.94588	1.18003	-12.89609	1.15266
YA9	-9.58709	0.76167	-18.00073	0.76168	-11.91357	0.76069
YA10	-10.15672	0.87503	-18.57036	0.87505	-12.43217	0.87872
YA11	-11.12614	1.27195	-19.50321	1.22524	-13.38480	1.27331
MO1	-10.22537	0.92764	-18.63901	0.92756	-12.57550	0.93464
MO2	-10.07636	0.68754	-18.49000	0.68756	-12.39466	0.70487
MO3	-10.35840	0.88297	-18.77203	0.88300	-12.69210	0.88532
UM1	-9.16698	0.52586	-17.58061	0.52584	-11.63637	0.53539
UM2	-9.15394	0.52256	-17.56758	0.52241	-11.61282	0.53559
UM3	-9.57183	0.62277	-17.98546	0.62279	-11.93390	0.60895
UM4	-9.19990	0.54902	-17.61354	0.54893	-11.64398	0.54436
UM5	-9.21589	0.52207	-17.62953	0.52203	-11.68670	0.53499
UM6	-9.37716	0.55495	-17.79080	0.55493	-11.80999	0.54090
UM7	-9.79861	0.61553	-18.21225	0.61550	-12.14212	0.61312
UM8	-9.32734	0.53755	-17.74097	0.53764	-11.81140	0.54004
UM9	-9.72343	0.62969	-18.13707	0.62973	-12.06008	0.62745
UM10	-9.49086	0.55360	-17.90449	0.55355	-11.97566	0.54702
UM11	-9.12336	0.52373	-17.53700	0.52366	-11.57038	0.53691
UM12	-9.60750	0.64111	-18.02114	0.64102	-11.96876	0.62042
UM13	-9.23477	0.52227	-17.64841	0.52214	-11.72693	0.53813
UM14	-9.34774	0.52296	-17.76138	0.52299	-11.84061	0.53520

TABLE 9. Computational Results for July. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^2]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-10.10926	0.75707	-18.53714	0.75706	-12.67415	0.90139
AD2	-9.95559	0.66080	-18.38347	0.66069	-12.44985	0.77091
AD3	-9.85804	0.60892	-18.28591	0.60894	-12.22258	0.62521
AD4	-9.60876	0.54894	-18.03664	0.54884	-12.05383	0.58968
AD5	-9.57551	0.56093	-18.00339	0.56083	-12.12573	0.64484
AD6	-9.68395	0.56250	-18.11183	0.56241	-12.23115	0.65476
AD7	-9.71459	0.61827	-18.14247	0.61819	-12.26712	0.72027
AD8	-9.48129	0.58350	-17.90916	0.58361	-12.04960	0.66333
AD9	-9.28450	0.59324	-17.71238	0.59328	-11.85515	0.66842
AD10	-9.11457	0.57537	-17.54245	0.57531	-11.59895	0.62582
BE1	-8.67434	0.56460	-17.10221	0.56458	-11.10646	0.60872
BE2	-8.04234	0.73266	-16.47021	0.73273	-10.50607	0.74613
BE3	-8.50317	0.55538	-16.93104	0.55542	-10.94883	0.56986
BE4	-8.62504	0.55403	-17.05292	0.55402	-11.07089	0.56835
BE5	-8.99604	0.56484	-17.42392	0.56479	-11.46939	0.61123
BE6	-9.14800	0.54403	-17.57588	0.54398	-11.63879	0.59494
BE7	-8.29908	0.57513	-16.72695	0.57510	-10.75201	0.58269
BE8	-9.14167	0.57769	-17.56954	0.57756	-11.59173	0.62743
BE9	-8.63461	0.56766	-17.06249	0.56765	-11.06154	0.59999
FR1	-8.80014	0.63312	-17.22802	0.63321	-11.32293	0.65266
FR2	-8.91306	0.65802	-17.34093	0.65803	-11.42265	0.71717
FR3	-8.43066	0.54550	-16.85854	0.54547	-10.89550	0.55797
FR4	-8.35450	0.60533	-16.78238	0.60535	-10.83184	0.61853
FR5	-8.13472	0.55152	-16.56260	0.55148	-10.62968	0.56465
GR2	-10.49134	0.59530	-18.91921	0.59538	-12.95552	0.63079
GR3	-10.21144	0.57851	-18.63931	0.57841	-12.66103	0.59554
GR4	-9.84774	0.61015	-18.27562	0.61007	-12.22608	0.59628
GR5	-9.93492	0.57825	-18.36280	0.57835	-12.42271	0.58987
GR6	-10.09925	0.76492	-18.52713	0.76498	-12.60165	0.88971
GR7	-9.51213	0.56482	-17.94001	0.56482	-11.91568	0.56170
GR8	-9.87232	0.59345	-18.30019	0.59346	-12.28172	0.56839
GR9	-9.29677	0.56343	-17.72465	0.56349	-11.67985	0.57115
GR10	-9.26421	0.54960	-17.69209	0.54970	-11.67943	0.58389
GR11	-9.47482	0.64693	-17.90269	0.64697	-11.97399	0.75290
GR12	-9.04892	0.65552	-17.47680	0.65550	-11.54730	0.74101
GR13	-8.77005	0.64058	-17.19793	0.64055	-11.24972	0.67274
GR14	-9.97999	0.56976	-18.40787	0.56977	-12.46046	0.58117
KI1	-10.43551	1.35393	-18.79257	1.19416	-12.91027	1.27489
KI2	-11.20547	0.80637	-19.63334	0.80635	-13.72044	0.73836
KI7	-11.02026	0.88832	-19.44814	0.88827	-13.55620	0.80399
KI8	-10.05454	1.24704	-18.48242	1.24708	-12.59476	1.22411
KI9	-10.71282	1.14974	-19.14069	1.14975	-13.27632	1.08122
KI10	-11.17575	1.54853	-19.45255	1.36704	-13.77924	1.45955

TABLE 9. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-10.41174	1.03890	-18.83961	1.03890	-12.91897	1.13942
KL2	-10.26250	0.87255	-18.69037	0.87253	-12.73501	1.00537
KL3	-11.29418	1.10065	-19.72205	1.10060	-13.77451	1.22354
KL4	-11.27730	1.04467	-19.70518	1.04458	-13.80407	1.12332
WA1	-9.12124	0.55919	-17.54912	0.55920	-11.58961	0.61103
WA2	-8.68905	0.53565	-17.11693	0.53559	-11.17586	0.54925
WA3	-8.60954	0.55202	-17.03741	0.55203	-11.11335	0.55702
WA4	-8.75493	0.53125	-17.18280	0.53130	-11.26758	0.53656
WA5	-8.86089	0.52628	-17.28877	0.52619	-11.32851	0.54327
WA6	-9.02489	0.52338	-17.45276	0.52334	-11.49861	0.54568
WA7	-9.09045	0.51748	-17.51833	0.51742	-11.55864	0.52959
WA8	-8.95154	0.51832	-17.37942	0.51827	-11.42332	0.53134
WA9	-8.88149	0.53123	-17.30937	0.53113	-11.39862	0.53680
WA10	-8.92473	0.51885	-17.35261	0.51877	-11.40072	0.53518
YA1	-10.02599	1.06604	-18.45387	1.06602	-12.56759	1.10310
YA2	-11.28012	1.59820	-19.60599	1.49121	-13.91284	1.55628
YA5	-11.21776	1.35431	-19.64564	1.35428	-13.80456	1.33755
YA6	-9.55887	0.93483	-17.98675	0.93487	-12.03473	0.97804
YA7	-10.40841	1.02767	-18.83629	1.02773	-12.94437	1.06125
YA9	-9.05593	0.56614	-17.48381	0.56601	-11.53472	0.60385
YA10	-9.44041	0.60751	-17.86829	0.60749	-11.96331	0.69123
YA11	-10.25143	0.93418	-18.67931	0.93422	-12.79749	1.03374
MO1	-9.50660	0.54368	-17.93448	0.54362	-11.96625	0.60388
MO2	-9.56320	0.53948	-17.99108	0.53936	-11.98695	0.60361
MO3	-9.68731	0.54974	-18.11519	0.54968	-12.12731	0.61169
UM1	-9.09286	0.55161	-17.52074	0.55159	-11.58776	0.53526
UM2	-8.95802	0.53479	-17.38589	0.53473	-11.45248	0.53925
UM3	-9.23139	0.54478	-17.65927	0.54485	-11.68556	0.61435
UM4	-9.08684	0.55136	-17.51471	0.55148	-11.54731	0.57333
UM5	-9.06778	0.54766	-17.49566	0.54754	-11.56244	0.54007
UM6	-9.24121	0.55492	-17.66909	0.55476	-11.68225	0.57583
UM7	-9.44064	0.55486	-17.86852	0.55495	-11.88716	0.61256
UM8	-9.29372	0.54004	-17.72160	0.54001	-11.75905	0.53900
UM9	-9.32496	0.54292	-17.75283	0.54297	-11.76765	0.61389
UM10	-9.44094	0.54794	-17.86881	0.54806	-11.93408	0.54571
UM11	-8.93054	0.54194	-17.35842	0.54179	-11.44395	0.54137
UM12	-9.23178	0.54907	-17.65966	0.54912	-11.67842	0.61169
UM13	-9.05847	0.53034	-17.48635	0.53023	-11.53820	0.53439
UM14	-9.24765	0.54432	-17.67553	0.54432	-11.73707	0.53955

TABLE 10. Computational Results for August. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-10.03478	0.74988	-18.46266	0.74987	-12.61365	0.80420
AD2	-9.90701	0.76774	-18.33488	0.76781	-12.47548	0.79438
AD3	-9.84858	0.74904	-18.27646	0.74904	-12.39754	0.77418
AD4	-9.62929	0.67263	-18.05717	0.67262	-12.18108	0.69845
AD5	-9.59844	0.62957	-18.02633	0.62944	-12.19873	0.65635
AD6	-9.70834	0.61401	-18.13622	0.61401	-12.32232	0.64476
AD7	-9.75157	0.59754	-18.17945	0.59758	-12.33311	0.63715
AD8	-9.58488	0.59153	-18.01276	0.59142	-12.20998	0.62348
AD9	-9.31937	0.57270	-17.74725	0.57271	-11.93432	0.59712
AD10	-9.15006	0.59420	-17.57793	0.59420	-11.72450	0.62239
BE1	-8.67512	0.57554	-17.10299	0.57555	-11.10994	0.58200
BE2	-7.96541	0.74689	-16.39329	0.74683	-10.41249	0.75293
BE3	-8.54461	0.55973	-16.97249	0.55977	-10.92953	0.56539
BE4	-8.67809	0.57125	-17.10597	0.57119	-11.06271	0.57737
BE5	-9.16598	0.65462	-17.59385	0.65457	-11.64886	0.72451
BE6	-9.43766	0.67570	-17.86553	0.67563	-11.93927	0.73742
BE7	-8.29735	0.59097	-16.72523	0.59091	-10.69603	0.60316
BE8	-9.38255	0.80088	-17.81042	0.80092	-11.84527	0.84838
BE9	-8.65889	0.58821	-17.08677	0.58824	-11.09002	0.60402
FR1	-8.74676	0.61345	-17.17464	0.61343	-11.29860	0.64560
FR2	-8.92627	0.68843	-17.35414	0.68847	-11.45609	0.73369
FR3	-8.43227	0.55034	-16.86014	0.55037	-10.80613	0.56129
FR4	-8.25258	0.60250	-16.68046	0.60249	-10.73488	0.61719
FR5	-8.05730	0.56017	-16.48518	0.56015	-10.46535	0.55619
GR2	-10.93222	1.38730	-19.36009	1.38734	-13.52758	1.39173
GR3	-10.30991	0.83026	-18.73779	0.83022	-12.91621	0.82000
GR4	-9.91215	0.72719	-18.34002	0.72725	-12.52994	0.73904
GR5	-9.88265	0.78524	-18.31053	0.78528	-12.44943	0.79668
GR6	-9.96053	0.89033	-18.38840	0.89036	-12.49575	0.95821
GR7	-9.46527	0.68210	-17.89314	0.68219	-12.05117	0.72004
GR8	-9.81921	0.75130	-18.24708	0.75138	-12.44158	0.76138
GR9	-9.43912	0.65776	-17.86699	0.65784	-12.02098	0.68825
GR10	-9.42110	0.62994	-17.84898	0.62988	-11.99169	0.64808
GR11	-9.32130	0.63507	-17.74917	0.63514	-11.87576	0.67303
GR12	-8.91625	0.57671	-17.34413	0.57664	-11.44287	0.59806
GR13	-8.60563	0.64525	-17.03351	0.64520	-11.04066	0.63796
GR14	-9.93558	0.79177	-18.36346	0.79178	-12.49851	0.80328
KI1	-10.34188	1.25795	-18.76975	1.25795	-12.77499	1.23947
KI2	-11.77901	1.23631	-20.20689	1.23627	-14.27081	1.18089
KI7	-11.51279	1.30142	-19.94066	1.30144	-13.97411	1.27416
KI8	-9.77443	0.97262	-18.20231	0.97255	-12.14620	0.96299
KI9	-10.84101	1.11161	-19.26888	1.11165	-13.25835	1.10929
KI10	-11.14444	1.18880	-19.57232	1.18877	-13.53316	1.19262

TABLE 10. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-10.93472	1.40205	-19.30975	1.33642	-13.33763	1.54724
KL2	-10.80101	1.38842	-19.22888	1.38845	-13.19401	1.47972
KL3	-11.56307	1.42087	-19.99094	1.42087	-14.02113	1.71289
KL4	-11.04965	0.90292	-19.47753	0.90290	-13.31654	0.85119
WA1	-9.15062	0.55830	-17.57850	0.55822	-11.62975	0.59666
WA2	-8.70772	0.53981	-17.13560	0.53979	-11.19033	0.55420
WA3	-8.60962	0.55268	-17.03749	0.55264	-11.02506	0.55462
WA4	-8.79722	0.53320	-17.22510	0.53316	-11.24140	0.53946
WA5	-8.95585	0.54694	-17.38373	0.54695	-11.45631	0.55867
WA6	-9.09994	0.55437	-17.52781	0.55440	-11.60293	0.56794
WA7	-9.12486	0.54715	-17.55273	0.54712	-11.63863	0.56086
WA8	-9.04273	0.53276	-17.47061	0.53276	-11.52668	0.53870
WA9	-8.96798	0.53262	-17.39586	0.53268	-11.41403	0.53265
WA10	-9.02768	0.53551	-17.45555	0.53547	-11.50929	0.54302
YA1	-10.19236	1.38980	-18.62024	1.38982	-12.54195	1.33171
YA2	-11.50527	1.82002	-19.81801	1.71084	-13.84399	1.79655
YA5	-11.72412	2.17512	-19.63774	1.77176	-14.12535	2.22782
YA6	-9.79933	1.26798	-18.22721	1.26796	-12.23691	1.32229
YA7	-11.00876	1.57360	-19.37271	1.49407	-13.40540	1.70540
YA9	-9.33259	0.65189	-17.76047	0.65181	-11.81641	0.79618
YA10	-10.11668	1.20364	-18.54455	1.20367	-12.61955	1.34478
YA11	-10.86813	1.44142	-19.24974	1.38145	-13.26046	1.57524
MO1	-10.13858	1.28065	-18.56646	1.28065	-12.54675	1.27066
MO2	-9.96258	0.86893	-18.39045	0.86896	-12.38577	0.89119
MO3	-10.37088	1.34294	-18.79875	1.34302	-12.77463	1.36371
UM1	-9.10627	0.54218	-17.53415	0.54210	-11.52407	0.53610
UM2	-9.05323	0.53299	-17.48111	0.53299	-11.50775	0.53193
UM3	-9.43466	0.59386	-17.86254	0.59387	-11.88800	0.62535
UM4	-9.20804	0.57158	-17.63592	0.57164	-11.60728	0.56653
UM5	-9.12899	0.53388	-17.55687	0.53382	-11.56939	0.52768
UM6	-9.36801	0.56228	-17.79589	0.56225	-11.75337	0.56179
UM7	-9.65387	0.60539	-18.08175	0.60532	-12.06917	0.63108
UM8	-9.30187	0.53598	-17.72974	0.53599	-11.69150	0.52725
UM9	-9.52957	0.61024	-17.95745	0.61024	-11.98726	0.64861
UM10	-9.47027	0.54348	-17.89814	0.54348	-11.84204	0.53393
UM11	-9.00851	0.53668	-17.43639	0.53673	-11.45106	0.53439
UM12	-9.39445	0.59586	-17.82232	0.59587	-11.87353	0.63103
UM13	-9.17190	0.52973	-17.59978	0.52972	-11.62560	0.52483
UM14	-9.32357	0.54071	-17.75145	0.54069	-11.75880	0.53386

TABLE 11. Computational Results for September. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-10.03370	0.59730	-18.44734	0.59728	-12.66057	0.76392
AD2	-9.89559	0.60426	-18.30923	0.60406	-12.52717	0.74699
AD3	-9.83184	0.60826	-18.24547	0.60829	-12.43108	0.74914
AD4	-9.61199	0.60519	-18.02563	0.60517	-12.20340	0.69681
AD5	-9.57696	0.59765	-17.99060	0.59758	-12.15967	0.67602
AD6	-9.65336	0.56653	-18.06700	0.56649	-12.21693	0.64809
AD7	-9.71959	0.54527	-18.13323	0.54522	-12.31123	0.63287
AD8	-9.52258	0.54001	-17.93621	0.53999	-12.08110	0.57773
AD9	-9.20510	0.56445	-17.61874	0.56441	-11.77872	0.60424
AD10	-9.01586	0.59975	-17.42949	0.59978	-11.54872	0.65685
BE1	-8.60852	0.58439	-17.02216	0.58429	-11.05773	0.60111
BE2	-7.93729	0.75949	-16.35093	0.75954	-10.39943	0.77425
BE3	-8.35265	0.52427	-16.76628	0.52433	-10.78401	0.56288
BE4	-8.48471	0.53193	-16.89835	0.53181	-10.91866	0.56825
BE5	-9.18904	0.66708	-17.60267	0.66706	-11.69591	0.74018
BE6	-9.49304	0.68418	-17.90668	0.68418	-12.02792	0.78094
BE7	-8.13596	0.53342	-16.54959	0.53348	-10.57360	0.56107
BE8	-9.19664	0.73419	-17.61028	0.73424	-11.66161	0.84255
BE9	-8.42936	0.56331	-16.84300	0.56314	-10.83127	0.59106
FR1	-8.64622	0.63499	-17.05986	0.63490	-11.22189	0.67062
FR2	-8.94600	0.63370	-17.35963	0.63377	-11.50735	0.67346
FR3	-8.32953	0.53147	-16.74317	0.53150	-10.78544	0.57003
FR4	-8.23861	0.57390	-16.65224	0.57401	-10.78726	0.61543
FR5	-8.13486	0.55288	-16.54849	0.55280	-10.57933	0.57645
GR2	-10.39850	0.77920	-18.81213	0.77921	-13.02504	0.97382
GR3	-9.99288	0.62737	-18.40652	0.62733	-12.58062	0.78252
GR4	-9.72884	0.61458	-18.14248	0.61458	-12.27523	0.74649
GR5	-9.65674	0.58322	-18.07037	0.58314	-12.19864	0.61598
GR6	-10.06521	0.77099	-18.47884	0.77108	-12.70027	0.81688
GR7	-9.39406	0.57713	-17.80770	0.57717	-11.91190	0.63337
GR8	-9.60497	0.58434	-18.01861	0.58426	-12.14477	0.66347
GR9	-9.32862	0.62078	-17.74226	0.62078	-11.83367	0.69087
GR10	-9.27851	0.62853	-17.69215	0.62850	-11.81099	0.68996
GR11	-9.47337	0.76892	-17.88701	0.76880	-11.99042	0.76230
GR12	-9.05620	0.75583	-17.46984	0.75577	-11.51715	0.74585
GR13	-8.75263	0.76824	-17.16627	0.76830	-11.20559	0.77294
GR14	-9.69898	0.57450	-18.11262	0.57436	-12.25073	0.61348
KI1	-11.43564	1.47957	-19.84927	1.47956	-14.12341	1.47726
KI2	-13.60965	1.02465	-21.80502	0.85841	-16.42169	1.19078
KI7	-12.85471	1.01367	-21.26834	1.01370	-15.73962	0.97969
KI8	-10.53504	1.51705	-18.88523	1.42869	-13.06743	1.49316
KI9	-12.03793	1.52712	-20.22091	1.31260	-14.80910	1.35777
KI10	-11.94029	1.62071	-19.92811	1.14591	-14.76155	1.43383

TABLE 11. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.01033	1.24397	-19.42397	1.24398	-13.59070	1.39801
KL2	-10.70608	1.05398	-19.11972	1.05400	-13.28105	1.25732
KL3	-11.77687	1.24345	-20.19050	1.24344	-14.36506	1.44043
KL4	-12.02468	1.40978	-20.32678	1.32434	-14.64485	1.49517
WA1	-9.26429	0.54828	-17.67793	0.54840	-11.86713	0.57765
WA2	-8.87439	0.56093	-17.28803	0.56092	-11.41527	0.60635
WA3	-8.70632	0.54525	-17.11996	0.54513	-11.19131	0.57954
WA4	-8.95063	0.54881	-17.36427	0.54882	-11.47911	0.59983
WA5	-9.10334	0.55969	-17.51697	0.55966	-11.68425	0.60068
WA6	-9.25168	0.56068	-17.66531	0.56067	-11.84891	0.59802
WA7	-9.27545	0.55365	-17.68909	0.55366	-11.88874	0.60112
WA8	-9.16583	0.54657	-17.57947	0.54645	-11.76451	0.59693
WA9	-9.12408	0.55638	-17.53772	0.55633	-11.67475	0.61255
WA10	-9.15933	0.54968	-17.57297	0.54965	-11.75066	0.59866
YA1	-10.65573	1.50006	-19.06936	1.50002	-13.30467	1.57007
YA2	-11.96837	1.69500	-20.06936	1.41973	-14.86071	1.60157
YA5	-12.75572	1.72614	-20.86862	1.61704	-15.67143	1.73198
YA6	-10.36148	1.63827	-18.77512	1.63826	-13.00892	1.75870
YA7	-11.69125	1.84712	-19.97781	1.77273	-14.36824	2.01525
YA9	-9.71144	0.98484	-18.12507	0.98485	-12.30581	1.06788
YA10	-10.26256	0.93281	-18.67620	0.93284	-12.86890	1.10429
YA11	-11.20398	1.56486	-19.54592	1.49674	-13.87747	1.74356
MO1	-9.80004	0.65077	-18.21367	0.65080	-12.33997	0.83084
MO2	-9.71867	0.56706	-18.13230	0.56703	-12.19793	0.67121
MO3	-9.96024	0.68778	-18.37388	0.68783	-12.47866	0.87949
UM1	-9.13603	0.54582	-17.54967	0.54578	-11.61336	0.59280
UM2	-9.18026	0.55346	-17.59390	0.55344	-11.74688	0.60864
UM3	-9.12888	0.56872	-17.54252	0.56872	-11.51682	0.60097
UM4	-8.93732	0.52520	-17.35096	0.52520	-11.34638	0.53788
UM5	-9.22669	0.55360	-17.64032	0.55358	-11.76865	0.61212
UM6	-9.07464	0.52349	-17.48827	0.52346	-11.47494	0.53748
UM7	-9.39404	0.54289	-17.80767	0.54289	-11.81379	0.58547
UM8	-9.23119	0.53436	-17.64482	0.53451	-11.67070	0.56173
UM9	-9.32211	0.54878	-17.73575	0.54879	-11.73536	0.59716
UM10	-9.43748	0.54515	-17.85112	0.54519	-11.88386	0.57916
UM11	-9.15257	0.55850	-17.56620	0.55843	-11.69693	0.61366
UM12	-9.14602	0.56835	-17.55966	0.56848	-11.53499	0.59764
UM13	-9.22763	0.53996	-17.64126	0.53996	-11.82043	0.59418
UM14	-9.33583	0.54788	-17.74946	0.54787	-11.87259	0.60404

TABLE 12. Computational Results for October. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-10.29458	0.93590	-18.72246	0.93588	-12.88581	1.11304
AD2	-10.18947	0.87821	-18.61735	0.87821	-12.75698	1.00196
AD3	-9.95914	0.85211	-18.38701	0.85211	-12.38328	0.94036
AD4	-9.61082	0.58539	-18.03870	0.58530	-12.09159	0.62821
AD5	-9.68594	0.60276	-18.11381	0.60285	-12.23621	0.67301
AD6	-9.82394	0.66355	-18.25182	0.66348	-12.42772	0.79690
AD7	-9.92681	0.70183	-18.35468	0.70184	-12.51334	0.84441
AD8	-9.74052	0.65688	-18.16839	0.65685	-12.32288	0.76948
AD9	-9.35443	0.59577	-17.78231	0.59585	-11.86950	0.66468
AD10	-9.07822	0.58822	-17.50609	0.58837	-11.58834	0.64394
BE1	-8.74189	0.74711	-17.16976	0.74710	-11.27044	0.76030
BE2	-7.81448	0.73497	-16.24236	0.73497	-10.30109	0.76217
BE3	-8.40404	0.56734	-16.83192	0.56735	-10.84888	0.57120
BE4	-8.56303	0.57292	-16.99092	0.57284	-11.02186	0.57864
BE5	-9.79493	1.52108	-18.04979	1.21521	-12.38405	1.49885
BE6	-10.48093	1.73100	-18.60015	1.31030	-13.07184	1.69177
BE7	-8.13196	0.57408	-16.55983	0.57404	-10.58977	0.57544
BE8	-9.69525	1.30010	-18.12313	1.30006	-12.24869	1.33702
BE9	-8.48968	0.60699	-16.91755	0.60696	-10.93749	0.61196
FR1	-8.74906	0.71448	-17.17693	0.71453	-11.25085	0.74438
FR2	-9.04807	0.74453	-17.47595	0.74454	-11.56545	0.77250
FR3	-8.31602	0.54560	-16.74389	0.54547	-10.77915	0.54879
FR4	-8.20772	0.62407	-16.63560	0.62411	-10.70786	0.61930
FR5	-8.02711	0.54747	-16.45498	0.54737	-10.52179	0.55971
GR2	-10.88496	1.66073	-18.87702	0.83872	-13.29888	1.76511
GR3	-10.58489	1.30451	-19.01277	1.30452	-13.03027	1.42976
GR4	-9.90024	0.83937	-18.32811	0.83939	-12.32502	0.92310
GR5	-9.74084	0.75775	-18.16872	0.75769	-12.30727	0.92280
GR6	-9.98496	0.86055	-18.41284	0.86054	-12.50757	1.03237
GR7	-9.36352	0.58305	-17.79140	0.58303	-11.86055	0.70339
GR8	-9.74456	0.68284	-18.17243	0.68293	-12.24260	0.79527
GR9	-9.23938	0.57117	-17.66725	0.57103	-11.70142	0.67879
GR10	-9.22020	0.56474	-17.64808	0.56466	-11.71115	0.64686
GR11	-9.28017	0.62672	-17.70804	0.62675	-11.85401	0.74228
GR12	-8.83235	0.59598	-17.26023	0.59608	-11.39583	0.67499
GR13	-8.47484	0.70119	-16.90273	0.70110	-10.96422	0.72600
GR14	-9.78330	0.73648	-18.21117	0.73648	-12.33791	0.91371
KI1	-11.07494	1.69661	-19.23440	1.35966	-13.73214	1.79243
KI2	-11.69934	0.72519	-20.12722	0.72523	-14.24685	0.80404
KI7	-11.74746	1.04967	-20.17533	1.04967	-14.33627	1.14981
KI8	-10.71280	1.70265	-19.02840	1.56489	-13.31128	1.72355
KI9	-12.31832	1.59306	-20.54031	1.43892	-14.98238	1.63216
KI10	-12.46147	1.44973	-20.88935	1.44969	-15.08179	1.28911

TABLE 12. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.30635	1.78383	-19.45408	1.45583	-14.02171	1.65581
KL2	-11.56738	1.85413	-19.66384	1.48907	-14.28724	1.74514
KL3	-11.69079	1.78336	-19.95723	1.68160	-14.47779	1.69887
KL4	-10.65725	0.66257	-19.08512	0.66251	-13.50324	0.64356
WA1	-9.34060	0.60181	-17.76847	0.60176	-11.88480	0.62195
WA2	-8.78088	0.53846	-17.20876	0.53846	-11.31333	0.55677
WA3	-8.60187	0.53838	-17.02975	0.53835	-11.10163	0.54582
WA4	-8.86457	0.53026	-17.29245	0.53021	-11.36952	0.53678
WA5	-9.07549	0.54026	-17.50337	0.54035	-11.61515	0.55140
WA6	-9.30520	0.55664	-17.73308	0.55674	-11.86513	0.56599
WA7	-9.38316	0.58000	-17.81103	0.58001	-11.97600	0.58766
WA8	-9.19779	0.54513	-17.62567	0.54519	-11.75270	0.55734
WA9	-9.03168	0.53825	-17.45955	0.53826	-11.54803	0.55041
WA10	-9.16253	0.54122	-17.59041	0.54117	-11.70624	0.55651
YA1	-10.77780	1.74542	-19.02288	1.51419	-13.39392	1.76371
YA2	-11.82322	1.32414	-20.25110	1.32414	-14.55771	1.19758
YA5	-11.19227	0.54599	-19.62015	0.54592	-14.01979	0.54207
YA6	-10.11701	1.34843	-18.54488	1.34839	-12.85191	1.39192
YA7	-11.39876	1.97122	-19.50024	1.58936	-14.11390	1.72304
YA9	-10.59034	2.03431	-18.47484	1.26725	-13.24597	1.92872
YA10	-11.25584	1.96851	-19.16872	1.36316	-13.87608	1.84396
YA11	-11.10571	1.82818	-19.36517	1.66317	-13.93492	1.79773
MO1	-10.77716	1.66654	-18.97677	1.36030	-13.40615	1.56879
MO2	-10.48980	1.35560	-18.91768	1.35561	-13.05186	1.29366
MO3	-10.95273	1.82055	-19.02937	1.34572	-13.58910	1.71175
UM1	-9.08601	0.54350	-17.51389	0.54345	-11.57697	0.54205
UM2	-9.11131	0.53859	-17.53919	0.53854	-11.64285	0.55516
UM3	-9.53977	0.74898	-17.96764	0.74896	-12.04542	0.79314
UM4	-9.09244	0.56094	-17.52031	0.56100	-11.53362	0.56626
UM5	-9.14951	0.54094	-17.57739	0.54081	-11.67647	0.55137
UM6	-9.28365	0.56470	-17.71153	0.56471	-11.73189	0.56603
UM7	-9.97423	0.92373	-18.40211	0.92372	-12.46530	0.89685
UM8	-9.35442	0.55151	-17.78230	0.55148	-11.81138	0.55097
UM9	-9.84066	0.90942	-18.26854	0.90939	-12.37446	0.91886
UM10	-9.51780	0.58092	-17.94568	0.58083	-11.98573	0.57032
UM11	-9.05789	0.53907	-17.48577	0.53894	-11.57384	0.54664
UM12	-9.51486	0.74079	-17.94273	0.74076	-12.03999	0.78844
UM13	-9.20829	0.54822	-17.63617	0.54815	-11.76809	0.57736
UM14	-9.29736	0.55620	-17.72523	0.55624	-11.80979	0.57940

TABLE 13. Computational Results for November. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(C_i-s)/m^3]/C_i$; deposition rate, $[(C_i/m^2)/s]/C_i$; surface contamination, $(C_i/m^2)/C_i$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-9.94455	0.54477	-18.35818	0.54477	-12.54047	0.59688
AD2	-9.83862	0.55570	-18.25225	0.55578	-12.41882	0.61017
AD3	-9.55941	0.54836	-17.97305	0.54823	-12.15366	0.57932
AD4	-9.41473	0.53932	-17.82837	0.53936	-11.99020	0.57874
AD5	-9.52312	0.55549	-17.93676	0.55545	-12.12509	0.59978
AD6	-9.62607	0.53769	-18.03971	0.53758	-12.27281	0.58404
AD7	-9.76029	0.59982	-18.17392	0.59998	-12.38737	0.66868
AD8	-9.59226	0.57913	-18.00590	0.57896	-12.21055	0.62884
AD9	-9.21943	0.54688	-17.63307	0.54698	-11.81370	0.60243
AD10	-8.86322	0.57639	-17.27686	0.57635	-11.45514	0.63204
BE1	-8.68726	0.64245	-17.10089	0.64250	-11.00443	0.63017
BE2	-7.81664	0.76418	-16.23028	0.76418	-10.27719	0.77301
BE3	-8.31117	0.53940	-16.72481	0.53934	-10.73012	0.55554
BE4	-8.43026	0.52776	-16.84389	0.52778	-10.84199	0.54226
BE5	-9.44995	0.91870	-17.86358	0.91869	-11.83045	0.93321
BE6	-9.83938	0.66330	-18.25302	0.66330	-12.25905	0.75083
BE7	-8.07234	0.54884	-16.48597	0.54887	-10.48185	0.56841
BE8	-9.44736	0.87807	-17.86099	0.87827	-11.82445	0.93881
BE9	-8.40690	0.61834	-16.82053	0.61839	-10.75797	0.60525
FR1	-8.69182	0.67096	-17.10545	0.67100	-11.20361	0.70757
FR2	-9.21425	0.73077	-17.62789	0.73070	-11.70467	0.79134
FR3	-8.26115	0.53582	-16.67478	0.53585	-10.69890	0.55872
FR4	-8.39668	0.61177	-16.81031	0.61177	-10.85985	0.64245
FR5	-8.14893	0.56749	-16.56257	0.56749	-10.57579	0.55372
GR2	-9.98362	0.70808	-18.39725	0.70811	-12.57493	0.85869
GR3	-9.88465	0.76293	-18.29829	0.76294	-12.47523	0.93184
GR4	-9.57287	0.76063	-17.98651	0.76060	-12.20396	0.91249
GR5	-9.66232	0.71287	-18.07596	0.71295	-12.23281	0.85844
GR6	-9.95139	1.33461	-18.19924	0.99993	-12.47248	1.51187
GR7	-9.17323	0.56153	-17.58686	0.56157	-11.75843	0.62947
GR8	-9.50506	0.73483	-17.91869	0.73487	-12.10114	0.88844
GR9	-9.09185	0.56459	-17.50549	0.56463	-11.71040	0.62722
GR10	-9.02744	0.54412	-17.44108	0.54410	-11.63445	0.57970
GR11	-9.45673	1.34556	-17.79281	1.14251	-11.99342	1.42118
GR12	-9.24138	1.51014	-17.56302	1.29018	-11.79612	1.52337
GR13	-8.64605	0.90765	-17.05968	0.90767	-11.13897	0.93973
GR14	-9.69454	0.71588	-18.10818	0.71587	-12.25915	0.86603
KI1	-10.20648	1.36656	-18.46033	1.06887	-12.71181	1.43580
KI2	-10.82926	0.88438	-19.24289	0.88441	-13.41880	1.09324
KI7	-11.70478	1.81061	-19.58091	0.96944	-13.98853	1.38396
KI8	-10.53273	1.70074	-18.85095	1.52425	-12.91406	1.55897
KI9	-11.35261	1.32610	-19.60441	1.10832	-13.94118	1.32967
KI10	-11.42855	1.85668	-19.47361	1.28553	-13.97011	1.74238

TABLE 13. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-11.96831	1.73244	-19.89011	1.15403	-14.45810	1.80716
KL2	-12.30322	1.87140	-20.08207	1.18510	-14.51001	1.65477
KL3	-12.11740	0.54432	-20.53104	0.54429	-14.59744	0.54061
KL4	-12.96273	2.02394	-20.30619	0.84734	-15.31263	1.99338
WA1	-9.52856	0.63706	-17.94220	0.63703	-11.98649	0.72637
WA2	-9.02253	0.56522	-17.43616	0.56506	-11.50600	0.57152
WA3	-8.71977	0.55229	-17.13341	0.55225	-11.20484	0.55360
WA4	-9.04772	0.56020	-17.46136	0.56010	-11.55516	0.56961
WA5	-9.27038	0.54900	-17.68402	0.54890	-11.78973	0.54394
WA6	-9.46622	0.55715	-17.87986	0.55704	-11.99115	0.56450
WA7	-9.58808	0.55986	-18.00172	0.55983	-12.12787	0.56316
WA8	-9.43028	0.55310	-17.84391	0.55314	-11.96037	0.55494
WA9	-9.31798	0.55036	-17.73161	0.55040	-11.82981	0.57325
WA10	-9.38734	0.55455	-17.80097	0.55454	-11.91733	0.55809
YA1	-10.44023	1.76717	-18.51429	1.16262	-12.75934	1.56045
YA2	-11.39583	2.09708	-19.35249	1.51324	-13.87131	1.96377
YA5	-11.23484	1.41925	-19.64847	1.41924	-13.70025	1.32020
YA6	-10.11296	1.43942	-18.39446	1.19229	-12.57224	1.45777
YA7	-11.03398	1.69900	-19.04016	0.99694	-13.50551	1.52129
YA9	-9.76213	1.06905	-18.17577	1.06902	-12.16432	1.10039
YA10	-10.65093	1.21811	-19.06456	1.21813	-13.11556	1.31963
YA11	-11.32256	1.59321	-19.50617	1.29941	-13.94636	1.68388
MO1	-10.69056	1.30464	-18.99831	1.13903	-13.09853	1.33551
MO2	-10.06992	0.60436	-18.48356	0.60439	-12.34475	0.58646
MD3	-10.92376	1.40216	-19.23963	1.20943	-13.26487	1.33779
UM1	-9.23074	0.55106	-17.64438	0.55104	-11.74228	0.56021
UM2	-9.40004	0.54569	-17.81368	0.54558	-11.91710	0.56874
UM3	-9.36154	0.60068	-17.77518	0.60062	-11.68925	0.61127
UM4	-8.93264	0.53820	-17.34628	0.53812	-11.34205	0.55351
UM5	-9.39750	0.53888	-17.81114	0.53880	-11.90763	0.56325
UM6	-9.11888	0.54995	-17.53251	0.54995	-11.54044	0.58030
UM7	-9.69721	0.63637	-18.11085	0.63648	-12.00723	0.62810
UM8	-9.28767	0.54998	-17.70130	0.55004	-11.77879	0.57075
UM9	-9.62267	0.59083	-18.03631	0.59073	-11.93189	0.58430
UM10	-9.55405	0.59152	-17.96769	0.59155	-12.02174	0.61709
UM11	-9.33289	0.54623	-17.74653	0.54614	-11.84210	0.56665
UM12	-9.35880	0.60579	-17.77244	0.60578	-11.69726	0.61388
UM13	-9.54884	0.54834	-17.96247	0.54823	-12.09151	0.57751
UM14	-9.54348	0.57265	-17.95712	0.57263	-12.07110	0.61662

TABLE 14. Computational Results for December. All numerical values are logarithms to base 10. Units are as follows: time-integrated air concentration, $[(Ci-s)/m^3]/Ci$; deposition rate, $[(Ci/m^2)/s]/Ci$; surface contamination, $(Ci/m^2)/Ci$.

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
AD1	-10.94975	1.60617	-19.18663	1.26810	-13.44934	1.74718
AD2	-10.42204	0.87062	-18.77768	0.62811	-12.91444	0.89493
AD3	-10.00899	0.69038	-18.43687	0.69031	-12.48096	0.60229
AD4	-9.88581	0.61147	-18.31369	0.61144	-12.37317	0.59675
AD5	-10.24098	1.17348	-18.57762	0.96969	-12.72068	1.26634
AD6	-10.79442	1.91105	-18.95373	1.44078	-13.03583	1.62017
AD7	-10.54541	1.17636	-18.97328	1.17638	-13.04888	1.36422
AD8	-10.19505	0.95434	-18.62292	0.95435	-12.67903	1.11458
AD9	-9.77363	0.89069	-18.20150	0.89069	-12.15270	0.87036
AD10	-9.63503	1.32499	-17.96922	1.13660	-12.08071	1.31705
BE1	-8.34562	0.64391	-16.77350	0.64387	-10.86543	0.67495
BE2	-7.86395	0.98180	-16.29182	0.98181	-10.35891	1.03247
BE3	-8.05729	0.53664	-16.48517	0.53661	-10.66173	0.60554
BE4	-8.24528	0.54490	-16.67316	0.54485	-10.84047	0.60859
BE5	-9.50805	1.15091	-17.93592	1.15092	-11.98547	1.21226
BE6	-10.26380	1.23594	-18.69168	1.23596	-12.75802	1.27318
BE7	-7.88001	0.54696	-16.30788	0.54689	-10.46528	0.60325
BE8	-9.47573	1.14982	-17.90360	1.14975	-12.02765	1.15840
BE9	-8.17113	0.59026	-16.59901	0.59031	-10.71573	0.63069
FR1	-9.06565	0.90716	-17.49353	0.90712	-11.54712	0.98425
FR2	-9.61473	0.98324	-18.04261	0.98322	-12.14054	1.00942
FR3	-8.10958	0.55681	-16.53745	0.55677	-10.69426	0.61602
FR4	-8.79071	0.79064	-17.21859	0.79058	-11.35704	0.88265
FR5	-8.18267	0.60491	-16.61055	0.60482	-10.75716	0.63450
GR2	-10.76077	0.81412	-19.18864	0.81409	-13.26342	0.69998
GR3	-10.43346	0.79687	-18.86134	0.79679	-12.91582	0.69484
GR4	-10.15602	0.74407	-18.58390	0.74399	-12.58097	0.68914
GR5	-10.13712	0.83313	-18.56499	0.83319	-12.69825	0.66706
GR6	-11.34958	1.89037	-19.33659	1.32307	-13.91895	1.78578
GR7	-9.76238	0.64202	-18.19026	0.64200	-12.24181	0.64428
GR8	-10.12844	0.77662	-18.55632	0.77658	-12.57357	0.70200
GR9	-9.59648	0.67307	-18.02436	0.67305	-12.08023	0.66189
GR10	-9.47664	0.64462	-17.90451	0.64461	-11.97770	0.62228
GR11	-10.13667	1.52385	-18.39609	1.20274	-12.69673	1.48246
GR12	-9.64141	1.36039	-18.06928	1.36041	-12.27198	1.49278
GR13	-9.08351	1.48389	-17.51138	1.48391	-11.63981	1.61853
GR14	-10.23286	0.84312	-18.66074	0.84307	-12.78175	0.67026
KI1	-11.80893	2.04404	-19.79605	1.65127	-14.24951	2.01516
KI2	-12.59253	2.00530	-20.29635	1.73366	-14.96366	1.98166
KI7	-12.32944	1.12946	-20.75732	1.12948	-14.66412	1.10570
KI8	-10.75228	1.96028	-18.82170	1.45947	-12.98303	1.88501
KI9	-12.18225	1.71515	-20.10177	1.12033	-14.25096	1.45865
KI10	-11.10435	0.91306	-19.53223	0.91300	-13.27795	0.90263

TABLE 14. (contd)

Census Div.	Time-Integrated Air Concentration		Deposition Rate		Surface Contamination	
	avg	sd	avg	sd	avg	sd
KL1	-13.10562	1.85393	-20.96770	1.46435	-15.34562	1.85989
KL2	-13.19868	1.95279	-20.95570	1.63872	-15.43134	1.87893
KL3	-14.99228	0.87848	-22.73836	0.56460	-17.19097	0.91219
KL4	-13.95980	0.61525	-22.38767	0.61520	-16.02952	0.61229
WA1	-10.35587	0.94297	-18.78375	0.94292	-12.91075	1.04690
WA2	-9.28589	0.71369	-17.71376	0.71374	-11.93759	0.77943
WA3	-8.71377	0.60299	-17.14164	0.60305	-11.30337	0.65692
WA4	-9.09064	0.64566	-17.51852	0.64569	-11.71398	0.70302
WA5	-9.77276	0.76295	-18.20063	0.76296	-12.41977	0.84659
WA6	-10.42799	1.51271	-18.52770	0.70258	-12.87048	1.18070
WA7	-10.77492	1.63766	-18.84985	0.98035	-13.23108	1.44779
WA8	-9.79354	0.73135	-18.22142	0.73137	-12.42094	0.81885
WA9	-9.29167	0.59725	-17.71954	0.59723	-11.93627	0.64616
WA10	-9.68993	0.64246	-18.11780	0.64252	-12.31279	0.71933
YA1	-10.77687	2.05503	-18.85818	1.62769	-12.93999	1.98490
YA2	-10.64222	0.84636	-19.07010	0.84638	-12.74576	0.88215
YA5	-11.06357	1.05794	-19.49145	1.05792	-13.14295	1.09356
YA6	-10.85782	2.34797	-18.60198	1.53900	-13.01150	2.31614
YA7	-12.43583	1.98833	-20.10939	1.30950	-14.36648	1.80039
YA9	-10.18466	1.51272	-18.49583	1.30707	-12.53594	1.65806
YA10	-11.40220	1.86630	-19.54244	1.48977	-13.65835	1.73231
YA11	-13.17265	2.05544	-20.75872	1.53434	-15.20161	1.99937
MO1	-10.59721	1.14633	-19.02509	1.14639	-13.16250	1.25442
MO2	-10.01409	0.60525	-18.44197	0.60530	-12.66888	0.73339
MO3	-10.61719	1.00788	-19.04507	1.00785	-13.24300	1.15277
UM1	-9.11142	0.59936	-17.53930	0.59939	-11.70136	0.66122
UM2	-9.43911	0.61719	-17.86699	0.61723	-12.08515	0.66885
UM3	-9.26019	0.64826	-17.68806	0.64829	-11.89908	0.75048
UM4	-8.74174	0.55141	-17.16961	0.55140	-11.33017	0.61480
UM5	-9.35720	0.62126	-17.78508	0.62129	-12.00683	0.66587
UM6	-8.93028	0.57466	-17.35815	0.57465	-11.54250	0.63656
UM7	-9.64267	0.65975	-18.07055	0.65977	-12.30166	0.77521
UM8	-9.17707	0.58962	-17.60494	0.58967	-11.74259	0.64315
UM9	-9.54823	0.63507	-17.97611	0.63507	-12.22049	0.76272
UM10	-9.48721	0.60679	-17.91508	0.60678	-12.04908	0.65903
UM11	-9.28078	0.60034	-17.70865	0.60036	-11.92402	0.64778
UM12	-9.23083	0.64302	-17.65871	0.64309	-11.85033	0.73078
UM13	-9.63351	0.66273	-18.06138	0.66274	-12.30421	0.72359
UM14	-9.50865	0.67761	-17.93652	0.67766	-12.18829	0.70645

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APPENDIX

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
1.	Vietchau Nguyen		Monthly time-integrated concentrations are used in the MESOILT2 model, thus ignoring the irreversible health impact peak concentrations may cause when high releases of iodine-131 occur in the shorter time scale.	MESOILT2 can use release rates defined hourly and makes its time-integrated air concentration and deposition calculations using time steps that are no longer than 15 minutes.
2.	VN	Page 3	A clarification on the current status and upgraded capabilities of MESOILT2 must be provided. Model deficiencies and methods of resolution must also be detailed as well as model limitations, especially with regard to the effect of topography.	The MESOILT2 model is fully described in PNL-7340 HEDR. Extensive modifications are being made to the model and will be documented when complete.
3.	VN	Page 5	Wind fields are computed using interpolation and adjusted for terrain effects. This approach raises concerns on the additional uncertainty associated with the calculated values caused by interpolation.	Alternative methods for estimating wind fields are being evaluated.
4.	VN		Sample runs (including input data and actual output files) are not provided as requested for verification.	This is not the appropriate place for the requested information. The information was provided to Dr. Nguyen in July 1990.
5.	VN	Tables 3-14	Sensitivity of computational results has not been addressed. This will help narrow down the computational variance of the dose estimates.	A sensitivity analysis is beyond the scope of this report. An evaluation of sensitivity and uncertainty of the model will be made following completion of the model revisions.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
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Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
6.	R.L. Morrill		This report is too brief and skeletal. I want more meat.	The scope of this report is limited to documentation of the input to the atmospheric transport model used in Phase I and of the output from the atmospheric model that was passed to the dose calculation task. It does not include an analysis of the atmospheric model output. The restructured model will be fully evaluated and described.
7.	RLM		A map showing the grid system of the rectangular domain overlying the study area is needed.	Figures 1 and 2 show the relationship between the atmospheric model domain and the 10-county study area. The lower left corner of the model domain corresponds to grid location 1,1, and the upper right corner corresponds to location 31,31. Addition of the grid lines would clutter the figures without adding a significant amount of information.
8.	RLM		There should be several maps, as every other month, converting the data in the tables to contour isolines, say of air concentrations or surface contamination.	The requested maps are outside the scope of this report. Such maps will be available from analysis of the restructured model.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
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Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
9.	RLM	Pages 3,5	Do these model results make use of the six typical wind patterns or not?	The Phase I results are based on model calculations using actual wind data to generate the wind fields. Using patterns was not necessary.
10.	RLM		Could high precipitation away from Hanford lead to elevated concentrations and surface contamination? If so, then the results here would not capture that.	Precipitation results in higher deposition rates than does dry deposition. However, the fraction of time that precipitation occurs at any location in the model domain is small. Therefore, the expected effect of not including precipitation in the calculations is small. This expectation was confirmed in a subsequent set of calculations. Precipitation data will be included in final dose estimates.
11.	RLM		What I'd like is a better sense of where the numbers come from. Shouldn't we be talking about a distribution of hours of different wind directions and speeds, instead of crude monthly averages?	The Phase I model calculations were made using observed meteorological data, not with averages or summarized data. Results of future models can be presented in time-location representations.
12.	RLM		This atmospheric modeling component is extremely important. Its meaning and operation must be made clearer to us and ultimately to the public.	PNL-7340 HEDR provides a complete description of the atmospheric model used in the Phase I calculations.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
13.	R. Cook		The document should plot data (for example, in Table 3) on large-scale maps, with contour lines connecting the points with equivalent values.	The requested plots are outside the scope of this report. This information will be available for final meteorological representations.
14.	RC		Discuss the basis for the deposition velocity for iodine and other isotopes, and identify the validity of the respective values. Identify uncertainties in the values. Specify best estimate, 1 sigma and 2 sigma values.	MESOILT2 uses a constant deposition velocity of 1 cm/sec. Use of this value is consistent with practice in many models used by the NRC and EPA. A more refined method of treating dry deposition is being added to the model as the model is being revised.
15.	RC		To correlate wind pattern data with iodine-131 levels around Hanford, provide contour plots of the iodine-131 data as a function of time--by the month.	The requested plots are outside the scope of the report. See response to comment 13.
16.	D.S. Barth	Page 2, para 5	What are the criteria on the basis of which the test results were found to be satisfactory?	Text was rewritten to state extent and results of the tests.
17.	DSB	Page 6, para 6	Why is it not possible to spot check the actual data against the 1983-87 data for similarities or differences for at least a few of the most important months?	The model has been run with the actual meteorological data; see Figure 2.7 of the Air Pathway Report (PNL-7412 HEDR).
18.	DSB	Page 10, lines 10-11	Why was not a flow of 45,000 ft ³ /min assumed for the imaginary stack replacing the two real stacks?	The flow was used to estimate the initial dilution of the iodine-131. Assuming a flow equal to twice the flow of a single stack

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
19.	DSB		It would be a useful exercise to calculate, for a few selected months, biweekly or weekly averages and variances so that these could be compared to the monthly average results.	would reduce the initial concentration by a factor of 2. In general, however, the concentrations and therefore the doses at locations off the Hanford Site are not affected by the assumed flow because the volume of the puffs is large compared with the initial volume.
20.	Glyn G. Caldwell		Will 5 radionuclides be adequate for 90-95% of radiation; can runs be done with more than 1 set of radionuclides?	The revised atmospheric model will generate daily values of the time-integrated air concentrations and deposition for use in dose calculations.
21.	GGC		Were any radionuclides handled as particulates; did particulates exist?	The model can be extended to handle as many radionuclides as needed for the dose calculation. The number of model runs will depend more on the number and variety of sources and their characteristics than on the number of radionuclides. MESOILT2 can treat 4 sources simultaneously. This number can also be expanded if necessary.
				The Phase I study dealt only with iodine-131. It was treated as a depositing species without further characterization. The deposition

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

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22.	GGC		How were the deposition velocities used determined; from what data?	<p>velocity assumed for iodine-131 is characteristic of reactive gases. The revised atmospheric model will calculate deposition velocities for both reactive gases and particulates based on atmospheric conditions and surface roughness.</p> <p>The 0.01-m/sec deposition velocity assumed in the Phase I calculations is consistent with NRC and EPA regulatory practice. This velocity is near the high end of the range of experimental values reported in Sehmel's 1980 review article (<u>Atmospheric Environment</u> 14:983-1011).</p>
23.	GGC	Page 4, para 1, lines 1-2	Are node distances acceptable, were others evaluated; if not, why not; if so, what led to use of 5-mile spacing?	<p>The 5-mile node spacing was determined from overall domain size and the existing model structure. No other spacing was considered, because the spacing was not a critical factor in assessing whether the objectives of Phase I were met. The results of Phase I indicate that 5-mile node spacing is satisfactory for making offsite dose estimates.</p>

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
24.	GGC	Page 4	How will high terrain be managed in later versions and the final model?	A method for treating terrain in the revised model has not been established.
25.	GGC	Page 6	Is assumed uniformity of the atmospheric stability supportable by existing data?	The assumption is probably acceptable in general but is certainly incorrect in specific cases. Atmospheric stability will be a function of location in the revised model.
26.	GGC	Page 6	When will precipitation be included?	MESOILT2 is capable of treating precipitation. Precipitation data were not used in the Phase I calculations but have been used in subsequent calculations without changing the general character of the results.
27.	GGC	Page 10, para 2	Will final model use both stacks and actual data?	Yes, future model calculations will make use of all available data on release locations and release rates.
28.	GGC	Page 13	This statement about decay seems to contradict that made earlier in the text.	Both statements were deleted; the text has been revised for clarity.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
29.	GGC	Page 20, para 1	On what data were these assumed background concentrations and rates based?	The text has been rewritten to better describe the numbers. The numbers were used as minimum values to avoid problems associated with using logarithms of very small numbers in computing the averages and standard deviations of values for the census divisions.
30.	GGC	Tables 3-14	Could data be plotted on a map such as Figure 3; would such a map be more understandable to the public?	The requested figures are outside the scope of the report. Such maps could be developed from restructured model data.
31.	David Price		The surface contamination average value for AD 1 for December is out of line with those for November and January.	The value in question is correct. It is consistent with December values for adjacent locations.
32.	DP		Converting surface contamination values to index numbers more readily shows the relationship between contamination in different geographic areas.	The requested transformation is outside the scope of the report. See response to comment 30.
33.	John E. Till		I do not expect that the doses will change significantly, but this is something we will have to repeat after we get the correct met data for 1944-47.	Cursory examination of the results of model calculations made with the 19B3-1987 and 1944-1947 meteorological data sets doesn't indicate that use of the 1944-1947 meteorological data in the Phase I study would have changed the Phase I conclusions.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
34.	JET		Add equations and figures to take the reader through the input variables, the normalization process, and how the results will be used.	The requested information is outside the scope of this report. However, much of it was included in the MESOILT2 code documentation (PNL-7340 HEDR).
35.	JET	Pages v, 1	Don't rule out the possibility that we will use this model.	MESOILT2 provides the general framework for the final model. However, many of the details of the model will change to enhance the technical credibility of the model and to permit estimates of uncertainty to be included in model calculations.
36.	JET		Although the puff model is used here, it is the summation of puffs over time that counts. This point should be stressed. What we are most interested in is the time-integrated concentration in air or on land surface.	The comment is correct. In addition, the literature indicates that uncertainty in model results decreases as the integration time increases.
37.	JET	Page 4, para 4	The rationale for the domain being shifted to the east is not clear, especially since we wanted to specifically address the 10-county area.	The offset was based on consideration of prevailing wind patterns and topography. The discussion of the domain has been expanded to include the rationale.
38.	JET	Page 6, para 5	Will we have the 1944-47 data in time to include an analysis illustrating the potential effect on the results of Phase I from their insertion? If at all possible, we need to do this.	See response to comment 17.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

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Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
39.	JET	Page 9, Table 1	Make it clear in the title that these results are for 1983-87 met data.	Revised title.
40.	JET	Page 8, line 2 (and elsewhere)	Use ¹³¹ I format. Further, I know gasses is a correct plural spelling, but I think this is the first time I have seen it used. I would be interested in other opinions, but I prefer gases.	We have chosen to spell out the names of radionuclides throughout text for clarity. "Gasses" has been replaced by "gases."
41.	JET	Page 10, para 1	Add references for the stack flow rate and offgas temperature. Also, was there a variation in offgas temperature based on time of year or throughput? Show references.	Text revised.
42.	JET	Page 11	Normalization explanation is not very clear. Why is 1000 Ci used, then normalization to 1 Ci? Also, a figure (block diagram) explaining what you are doing would be helpful.	Text revised to include an explanation.
43.	JET	Page 22, Table 3	Why report these data in logarithms? It is difficult to interpret. Unless there is a good reason, standard values (using E format) should be listed.	The data are reported in logarithms because they were transferred to the dose assessment task in that form. The tables are listings of computer files with appropriate headings added. The discussion on pages 20-21 was expanded.
44.	JET		Plot average X/Q values on the county map and convert these to isopleths for each month or for quarters.	The requested figures are outside the scope of this report. See response to comment 30.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

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Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
45.	Bernard Shleien		The report provides no information of substance as to preliminary results. Should give actual data on parameters specific to Phase I, and uncertainties associated with the models used.	The report describes the atmospheric model input and output for the Phase I calculations. Uncertainties in the model results are included in the output based on evaluation of performance of the predecessor model in estimating monthly-average krypton-85 concentrations at Hanford, the interannual variability of model estimates of monthly-average air concentrations, and the spatial variability of concentration estimates within census districts. MESOILT2 does not have mechanisms to incorporate estimates of model parameter uncertainty in its calculations or to generate estimates of model uncertainty.
46.	BS		Without some information on the uncertainties, or the variance that could be expected due to specific decision points, one cannot judge the utility of the results for Phase I.	The purpose of the Phase I calculations was to demonstrate that data and models are available to make the calculations needed for dose reconstruction.
47.	Vietchau Nguyen		Given the underlying assumptions of the Lagrangian formulation (which led to the fundamental MESOI Gaussian solution), applicability of the MESOI formulation to the HEDR Project domain must be justified.	The selection of the atmospheric modeling approach is discussed in PNL-7998 and was discussed again at a TSP workshop in June 1990. The workshop participants (including the outside experts) agreed

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

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48.	VN		The validity of the assumptions of the slender plume approximation needs to be verified for the HEDR project.	that a puff model provides an appropriate framework of transport and diffusion calculations for the Hanford Environmental Dose Reconstruction Project. The puff model does not rely on the slender plume approximation. However, all modeling assumptions are being re-evaluated as a part of the model revision process.
49.	VN		Further explanation/justification is required for 1) the weighting process used in the calculation of sector-averaged exposure and 2) the assumption of joint probability of wind direction transport into a sector, wind speed and stability class.	Sector-average exposures are not calculated anywhere in MESOILT2, and the model does not make use of joint probability distributions. The model uses actual observed meteorological data in its calculations.
50.	VN		The proposed atmospheric modeling approach requires many computational assumptions, which must be shown to be consistent with the basic physics principles and site conditions.	The approach is consistent with basic physical principles and the available data.
51.	VN		The slender plume approximation will undoubtedly underestimate the concentration distant from the area covered by the progression of the plume. This underestimation is inherent in the basic formulation of the MESOI code.	The assertion is not correct. Both overestimates and underestimates of time-integrated air concentrations and deposition are possible at all distances.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
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52.	VN		Using the NRC approximation would result in overestimation of concentrations in the near-field and near the puff trajectory, and underestimation of values far-field and/or away from the puff trajectory.	The assertion is not correct. However, methods used to estimate diffusion will be re-evaluated as part of the model revision process.
53.	VN		The concept of sector averaging, as presented in this report, seems to be arbitrary and has no physical foundation.	MESOILT2 does not incorporate any sector averaging.
54.	VN		Due to the rapid chemical reactions of some released radionuclides in the atmosphere, the fundamental principles used by MESOI and the underlying assumptions concerning the advection time scale and the chemical reaction time scale must be reexamined.	All modeling assumptions will be reexamined as part of the model revision process.
55.	VN		A computational mechanism must be provided to reconcile all possible errors resulting from the assumptions and approximations made in the atmospheric transport modeling approach using MESOI.	The revised model will include mechanisms to account for uncertainty in the model input.
56.	VN		Sensitivity analyses should be performed to establish the variations which are inherently allowed by the intrinsic formulation of the code. Sensitivity studies for each sigma-2 parameterization is also recommended.	The sensitivity of the revised model to the changes in model components will be evaluated.
57.	VN		All sigma-z parameterizations should be tested and compared against data and against each other.	Alternative methods for estimating diffusion are being evaluated.

SUMMARY OF TSP COMMENTS AND BATTELLE RESPONSES

Document Number PNL-7199 HEDRDocument Title Atmospheric Transport Modeling and Input
Data for Phase I of the HEDR Project

Comment Number	Commenter	Page, Paragraph	Comment Summary	Resolution
58.	VN		Because of the inadequate knowledge of the performance of model parameters at larger spatial scale, radionuclide concentrations (near and far-field) should be computed for a given probability and confidence level addressing different type of uncertainty.	The revised model will address uncertainty directly. Probabilities and confidence levels will be obtainable from model output.
59.	B. Shleien		Need for sensitivity and uncertainty analyses which would provide assurance that the Phase I results will stand up to future scrutiny.	Sensitivity and uncertainty analyses will be performed on the revised code. They are outside the scope of this report.
60.	BS		There is a factor of two difference in the GENII code due to an interface error in the met portion of the model. However, the Phase I results for the HEDR project by-pass the GENII met model.	The relationship between the GENII and MESOILT2 computer codes is remote. A few subroutines in the two codes may have a common ancestry. However, the models are distinctly different in their data requirements and calculational methods. MESOILT2 uses hourly meteorological data from several locations for its calculations, while GENII uses climatological data summaries in its calculations.

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