APPENDIX A
INFORMATION ON POTENTIAL STUDY AREAS

PRELIMINARY 1990 CENSUS INFORMATION

Quantity	Lodi	Rose-ville	Marys-ville	Ukiah	Healds-burg	Santa Rosa	Auburn	Placer-ville
No. of Occupied Dwellings	19,300	17,500	4,800	5,700	3,700	46,700	4,700	3,400
% Vacant Dwellings	3.3	6.7	5.3	2.9	3.1	3.8	5.4	6.1

1980 CENSUS INFORMATION

Quantity	Lodi	Rose-ville	Marys-ville	Ukiah	Healds-burg	Santa Rosa	Auburn	Placer-ville
No. of Year-round Occupied Dwellings	14,000	9,200	4,200	4,700	2,900	33,800	3,200	2,800
% gas as primary heating fuel*	87.9	85.1	82.8	78.5	84.9	87.7	76.3	27.9
% wood as primary heating fuel	0.3	0.9	0.8	3.2	2.0	1.0	2.9	16.6
% gas cooking*	37.3	47.9	46.2	46.9	38.6	32.6	36.3	16.9

* Includes natural and bottled gas; natural gas is the dominant type in all towns except Placerville.

PREVALENCE OF SMOKING IN WOODLAND (SAMPLE RESULTS)

CIGARETTES:	NONE	1-4	5-9	10+
No. Homes:	73	8	5	35
Percent:	60.3	6.6	4.1	28.9
CIGARS:	NONE	1-8		
No. Homes:	115	6		
Percent:	95.0	5.0		
PIPEFULS:	NONE	1-8		
No. Homes:	117	5		
Percent:	95.9	4.1		

INFORMATION FROM NORTHERN CALIFORNIA POWER AGENCY 1987 RESIDENTIAL END USE SURVEY

	Lodi	Roseville	Ukiah	Healdsburg
% gas heat	84.3	68.7	77.8	84.1
% fireplace				
primary	1.5	1.2	1.6	1.0
secondary	57.6	53.4	41.3	50.6
% woodstove				
primary	2.2	3.1	5.7	5.5
secondary	15.1	12.7	24.2	19.1
% wood as heating fuel				
primary	2.8	2.9	7.3	6.1
secondary	25.7	27.8	29.9	35.4
total	28.5	30.7	37.2	41.5
% non-apt. or condos*	83.3	91.3	86.3	94.8
% gas cooking**	28.3	30.1	41.6	33.4
No. residences	18,600	12,800	6,400	3,700

* Includes single family, duplex, triplex, quadplex, mobile home.

** Includes natural and bottled gas.

INFORMATION FROM PACIFIC GAS AND ELECTRIC'S
1986 RESIDENTIAL APPLIANCE SATURATION SURVEY

	Yuba, Sutter & Colusa Counties	Sonoma County	El Dorado, Nevada, Placer & Sierra Counties	PG&E System	
				non-apts & condos	all dwellings
% gas heat	71.1	73.8	28.6	84.2	82.8
% fireplace					
primary	4.7	3.1	4.5	1.8	1.5
secondary	15.9	26.8	19.2	23.9	20.4
% woodstove					
primary	10.6	9.3	24.0	6.2	5.1
secondary	6.0	13.5	19.3	6.5	5.3
% wood as heating fuel					
primary	?	?	?	8.4	6.9
secondary	?	?	?	?	?
% non-apt. or condos	89.6	87.6	96.1	100.0	81.4
% gas cooking	44.7	39.7	29.8	42.2	40.1
No. residences	46,000	135,000	102,000	3.1 mil	3.9 mil

APPENDIX B
SCREENING QUESTIONNAIRE

PART C.
INTRODUCTION AND SCREENING QUESTIONNAIRE MAIN STUDY

INTRO_1.
Hello, my name is ________ and I'm calling on behalf of the State of California Air Resources Board. We are conducting a study of certain air pollutants in California homes.

1. Your home has been randomly selected from this area. I am trying to reach (NUMBER DIALED). Did I dial the correct number?

[] 01 YES....................CONTINUE
[] 02 NO....................END, DIAL AGAIN. IF 2nd DIALING, MAKE NO MORE ATTEMPTS

2. Since we are trying to find out about pollutants in homes, I'd like to know, have I reached a private residence, a business, or something else?

[] 01 HOME....................CONTINUE
[] 02 NOT A HOME....................READ THE FOLLOWING:

I'm sorry, but for purposes of this study,
we need to reach only private residences.
Thank you for your time. END

IF CASE ID NUMBER BEGINS WITH 1, 2, OR 3 READ #3, ELSE READ 3a.

3. Is your mailing address in Placerville, Diamond Springs, or Deer Park?

[] 01 YES....................CONTINUE
[] 02 NO....................READ THE FOLLOWING:

I'm sorry, but for purposes of this study,
we need to reach only residents in Placerville, Diamond Springs, Deer Park.
Thank you for your time. END.

3a. Are you within 5 miles of US 50?

[] 01 YES....................CONTINUE WITH #4
[] 02 NO....................READ THE FOLLOWING:

I'm sorry, but for purposes of this study,
we need to reach only residents within 5 miles
of US route 50. Thank you for your time. END.

3b. Is this home located in the city limits of Roseville?

[] 01 YES....................CONTINUE
[] 02 NO....................READ THE FOLLOWING:

I'm sorry, but for purposes of this study,
we need to reach only residents in Roseville.
Thank you for your time. END.

4. The rest of this survey must be conducted with an adult resident of the home. Would that be you?

[] 01 YES....................SKIP TO DESCRIPTION
[] 02 NO....................CONTINUE

5. May I speak with an adult resident of the home?

[] 01 YES....................CONTINUE
[] 02 NO....................CONVERT IF RELUCTANT OR PROMPT FOR NAME OF AN ADULT, SET CALLBACK TIME AND DATE

INTRO_2
Hello, my name is _________ and I'm calling on behalf of the State of California Air Resources Board. We are conducting a study of indoor air quality in California homes.

DESCRIPTION
The purpose of this study is to obtain information about air pollutants that may be in homes throughout the State and your home number was randomly dialed. We are calling now to determine which homes are suitable for participation in a study this winter. Right now I'd like to ask you a few questions about your home. This will take about two to three minutes of your time.

6. First, will this be your primary residence for the next 6 months?

[] 01 YES....................CONTINUE
[] 02 NO....................READ THE FOLLOWING:

I'm sorry but for purposes of this study,
we are interviewing only long-term residents.
Thank you for your time. END.

7. Which of the following best describes this home? Is it a...

[] 01 detached single family home..............................CONTINUE
[] 02 attached single family home..............................CONTINUE
[] 03 mobile home..............................CONTINUE
[] 04 condominium or apartment..............................CONTINUE

8. Including this telephone number, how many phone numbers are there in your house?

[] 01 ONE..............................CONTINUE
[] 02 TWO..............................CONTINUE
[] 03 THREE OR MORE..............................CONTINUE

9. Do you use any of the following cooking appliances at least once a week?

CHECK ALL THAT APPLY

9a. Stove or oven that uses natural gas

[] 01 YES..............................CONTINUE
[] 02 NO..............................CONTINUE

9b. Stove or oven that uses propane

[] 01 YES..............................CONTINUE
[] 02 NO..............................CONTINUE

9c. Electric stove or oven

[] 01 YES..............................CONTINUE
[] 02 NO..............................CONTINUE

10. What is the primary source of heat in your home?

[] 01 Natural gas....................CONTINUE
[] 02 Propane....................CONTINUE
[] 03 Electricity....................CONTINUE
[] 04 Kerosene....................CONTINUE
[] 05 Other....................CONTINUE

11. Do you have a woodstove or a woodburning fireplace in your home?

[] 01 YES, WOODSTOVE....................SKIP TO 13
[] 02 YES, WOODBURNING FIREPLACE....................SKIP TO 13
[] 03 YES, BOTH....................CONTINUE
[] 04 NO, DON'T HAVE EITHER ONE....................SKIP TO 14

12. Which do you use most frequently?

[] 01 The woodstove or....................CONTINUE
[] 02 the woodburning fireplace....................CONTINUE

13. Assuming the weather is cold, about how many days per week do you think you would use your woodstove or woodburning fireplace during the upcoming winter?

[] 00 None or less than one day per week....................CONTINUE
[] 01 One or two days per week....................CONTINUE
[] 02 Three or four days per week....................CONTINUE
[] 03 Five or more days per week....................CONTINUE

14. Are tobacco products regularly smoked in your home by you or other household members?

[] 01 YES....................CONTINUE
[] 02 NO....................SKIP TO 18

15. Approximately how many cigarettes per day are smoked in the home?

[__] ENTER THE NUMBER OF CIGARETTES

16. Approximately how many cigars per day are smoked in the home?

[__] ENTER THE NUMBER OF CIGARS

17. Approximately how many pipefuls of tobacco per day are smoked in the home?

[__] ENTER THE NUMBER OF PIPEFULS

18. Those are all the questions I have about your house. You may be called again and asked to help in another part of the study. If you are selected for the second part of the study, we would first like to send you information that further explains the study and what it will mean to you and the rest of the people of California. May I please have a mailing address where we can send this information?

[] 01 YES....................RECORD AND CONTINUE
[] 02 NO....................PROBE FOR CONVERSION. IF CONVERSION UNSUCCESSFUL, SKIP TO THE THANK-YOU SCRIPT.

STREET: ______________________________

CITY: ________________ , CA ZIP ________

19. And to whom should I address the envelope?

TITLE: Mr. Mrs. Ms. Dr. _____ (other)

FIRST NAME: ______________________________

LAST NAME: ______________________________

THANK_YOU

Thank you very much for your help and cooperation. Have a nice day/evening.

COMMENTS:

APPENDIX C
INFORMATION PACKAGE

The California Air Resources Board is sponsoring a study to measure levels of selected air pollutants in homes. Your household was contacted this fall by telephone and you provided information on the use of combustion sources in your home. Thank you for participating in that telephone survey and for agreeing to receive information on the next phase of this important study. The enclosed materials consist of:

- a brochure that describes this research study, and

- a copy of an article on the study that appeared in your local newspaper.

I sincerely hope that you will examine these materials carefully. If your home is selected to participate in the next phase of the study, you will be called in the next few weeks to schedule a time for air monitoring visits. These visits are performed on three consecutive days and will take a total of about two hours of your time.

Your participation is voluntary, but since each selected home represents many other similar homes in your town, the participation of each household is vitally important to the success of the study. Your name and address will be kept confidential and will not be used when compiling, analyzing, or reporting the results of the study. Each household will receive $25 for participating in the study.

If you have any questions or would like additional information, you are welcome to contact Stephen Brown of my staff who is responsible for this study. Stephen can be reached at (916) 323-1526. Thank you very much for your cooperation in this important project.

Sincerely yours,

John R. Holmes, Ph.D.
Chief, Research Division

WHAT ARE THE MONITORS LIKE?

The indoor and outdoor monitors are small boxes with pumps and filters. The pumps are quiet, making no more noise than a standard aquarium air pump. Air is drawn through a tube where various materials will collect the particles and gases. At the end of 24 hours, the tubes are sealed and sent to the laboratory for analysis of the collected substances.

These monitors are on stands that will be placed in out-of-the-way places in your living area and yard. You are not liable if any one of the monitors stops working or is damaged.

WHO IS SPONSORING THE STUDY?

The California Air Resources Board (ARB) contracted with Research Triangle Institute (RTI) to carry out the study. RTI is a not-for-profit research institute in North Carolina that has previously conducted studies of people's exposures to chemicals.

WILL MY DATA BE KEPT CONFIDENTIAL?

Yes. Your name and address will be kept confidential and will not be used when compiling, analyzing or reporting the results of the study.

WHO DO I CONTACT IF I WANT MORE INFORMATION?

If you would like more information about any part of the study, or have any questions about the study and your participation, please feel free to call:

Dr. Linda Sheldon
Project Manager
Research Triangle Institute
Telephone - Toll free: (800) 334-8571

Dr. Stephen Brown
ARB Project Coordinator
California Air Resources Board
Telephone (916) 323-1526

The Indoor Air Quality Study of

Northern California Residences

12/5/91

WHAT IS THIS STUDY?

This is a study of residential indoor air quality sponsored by the California Air Resources Board. Its **goal is to identify and evaluate the factors that increase indoor air concentrations of certain pollutants.** Measuring residential exposure levels is the first step in determining the degree of health risks posed by these pollutants indoors.

WHERE AND WHEN ARE YOU GOING TO DO THIS STUDY?

The communities of Placerville (and vicinity) and Roseville have been selected for this study because together they offer adequate numbers of households that use wood or natural gas. They are good representatives of other northern California valley and foothill communities. Some homes that do not use gas or wood to heat or cook will be included so that we can compare results.

In December, telephone interviewers will begin to call homes to set up appointments for participation in the study which will start in early January and continue through March 1992.

WHAT WILL I BE ASKED TO DO?

PHASE 1

Every household receiving this brochure has already given some information to a telephone interviewer from Research Triangle Institute, a scientific research organization. In a few weeks, another interviewer may call you to schedule the actual appointments for technicians to come to your home. All the appointments will be scheduled for late afternoon or evening hours on three consecutive days. The interviewer will let you know which times are available and you can choose the most convenient one.

PHASE 2

On the first visit, a small tube containing a harmless and odorless tracer gas will be placed inside your house to measure the amount of air moving into and out of your home. On the second visit, a technician will set up the air samplers. These small, quiet air samplers will be placed inside and outside the home for 24 hours. After the 24 hours, the technician will come back for the third and last time to retrieve the samplers and ask you questions about the combustion activities that may have occurred during that time. For their safety and yours, the technicians will be wearing identification badges. We have also contacted the police department in your area and they are aware that this study is taking place.

WHAT POLLUTANTS ARE BEING MEASURED?

This study will measure the chemicals that are given off by indoor combustion sources such as cigarette smoking, wood burning, and the use of certain household appliances. Carbon monoxide and chemicals called "polycyclic aromatic hydrocarbons" (PAHs) will be measured both inside and outside the home for a 24-hour period. How fast air moves in and out of your home will also be measured.

WHY ARE YOU MEASURING THESE POLLUTANTS?

Some of the PAHs are known or suspected to cause cancer, and carbon monoxide poisoning can be lethal. The concentration of these compounds, produced by the normal use and maintenance of combustion sources such as wood burning and gas appliances and cigarette smoking, is important in determining people's indoor exposures. Californians spend an average of 62% of their time inside their homes. Therefore, when indoor pollutants are encountered, they may account for a major proportion of the health risks from air pollution.

WHY SHOULD I PARTICIPATE?

If you can participate, yours will be one of almost 150 homes that will represent the indoor concentrations found in comparable homes in your town. For this study, homes both with and without combustion sources are needed to make comparisons. Each selected home represents many other homes in the area and, therefore, your participation is very important if we are to obtain meaningful information about homes in your area.

Your participation will be very important to the success of the study and you will have the satisfaction of knowing you have contributed to an important scientific study – very few people ever have this opportunity. Many of our participants in previous studies have said they enjoyed participating and learning about their sources of exposure.

We realize that you will need to spend some time answering our questions and allowing us into your home. Therefore, **we will give you $25.00 immediately after you complete the monitoring period.** You will also receive information about indoor air quality and steps you can take to improve the air quality in your home. At the end of the study, results on the pollutant levels in your home will be available.

WOULD I BE ASKED TO STAY HOME FROM WORK OR TO CHANGE MY ACTIVITIES?

Quite the contrary! It is important to us that your household activities remain pretty much as normal for the 24 hours the air sampling monitors are in your home. These monitors do not need to be watched or attended to in any way, so you can go about your regular routines at home or at work. All we ask is that you be present whenever a technician is scheduled to come to your house, and that you follow your normal heating and cooking routines while we are monitoring your air.

Mountain Democrat

VOL. 141 NO. 166

& Placerville Times

FRIDAY, OCTOBER 18, 1991

Subscribe now for only 30 cents an issue
FIVE SECTIONS EIGHTY TWO PAGES TWO SUPPLEMENTS

Since 1851

Local families sought for indoor pollution study

SACRAMENTO — The state Air Resources Board will be calling residents in the Roseville-Placerville area from Oct. 16 through December in search of 280 area families to participate in a local indoor air pollution research project.

Researchers from the ARB and the Research Triangle Institute, the project research firm, are not requesting volunteers. Instead, the ARB will be interviewing residents chosen at random to determine who will be asked to participate in the study.

Initially, the researchers will conduct five-minute telephone interviews to identify families that use different combinations of household appliances, such as woodstoves and indoor heaters. Those interviews will assure researchers that a variety of appliances are included in the study, which is designed to measure polycyclic aromatic hydrocarbons, a complex group of chemicals that contribute to smog and carbon monoxide.

Following the telephone call, selected families will receive letters marked with ARB letterhead requesting their participation in the study, which is scheduled to begin in early January 1992. Those letters will include information that study participants can use to identify ARB and Research Triangle employees.

During the study, researchers will monitor emissions from home appliances over three days.*The study will also include a questionnaire to determine the use of appliances and any personal behavior, such as the use of fireplaces or cigarette smoking, that may affect indoor pollution levels.

After the third study day, the researchers will analyze the monitors and prepare their report on the study's results. The final research report is expected during spring 1993.

*CORRECTION: Emissions will be measured for a 24-hour period.

APPENDIX D
APPOINTMENT SCHEDULING SCRIPT

CONTROL FORM

ID NUMBER:

PHONE:

PERSON NAME:

ADDRESS:

TIME CONTACTED DURING SCREENING:

APPOINT #:

RECORD OF CALLS:

Date	Time	Comments-WRITE THE LAST ITEM # ANSWERED	Code	Initials

502 Answered/# not confirmed
503 Answered/# confirmed - incomplete
504 Answered/non-adult-incomplete

506 Incompetent/impaired
510 Operator/non-working/disconnect
511 Modem/noise/busy/answering machine no answer/answering service
515 Other (cover sheet must specify)

600 Completed, appointment set
601 Completed, no appointment
602 Phone # never confirmed
603 # confirmed, never complete
604 No adult ever at home
605 Respondents moving away
606 Always incompetent/impaired
610 Permanent disc/non-working
611 All attempts reached modem/ busy/no answer/machine/etc.
615 Final - other (specify)

1. Hello, this is ______________. We're conducting a study on behalf of the California Air Resources Board to measure exposure to air pollution. We spoke to someone at this number [READ NUMBER] several weeks ago about this study.

1a. Have I reached the correct number?

Yes . . . . CONTINUE
No . . . . REDIAL

1b. May I speak to a head of this household?

Yes . . . . CONTINUE
No . . . . ASK FOR CALLBACK TIME AND NAME.

2. When we last called, we were given information about your house and the use of gas or wood burning appliances. Since that time, a letter and a brochure were sent informing you about the second part of this study.

2a. Do you still live in CITY NAME?

YES . . . . CONTINUE
NO . . . . END WITH SCRIPT:

I'm sorry, but for purposes of this study, we can only survey people whose homes are in Roseville/Placerville/Deer Park/Diamond Springs.

2b. Did you receive that letter?

YES . . . . SKIP TO 3
NO . . . . CONTINUE

I'm sorry the letter was not received, let me briefly describe the study to you. This is a residential indoor air quality study sponsored by the California Air Resources Board. It will measure chemicals that are given off by cigarette smoking, woodburning, and the use of certain household appliances. This study is the first step in understanding health risks associated with these pollutants in the home. RTI, a research institute in North Carolina, has been contracted to carry out this study.

Your participation involves allowing a chemist to come to your house on three consecutive afternoons or evenings to take air samples and will take about two hours of your time. On the first visit, a small tube containing a harmless and odorless tracer gas will be placed inside your house to measure the amount of air moving into and out of your home. On the second visit, the chemist will set up two air samplers. After 24 hours, the chemist will come back for the third and last time to retrieve the samplers and ask you some questions about the combustion activities that may have occurred during that time.

Your participation is voluntary, but vitally important to the success of this study. As our way of saying thank you, you will receive $25 at the completion of the air monitoring period. Do you have any questions?

3. As it says in the letter, your participation is voluntary, but vitally important to the success of this study. Participation involves allowing a chemist to come to your home on three consecutive afternoons or evenings to set up, monitor, and then take down air sampling devices. The chemist will also administer a short questionnaire. All of this will take about two hours of your time. As our way of saying thank you for participating, your will receive $25 at the completion of the air monitoring period. Do you have any questions?

   CONTINUE

4. What I'd like to do now is make the appointments for the chemists to come to your home. If you have a calendar or pencil and paper handy that might help. The appointments will be on three consecutive days.

PAUSE IF PARTICIPANT IS GETTING CALENDAR/PAPER.

4a. I'd like to schedule you for READ PFT DAY, DATE, TIME for the first appointment.

CONFIRM DAY/DATE/TIME WITH PARTICIPANT USING THE FIRST AVAILABLE APPOINTMENT CARD. IF THE FIRST (PFT) APPOINTMENT CANNOT BE SCHEDULED FOR THE AFTERNOON TIME YOU MAY OFFER THE MORNING ALTERNATIVE THAT IS LISTED. USE THIS ALTERNATIVE <u>ONLY</u> IF NECESSARY.

5. Okay, now the next appointment will be about 24 hours later. That would be on READ SET-UP DAY, DATE, TIME.

CONFIRM SET-UP DAY, DATE, TIME.

6. The last appointment will be 24 hours after the second one. That would make it READ TAKE-DOWN DAY, DATE, TIME.

CONFIRM TAKE-DOWN DAY, DATE, TIME.

7. Thank-you. Those are the only appointments we need to make. Now, I have your address as READ ADDRESS FROM COVER SHEET. Is that address correct?

   YES . . . . SKIP TO 9
   NO OR ONLY P.O. BOX USED . . . . CONTINUE

8. May I have your street address, please?

   YES . . . . FILL IN THE ADDRESS ON THE APPOINTMENT CARD
   NO . . . . CONVERT

9. Can you give me some simple directions to your home so that the chemists can find their way?

   RECORD ON THE APPOINTMENT CARD

10. And who should the chemists ask for when they get to the house or which adult will be at home at those appointment times?

RECORD ON THE APPOINTMENT CARD

11. We'll call you a day or two ahead of time to remind you that we're coming on the READ DATES AND TIMES. If you need to get in touch with us, please call us collect at (919) 541-6756 and ask for the air quality study supervisor.

12. When we call back to remind you of your appointment, what is the best time to try to reach you?

RECORD ON APPOINTMENT CARD

13. Is there another number where we should try to reach you?

YES . . . . RECORD ON APPOINTMENT CARD
CONTINUE

NO . . . . CONTINUE

IF THE ID NUMBER INDICATES FIREPLACE OR WOODSTOVE USE, READ THE FOLLOWING. IF NOT, SKIP TO ITEM 15.

14. Our records show that you frequently use your [fireplace]/[woodstove]. If possible, we would like you to use it as you normally would when we are monitoring your home.

15. Do you have any questions I can answer for your now?

ANSWER BRIEFLY

16. Thank you again for your help. Goodbye.

APPENDIX E
APPOINTMENT REMINDER SCRIPT

Hello, this is ______ calling on behalf of the State of California Air Resources Board. I'm calling to remind you of our appointment to take air samples in and around your home.

My appointment card shows that you are scheduled for...

READ PFT DAY, DATE, AND TIME

so the chemist can measure the air flow in your house with the tracer.

The next day, the chemist will come to actually put the monitors in place. That will be on...

READ THE SET UP DAY, DATE, AND TIME,

Then, the chemist will come to remove the monitors, complete a brief questionnaire, and give you the $25.00 incentive on ...

READ THE TAKE DOWN DAY, DATE, AND TIME

Those are the three days for your appointment schedule.

IF THE ID NUMBER INDICATES FIREPLACE OR WOODSTOVE USE, READ THE FOLLOWING. IF NOT SKIP.

Our records show that you use a [fireplace]/[woodstove]. If possible, we would like you to use it, on the day we are monitoring your home.

Do you have any questions about this?

ANSWER AS NECESSARY

If you need to get in touch with us you can call us collect at (919) 541-6756 and ask for the "air quality study supervisor."

Thank you for your help. We certainly appreciate your cooperation in making this study a success. Good-bye.

APPENDIX F
PARTICIPANT CONSENT FORM

California Air Resources Board

Indoor Air Quality Study

Participant Consent Form

Research Triangle Institute (RTI) has been contracted by the California Air Resources Board to conduct an indoor air quality study in Northern California. The purpose of this study is to measure air pollutants inside and outside of homes and to relate these measurements to the use of combustion sources in the home. Combustion sources include woodburning in woodstoves and fireplaces, cigarette smoking and the use of gas appliances.

To be part of the study, you must allow a scientist from RTI or our subcontractor, Dynamac, to come to your house on three consecutive afternoons or evenings to set up air sampling equipment. You will not need to stay home with the equipment once it's in place - the monitors don't need any attention. The scientist will come out on one day to set up air tracing equipment. This will involve the release of a small amount of nontoxic gas (PFT) into your home to measure air movement into and out of the house. The next day the scientist will come out to set up several small, quiet air sampling monitors, and the last day to remove the equipment. On the last visit, he/she will ask questions about home characteristics and the use of combustion sources during the monitoring period. Examples of the questions might be: were windows and doors open; did you do any cooking or frying; what kind of fuel did you use in your woodburning stove or fireplace (if you have one); and did anyone smoke in the house. You will receive $25.00 in cash for your complete participation. All three visits will take about two hours of your time.

This is a voluntary study and you are free to withdraw at any time. You may also refuse to answer any of the questions. Your name and address will be kept confidential and will not be used when compiling, analyzing or reporting the results of the study. Being part of this study will not result in any direct benefits to you other than $25.00 for your help. The results on the pollutant levels in your home will be available at the end of the study.

If you have any further questions about the study, you may contact:

Stephen Brown, California Air Resources Board, at (916) 323-1526 or

Linda Sheldon, Research Triangle Institute, at (800) 334-8571.

If you have any questions about your rights as a participant in this study, you may contact:

Dr. Janet Griffith, Research Triangle Institute, (800) 334-8541

The study has been explained to me and I understand what I must do to take part in it. I agree to take part in the study as described.

Participant Name: ______________________________

Please Print

______________________________ ____________

Signature (Date)

Participant ID:

APPENDIX G
STUDY QUESTIONNAIRE

STUDY QUESTIONNAIRE FOR CARB PAH STUDY

>Q1<

HOUSE TYPE (BY OBSERVATION)

<1> DETACHED SINGLE FAMILY HOUSE [goto Q1A]
<2> ATTACHED SINGLE FAMILY HOUSE [goto Q1A]
<3> MOBILE HOME [goto Q1A]
<4> CONDOMINIUM OR APARTMENT [goto Q2]
< > nothing

===>

>Q1A<

How old is your house?

<1-200> YEARS

<998> DK
<999> RE

===> [goto Q3]

>Q2<

Excluding a door to a garage, do all of the entryways into your condominium or apartment lead directly outdoors?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q3<

Does your home have an attached garage or parking area underneath?

<1> YES, GARGAGE [goto Q4]
<2> YES, PARKING AREA UNDERNEATH [goto Q4]
<3> NO
<8> DK
<9> RE

===> [goto Q8A]

>Q4<

Is there a door leading directly to the home from the garage or parking area underneath?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q5<

Were any vehicles started or run in the garage or the under building parking area during the monitoring period?

<1> YES [goto Q6]
<2> NO
<8> DK
<9> RE

===> [goto Q8A]

>Q6<

For how long?

<1-240> MINUTES

<998> DK
<999> RE

===>

>Q7<

Were any of the vehicles diesel powered?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8A<

Did you use any of the following systems to heat your home in the last 24 hours?

ANSWER YES FOR ALL THAT APPLY

Gas heat, including wall or floor furnance?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8B<

Electric heat?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8C<

Central oil heat?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8D<

Wood burning fireplace?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8E<

Gas burning fireplace?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8F<

Woodburning stove?

<1> YES
<2> NO
<8> DK
<9> RE

>Q8G<

Portable kerosene heater, including in an attached garage?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8H<

Gas space heater?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8I<

Electric space heater?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q8J<

Any other heating system?

<1> YES [goto Q8JA]
<2> NO
<8> DK
<9> RE

===> [goto Q9]

>Q8JA< [allow 50] [no erase]

What type of heating system?

****

===>

>Q9<

What was the primary source of heat in your home (used most often) during the monitoring period?

<1> central gas heat
<2> central electric heat
<3> central oil heat
<4> wood burning fireplace
<5> gas burning fireplace
<6> woodburning stove
<7> kerosene heater
<8> gas space heater
<9> electric space heater
<10> some other source

<98> DK
<99> RE

===>

>Q10<
[if Q8A ne <1> goto Q11]

>Q10A<

CENTRAL GAS HEAT

What type of gas heating system was used?

<1> central warm air furnace with ducts to room
<2> floor, wall or pipeless furnace
<3> wall furnace
<4> steam or hot water

<8> DK
<9> RE

===>

>Q10B<

How old is the heating system?

<1-100> YEARS

<998> DK
<999> RE

===>

>Q10C<

Where is the heating system located?

<1> basement or garage
<2> other inside
<3> other outside, including roof [goto Q11]
<8> DK
<9> RE

>Q10D<

Is it vented to the outside?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q10E<

Does the heating system have a gas or electric pilot light?

<1> YES, GAS
<2> YES, ELECTRONIC IGNITION
<3> NO
<8> DK
<9> RE

===>

>Q10F<

What type of gas was used?

<1> Natural gas
<2> Propane
<8> DK
<9> RE

===>

>Q11<

[if Q8D ne <1> goto Q12]

>Q11A<

WOODBURNING FIREPLACE

How many woodburning fireplaces were used?

<1-5> FIREPLACES

<8> DK
<9> RE

===>

>Q11B<

IF MORE THAT ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you burn wood in your fireplace during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

>Q11C<

What did you burn in the fireplace?

ANSWER YES FOR ALL THAT APPLY

Wood logs?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11D<

Wood pellets?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11E<

Newspaper or trash?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11F<

Any other type of fuel?

<1> YES [goto Q11G]
<2> NO
<8> DK
<9> RE

===> [goto Q11H]

>Q11G< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q11H<

Was the fireplace used to heat the room where monitoring took place?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11I<

What type of fireplace screen was used?

<1> glass door
<2> wire mesh
<3> none
<8> DK
<9> RE

===>

>Q11J<

Did you remove ashes from your fireplace during the last 24 hours?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11K<

Has your chimney been cleaned this winter?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11L<

Is this fireplace designed to heat more efficiently than a traditional fireplace?

PROMPT FOR SLIDING VENTS OR INSERTS

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12<

[if Q8E ne <1> goto Q13]

>Q12A<

GAS BURNING FIREPLACE

How many gas burning fireplaces were used?

<1-5> FIREPLACES

<8> DK
<9> RE

===>

>Q12B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you use your gas fireplace during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q12C<

What type of fuel was used?

ANSWER YES FOR ALL THAT APPLY

Natural gas?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12D<

Liquid propane?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12E<

Any other type of gas?

<1> YES [goto Q12F]
<2> NO
<8> DK
<9> RE

===> [goto Q12G]

>Q12F< [allow 50] [no erase]

What other type of gas?

****

===>

>Q12G<

Was the gas fireplace used to heat the monitoring area?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12H<

What type of fireplace screen was used?

<1> glass door
<2> wire mesh
<3> none
<4> other
<8> DK
<9> RE

===>

>Q13<

[if Q8F ne <1> goto Q14]

>Q13A<

WOODSTOVES

How many woodstoves were used?

<1-5> WOODSTOVES

<8> DK
<9> RE

===>

>Q13B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you burn fuel in your woodstove during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q13C<

What did you burn in the woodstove?

ANSWER YES FOR ALL THAT APPLY

Wood logs?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13D<

Wood pellets?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13E<

Newspaper or trash?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13F<

Any other type of fuel?

<1> YES [goto Q13G]
<2> NO
<8> DK
<9> RE

===> [goto Q13H]

>Q13G< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q13H<

Was the stove used to heat the monitoring area?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13I<

What percent of the time was the woodstove door at least part way open during operation?

<1> less than 25%
<2> 25 - 50%
<3> 50 - 75%
<4> 100%
<8> DK
<9> RE

===>

>Q13J<

How often did you refuel or stoke your woodstove?

<1> once
<2> twice
<3> three times
<4> 4 or more times
<8> DK
<9> RE

===>

>Q13K<

Did you remove ashes from your woodstove during the last 24 hours?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13L<

Has your chimney been cleaned this winter?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13M<

Are there cracks or leaks in your stove pipe?

(VISUAL CHECK IF NECESSARY)

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q14<

[if Q8G ne <1> goto Q15]

>Q14A<

KEROSENE HEATER

How many kerosene heaters were used in your home or attached garage?

<1-5>

<8> DK
<9> RE

===>

>Q14B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you use your kerosene heater during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q14C<

Was the kerosene heater used to heat the room where monitoring took place?

<1> YES
<2> NO, ELSEWHERE IN HOUSE
<3> NO, IN ATTACHED GARAGE
<8> DK
<9> RE

===>

>Q14D<

Was the heater vented to the outdoors during the monitoring period?

<1> YES, INSTALLED
<2> YES, WINDOW OR DOOR OPEN TO OUTDOORS
<3> NO
<8> DK
<9> RE

===>

>Q15<

[if Q8H ne <1> goto Q16]

>Q15A<

PORTABLE GAS SPACE HEATER

How many gas space heaters were used?

<1-5>

<8> DK
<9> RE

===>

>Q15B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How many hours did you use your gas space heater during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q15C<

Was the gas space heater used to heat the room where monitoring took place?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q15D<

Was the heater vented to the outdoors during the monitoring period?

<1> YES, WINDOW OR DOOR OPEN
<2> NO
<8> DK
<9> RE

===>

>Q16<

Has a clothes dryer been used in your home, including in an attached garage or an attached shed, in the past 24 hours?

<1> YES [goto Q17]
<2> NO
<8> DK
<9> RE

===> [goto Q19A]

>Q17<

Is the clothes dryer

<1> natural gas
<2> propane
<3> electric [goto Q19A]
<8> DK
<9> RE

===>

>Q18<

Where is the dryer located?

<1> basement
<2> attached garage or shed
<3> other inside home
<8> DK
<9> RE

===>

>Q19<

Where is the dryer vented?

<1> to the outdoors
<2> same room
<3> other
<8> DK
<9> RE

===>

>Q19A<

Do you have a gas water heater?

<1> YES [goto Q19B]
<2> NO
<8> DK
<9> RE

===> [goto Q20]

>Q19B<

Where is it located?

<1> Basement or garage
<2> other inside
<3> outside [goto Q20]
<8> DK
<9> RE

===>

>Q19C<

Does it have a gas or electric pilot light?

<1> YES, GAS
<2> YES, ELECTRONIC IGNITION
<3> NO
<8> DK
<9> RE

===>

>Q19D<

What type of gas is used?

<1> Natural gas
<2> propane
<8> DK
<9> RE

===>

>Q20<

Do you have a gas oven in your home?

<1> YES [goto Q21]
<2> NO
<8> DK
<9> RE

===> [goto Q22]

>Q21<

What fuel does your oven use?

<1> natural gas
<2> liquid propane
<3> other type of fuel [goto Q21A]
<8> DK
<9> RE

===> [goto Q21B]

>Q21A< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q21B<

How old is your oven?

<1> less than 3 years
<2> 3 to 10 years
<3> older than 10 years
<8> DK
<9> RE

===>

>Q21C<

What type of pilot light(s) does your oven have?

<1> electronic ignition
<2> nonstanding, light by hand
<3> constantly burning
<8> DK
<9> RE

===>

>Q21D<

How long was your oven on during the last 24 hours?

<0-240> MINUTES

<998> DK
<999> RE

===>

>Q22<

Do you have a gas stove in your home?

<1> YES [goto Q22A]
<2> NO
<8> DK
<9> RE

===> [goto Q27]

>Q22A<

What fuel does your stove use?

<1> natural gas
<2> liquid propane
<3> other type of fuel [goto Q22B]
<8> DK
<9> RE

===> [goto Q22C]

>Q22B< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q22C<

How old is your stove?

<1> less than 3 years
<2> 3 to 10 years
<3> older than 10 years
<8> DK
<9> RE

===>

>Q22D<

What type of pilot light(s) does your stove have?

<1> electronic ignition [goto Q22F]
<2> nonstanding, light by hand [goto Q22F]
<3> constantly burning
<8> DK
<9> RE

===> [goto Q22E]

>Q22E<

How many pilot lights does your stove have?

<1-4>

<8> DK
<9> RE

===>

>Q22F<

How long were any of the burners on during the last 24 hours?

<0-240> MINUTES (TOTAL BURNER TIME)

<998> DK
<999> RE

===>

>Q27<
[if Q22F gt <0> goto Q28]
[if Q21D gt <0> goto Q28]

[goto Q28A]

>Q28<

Did you use an exhaust fan to vent air outdoors during cooking?

<1> never
<2> sometimes
<3> always
<8> DK
<9> RE

===>

>Q28A<

Was indoor grilling performed in your home over the past 24 hours?

<1> Yes, electric grill [goto Q28C]
<2> Yes, gas grill [goto Q28C]
<3> Yes, some other type [goto Q28B]
<4> No
<8> DK
<9> RE

===> [goto Q28F]

>Q28B< [allow 50] [no erase]

What other type of fuel?

****
===>

>Q28C<

How long was the grill on during the last 24 hours?

<1-240> MINUTES

<998> DK
<999> RE

===>

>Q28D<

How long was the food actually grilled?

<1-240> MINUTES

<998> DK
<999> RE

===>

>Q28E<

Was an exhaust fan to the outdoors used?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q28F<

Was frying performed in your home
over the past 24 hours?

<1> YES [goto Q28G]
<2> NO
<8> DK
<9> RE

===> [goto Q29]

>Q28G<

How long was the food actually fried uncovered?

<1-240> MINUTES

<998> DK
<999> RE

===>

>Q28H<

Was an exhaust fan to the outdoors used?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q29<

Including visitors and other family members, were any tobacco products smoked in your home during the past 24 hours?

<1> YES [goto Q30]
<2> NO
<8> DK
<9> RE

===> [goto Q35A]

>Q30<

How many cigarettes?

<0-100>

<998> DK
<999> RE

===>

>Q31<

Cigars?

<0-40>

<98> DK
<99> RE

===>

>Q32<

Pipefuls of Tobacco?

<0-40> MINUTES

<98> DK
<99> RE

===>

>Q35A<

Other than cigarettes, was there any smoke in your home over the past 24 hours? (Such as from candles, wood burning, welding, or incense.)

<1> YES [goto Q35B]
<2> NO
<8> DK
<9> RE

===> [goto Q36]

>Q35B<

Was the smoke light, moderate, or heavy?

<1> LIGHT
<2> MODERATE
<3> HEAVY
<8> DK
<9> RE

===>

>Q35C<

How long did the smoke last?

<1> less than 5 mintues
<2> 5 to 15 minutes
<3> 15 to 30 minutes
<4> longer than 30 minutes
<8> DK
<9> RE

===>

>Q35D<

[no erase] [allow 50]

What was the source of smoke?

****

===>

>Q36<

Did any smoke enter your home from the outdoors during the past 24 hours?

<1> YES [goto Q36A]
<2> NO
<8> DK
<9> RE

===> [goto Q38]

Q36A Was the smoke light, moderate, or heavy?

<1> LIGHT
<2> MODERATE
<3> HEAVY
<8> DK
<9> RE

===>

>Q36B<

How long did the smoke last?

<1> less than 5 mintues
<2> 5 to 15 minutes
<3> 15 to 30 minutes
<4> longer than 30 minutes
<8> DK
<9> RE

===>

>Q37<

[allow 50] [no erase]

What was the source of the smoke?

****

===>

>Q38<

Did you leave any windows or doors open during the monitoring period? If so, for about how long?

<1> No
<2> Yes, less than 30 minutes
<3> Yes, 30 minutes to 3 hours
<4> yes, 3 to 6 hours
<5> yes, 6 to 12 hours
<6> yes, 12 to 24 hours
<8> DK
<9> RE

===>

>Q39<

PROXIMITY TO HEAVILY TRAFFICKED AREA

(VISUAL CHECK)

<1> LESS THAN 100 FT.
<2> 100 FT. TO 100 YARDS
<3> 100 YARDS TO 1/2 MILE
<4> GREATER THAN 1/2 MILE
<8> DK
<9> RE

===>

>Q40<

OUTDOOR GEOGRAPHY (VISUAL CHECK)

<1> NEAR THE TOP OR ON TOP OF A HILL
<2> NEAR THE BOTTOM OF A CANYON OR IN A VALLEY
<3> ON TOP OF THE RIDGE
<4> FLAT TERRAIN
<5> OTHER [goto Q40A]
<8> DK
<9> RE

===> [goto Q41]

>Q40A< [allow 50]

ENTER OTHER TYPE OF TERRAIN

****

===>

>Q41<

RELATION OF KITCHEN TO MONITORING EQUIPMENT (VISUAL CHECK)

<1> SAME ROOM
<2> ADJACENT ROOM, OPEN
<3> ADJACENT ROOM, CLOSED
<4> SAME ZONE, OPEN
<5> SAME ZONE, CLOSED
<6> DIFFERENT ZONE
<8> DK
<9> RE

===>

>DONE< [complete]

APPENDIX H
RATIONALE FOR ADJUSTING PAH CONCENTRATIONS BY SURROGATE RECOVERIES

RESEARCH TRIANGLE INSTITUTE

Analytical and Chemical Sciences

October 14, 1992

Mr. Steve Brown
California Air Resources Board
Research Division
P.O. Box 2815
Sacramento, CA 95812

Dear Steve:

This is a follow-up to our telephone conversation regarding the quantitation of PAH's in sample extracts. The basic question is whether PAH concentrations should be adjusted for recoveries of the three surrogate standards. The three surrogates shown in Table 1 were added to each sample immediately prior to extraction to evaluate method performance for each sample. Table 1 also shows the target PAH's that each surrogate is intended to represent.

Table 2 shows the surrogate recoveries that were achieved during this study and those that were achieved for the Riverside study. The major difference in the data for the two studies is the recovery for the most volatile surrogate, fluorene-d_{10}. On this study the average recovery was 60% with the range generally between 40 to 80%. Higher recoveries were reported for the Riverside study.

Essentially we feel that the lower recovery for fluorene-d_{10} is due to volatility losses during the final extract concentration step performed immediately prior to analysis. We also believe that the same losses should be occurring for the PAH's in the sample extracts.

To evaluate this effect, PAH recoveries in the field controls and NIST standard controls were calculated both with and without adjusting for surrogate recoveries. Results of these calculations are given in Table 3. Data in the table show that for the high molecular weight PAHs where surrogate recoveries are high, adjusting for recovery has very little effect on the results. However, for the more volatile PAH (i.e., acenaphthylene to anthracene) adjusting for recovery improves both accuracy (% recovery) and precision (% RSD) of the analyses for both the field controls and NIST controls.

We may have unwittingly been making this recovery adjustment during the Riverside study when we quantitated the more volatile PAHs using the external quantitation standard (EQS), acenapthene-d_{10}. Since the EQS's was added before the final extract was concentrated to 100 µl, it would have also be subjected to the same volatility losses as the surrogate

Post Office Box 12194 Research Triangle Park, North Carolina 27709-2194
Telephone 919 541-6507 Fax: 919 541-7208

standards and PAH's in the samples. Although we used the same method for adding the EQS's on both studies. We could not use acenaphthene-d_{10} as an EQS on the Placerville study, since sample extracts were "dirty" and there were substantial interferences with this compound. This problem was discussed with your prior to beginning the analyses last winter. Dichloroanthracene was used instead which is less volatile and hence would not be prone to volatility losses during the final concentration step. Under these conditions, dichloroanthracene would not mimic the behavior of the surrogate standard fluorene-d_{10}, or the volatile PAHs.

At this point we have calculated PAH's concentrations both ways, both data sets are on a computer file, and either set can be used for statistical analysis. Summary statistics for both sets are included here as attachments A and B. I would like to recommend using the data set corrected for surrogate recoveries for the following reasons

1) It improves the precision and accuracy of the data.

2) Adjusting for recoveries is an accepted treatment of the data (i.e., it is the basis for isotope dilution techniques; adjustment for recoveries of control data has been used on all TEAM studies).

3) Given the differences in the quantitation procedures between the study and the Riverside, (i.e., elimination of acenaphene-d_{10} as an EQS), it may make the data from the two studies more comparable

We cannot procedure with additional statistical analyses until a decision has been made. If you any questions or need additional information concerning this matter, please contact me at your earliest convenience.

Sincerely,

Linda Sheldon (gep)

Linda Sheldon
Project Leader

cc: Dr. E. D. Pellizzari
5038-10 File

LS/dac

TABLE 1. SURROGATE STANDARDS FOR PAH ANALYSIS

Surrogate Standard	Target PAH
Fluorene-d_{10}	Quinoline, Acenaphthylene, Phenathrene, Anthracene
Chrysene-d_{12}	Fluoranthene, Pyrene, Benzo[a]anthracene, Chrysene
Benzo[e]pyrene-d_{12}	Benzo[k]Fluoranthene, Benzo[e]pyrene, Indeno[1,2,3-cd]pyrene, Benzo[ghi]perylene, Cornene

TABLE 2. RECOVERY OF SURROGATE STANDARDS

Standard	% Recovery (% RSD)	
	Riverside	This Study
Fluorene-d_{10}	87(26)	59(17)
Chrysene-d_{12}	89(20)	90(13)
Benzo[e]pyrene-d_{12}	89(23)	97(12)

TABLE 3. PAH RECOVERIES IN FIELD CONTROLS AND NIST CONTROL SAMPLES

Compound	% Recovery (RSD %)			
	Field Control		NIST Control	
	Uncorrected	Corrected	Uncorrected	Corrected
<u>TARGETS</u>				
Quinoline	56(26)	100(18)	NA	NA
Acenaphthyline	53(23)	96(9.5)	NA	NA
Phenanthene	54(19)	98(8.0)	55(33)	99(19)
Anthracene	63(27)	113(14)	NA	NA
Fluoranthen	75(17)	84(16)	66(30)	79(15)
Pyrene	75(19)	84(17)	56(30)	67(13)
Benzo[a]anthracene	84(20)	96(18)	NA	NA
Chrysene	85(16)	97(15)	NA	NA
Benzo[f]fluoranthene	119(16)	115(15)	112(30)	126(14)
Benzo[e]pyrene	94(17)	91(15)	71(31)	79(15)
Benzo[a]pyrene	103(91)	101(21)	80(34)	89(20)
Indeno[1,2,3-cd]pyrene	124(14)	121(16)	147(33)	164(19)
Benzo[ghi]perylene	113(9)	110(14)	102(33)	113(18)
Corone	117(13)	114(16)	NA	NA
<u>SURROGATES</u>				
Fluorene-d_{10}	59(31)	100[a]	61(23)	100[a]
Chrysene-d_{12}	92(20)	100[a]	90(15)	100[a]
Benzo[e]pyrene-d_{12}	108(22)	100[a]	95(8)	100[a]

[a] 100% recovery is basis for correction.

APPENDIX I
RESULTS OF CO MEASUREMENTS REPORTED BY SOURCE CATEGORY

TABLE I-1. CARBON MONOXIDE RESULTS SOURCE CATEGORY A1 - SMOKING

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm)[a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
026	NQ	NQ	5.5	10
034	NQ	NQ	2.5	23
036	NQ	NQ	3	5
036D	NC	NQ	NC	6
043	NQ	NQ	2.5	NQ
045	2	NQ	8	50
054	NQ	NQ	5	52
061	NQ	NQ	2.5	NQ
065	NQ	NQ	3	NQ
069	NQ	NQ	5	103
075	NQ	NQ	NQ	6
076	NQ	NQ	3	5
080	NQ	NQ	8	4.5
088	NQ	NQ	NQ	NQ
092	NQ	NQ	7.5	NQ
101	NQ	NQ	NQ	NQ
102	NQ	NQ	NQ	15
102D	NQ	NC	3.5	NC
108	NQ	NQ	NQ	5.5
115	NQ	NQ	5	20
121	NQ	NQ	4	3.5
131	NQ	NQ	NQ	NQ
134	NQ	NQ	8	NQ
137	NQ	NQ	3.5	NQ
138	NQ	NQ	3	NQ
238	NQ	NQ	4	2.5
244	NQ	NQ	2.5	2
246	NQ	NQ	NQ	NQ
246D	NQ	NC	NQ	NC
254	NQ	NQ	3	3
255	NQ	NQ	4	4.5
270	NQ	NQ	NQ	NQ
272	NQ	NQ	2	28
274	NQ	NC	6	NC
289	2.5	NQ	4.5	NQ
300	4	NQ	6	NQ
308	NQ	NQ	NQ	4
327	NQ	NQ	2	2
331	NQ	NQ	2	NQ
338	NQ	NQ	3	2
346	NQ	NQ	NQ	NQ
347	NQ	NQ	NQ	NQ

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
[a]Highest one-minute concentration measured.

TABLE I-2. CARBON MONOXIDE RESULTS
SOURCE CATEGORY A2 – SMOKING / FIREPLACE

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm)[a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
002	NQ	NQ	2.5	11
042	NQ	NQ	4.5	7
048	NQ	NQ	NQ	6.5
067	NQ	NQ	2	NQ
077	NQ	NQ	NQ	NQ
077D	NQ	NC	NQ	NC
201	NQ	NQ	2.5	NQ
205	NQ	NQ	3.5	3.5
216	ND	NQ	ND	3
217	NQ	NQ	2	NQ

NQ – NOT QUANTIFIABLE, < 2 PPM CO
NC – NOT COLLECTED
ND – NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-3. CARBON MONOXIDE RESULTS
SOURCE CATEGORY B - FIREPLACE

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm) [a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
003	NQ	NQ	NQ	20
006	NQ	NQ	2	NQ
018	NQ	NQ	2	3.5
021	NQ	NQ	2	5.5
028	NQ	NQ	NQ	NQ
033	NQ	NQ	3	NQ
039	NQ	NQ	3.5	23
040	NQ	NQ	2	6
052	NQ	NQ	NQ	4
070	NQ	NQ	2	NQ
091	NQ	NQ	NQ	NQ
095	2	NQ	14	5.5
103	NQ	NQ	NQ	NQ
206	NQ	NQ	NQ	13
215	NQ	NQ	NQ	NQ
218	NQ	NQ	3	3.5
220	NQ	NQ	2.5	NQ
221	NQ	NQ	3	7.5
234	3	NQ	7	NQ
236	NQ	NQ	3.5	56
256	ND	NQ	ND	NQ
259	NQ	NQ	3	NQ
278	NQ	NQ	NQ	3.5
286	5	NQ	25	NQ
286D	NC	NQ	NC	NQ
288	NQ	NQ	4	NQ
290	NQ	NQ	NQ	NQ
293	NQ	NQ	NQ	NQ
296	NQ	NQ	NQ	NQ
299	NQ	NQ	9	NQ
304	NQ	NQ	4	NQ
306	NQ	NQ	NQ	3
319	2.5	NQ	4.5	4.5
319D	NQ	NC	NQ	NC
341	NQ	NQ	NQ	NQ

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
ND - NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-4. CARBON MONOXIDE RESULTS
SOURCE CATEGORY C – WOODSTOVE

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm) [a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
004	NQ	NQ	NQ	2.5
009	NQ	NQ	NQ	2.5
020	NQ	NQ	NQ	7.5
027	NQ	NQ	5.5	NQ
049	NQ	NQ	NQ	NQ
050	NQ	NQ	3	12.5
053	NQ	NQ	NQ	3
057	NQ	NQ	NQ	2
062	2	NQ	10	3
072	NQ	NQ	NQ	NQ
072D	NQ	NC	NQ	NC
084	NQ	NQ	2.5	NQ
096	NQ	NQ	NQ	NQ
097	NQ	NQ	3	5
098	NQ	NQ	NQ	NQ
099	NQ	NQ	NQ	5
106	NQ	NQ	NQ	NQ
111	NQ	NQ	2	NQ
112	NQ	NQ	NQ	NQ
114	NQ	NQ	2.5	6
114D	NC	NQ	NC	7.5
118	NQ	NQ	NQ	7.5
120	NQ	NQ	NQ	3.5
128	NQ	NQ	NQ	NQ
129	NQ	NQ	2	6
132	NQ	NQ	NQ	NQ
135	NQ	NQ	NQ	NQ
202	NQ	NQ	NQ	2
202D	NC	NQ	NC	2
209	NQ	NQ	NQ	2
209D	NC	NQ	NC	2.5
210	2	NQ	6	2.5
240	2	NQ	7	3.5
245	NQ	NQ	9	NQ
260	NQ	NQ	NQ	NQ
263	NQ	NQ	NQ	NQ
263D	NC	NQ	NC	NQ
264	2	NQ	6	NQ
268	NQ	NQ	4	NQ
268D	NC	NQ	NC	3
275	NQ	NQ	2	NQ
314	NQ	NQ	3	7
345	NQ	NQ	NQ	NQ

NQ – NOT QUANTIFIABLE, < 2 PPM CO
NC – NOT COLLECTED
[a]Highest one-minute concentration measured.

TABLE I-5. CARBON MONOXIDE RESULTS
SOURCE CATEGORY D - WOODSTOVE / GAS HEAT

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm) [a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
010	NQ	NQ	NQ	NQ
011	NQ	ND	NQ	ND
013	NQ.	NQ	NQ	4
023	NQ	NQ	NQ	NQ
030	NQ	NQ	NQ	4
031	NQ	NQ	NQ	70
066	NQ	NQ	2	2.5
090	NQ	NQ	NQ	3
090D	NC	NQ	NC	3
105	NQ	NQ	NQ	NQ
122	NQ	NQ	3	NQ
125	NQ	NQ	NQ	3
125D	NQ	NC	NQ	NC
133	NQ	NQ	NQ	NQ
212	4	NQ	7	NQ
224	NQ	NQ	4.5	3.5
224D	2.5	NC	7.5	NC
232	NQ	NQ	5.5	NQ
239	NQ	NQ	3.5	15
291	NQ	NQ	NQ	NQ

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
ND - NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-6. CARBON MONOXIDE RESULTS
SOURCE CATEGORY E - NO SOURCE

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm) [a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
014	NQ	NQ	2	8.5
024	NQ	NQ	2	NQ
024D	NQ	NC	NQ	NC
044	NQ	NQ	5	NQ
056	3.5	NQ	6.5	7.5
060	NQ	NQ	3	32
060D	NC	NQ	NC	26
079	NQ	NQ	NQ	NQ
081	3	NQ	42	23
087	NQ	NQ	NQ	8.5
127	NQ	NQ	NQ	9
140	NQ	NQ	NQ	26
203	NQ	NQ	2.5	9
207	NQ	NQ	2.5	24
223	NQ	NQ	3	7
228	3.5	NQ	7.5	8
250	NQ	NQ	NQ	NQ
273	NQ	NQ	2	NQ
298	NQ	NQ	NQ	4
298D	NQ	NC	NQ	NC
302	NQ	NQ	2	NQ
309	NQ	NQ	NQ	3
309D	NC	NQ	NC	2
320	NQ	NQ	2	4.5
321	ND	NQ	ND	NQ
322	2	NQ	4	14
323	NQ	NQ	NQ	2.5
340	NQ	NQ	NQ	NQ
342	NQ	NQ	NQ	NQ
342D	NQ	NC	NQ	NC
344	NQ	NQ	NQ	NQ
351	NQ	NQ	NQ	16

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
ND - NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-7. CARBON MONOXIDE RESULTS
SOURCE CATEGORY F - GAS HEAT

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm)[a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
005	NQ	NQ	NQ	NQ
007	NQ	NQ	3	9
015	NQ	NQ	5.5	3
015D	NC	NQ	NC	2
037	NQ	NQ	18.5	24
046	4	NQ	13	14.5
046D	6	NC	16	NC
058	NQ	NQ	NQ	10
073	NQ	NQ	NQ	6
083	NQ	NQ	4	2
085	NQ	NQ	NQ	6
086	NQ	NQ	NQ	NQ
094	2	NQ	22	3
110	NQ	NQ	NQ	NQ
213	NQ	NQ	12.5	2.5
226	2	NQ	5	4
229	2	NQ	3	12
231	NQ	NQ	NQ	2
235	NQ	NQ	5.5	NQ
235D	NQ	NC	5	NC
242	NQ	NQ	3.5	5
248	NQ	NQ	NQ	NQ
251	NQ	NQ	NQ	29
252	NQ	NQ	5	NQ
257	NQ	NQ	2	NQ
266	NQ	NQ	NQ	NQ
267	2.5	NQ	3.5	NQ
271	NQ	NQ	NQ	2
277	NQ	NQ	2	39
281	NQ	NQ	NQ	NQ
282	NQ	NQ	NQ	2
283	NQ	NQ	NQ	2
285	NQ	NQ	2	NQ
294	2.5	NQ	4.5	NQ
301	NQ	NQ	9	2
307	NQ	NQ	NQ	NQ
310	NQ	ND	4.5	ND
313	NQ	NQ	NQ	NQ
315	2	NQ	3	4.5

TABLE I-7. CARBON MONOXIDE RESULTS
SOURCE CATEGORY F - GAS HEAT

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm)[a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
318	4.5	NQ	5.5	4
325	NQ	NQ	NQ	10.5
325D	NQ	NC	NQ	NC
329	NQ	NQ	NQ	NQ
330	NQ	NQ	NQ	2
333	NQ	NQ	NQ	NQ
336	NQ	NQ	NQ	NQ
336D	NC	NQ	NC	NQ
339	NQ	NQ	NQ	NQ
349	NQ	NQ	NQ	5

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
ND - NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

APPENDIX J
STUDY QUESTIONNAIRE FREQUENCIES

STUDY QUESTIONNAIRE

How old is the house

Q1A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	8	3.1	8	3.1
002	10	3.9	18	7.0
003	17	6.6	35	13.6
004	13	5.1	48	18.7
005	9	3.5	57	22.2
006	19	7.4	76	29.6
007	5	1.9	81	31.5
008	9	3.5	90	35.0
009	9	3.5	99	38.5
010	13	5.1	112	43.6
011	4	1.6	116	45.1
012	15	5.8	131	51.0
013	6	2.3	137	53.3
014	6	2.3	143	55.6
015	4	1.6	147	57.2
016	8	3.1	155	60.3
017	8	3.1	163	63.4
018	1	0.4	164	63.8
019	3	1.2	167	65.0
020	9	3.5	176	68.5
021	2	0.8	178	69.3
022	1	0.4	179	69.6
023	1	0.4	180	70.0
024	1	0.4	181	70.4
025	7	2.7	188	73.2
026	1	0.4	189	73.5
027	2	0.8	191	74.3
028	2	0.8	193	75.1
029	4	1.6	197	76.7
030	9	3.5	206	80.2
031	4	1.6	210	81.7
032	4	1.6	214	83.3
034	1	0.4	215	83.7
035	2	0.8	217	84.4
036	2	0.8	219	85.2
038	1	0.4	220	85.6
039	2	0.8	222	86.4
040	8	3.1	230	89.5
042	3	1.2	233	90.7
045	5	1.9	238	92.6
047	1	0.4	239	93.0
049	1	0.4	240	93.4
050	5	1.9	245	95.3
054	1	0.4	246	95.7
059	1	0.4	247	96.1
070	2	0.8	249	96.9
071	1	0.4	250	97.3
080	1	0.4	251	97.7
090	1	0.4	252	98.1

STUDY QUESTIONNAIRE

How old is the house

Q1A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
104	1	0.4	253	98.4
152	1	0.4	254	98.8
998	3	1.2	257	100.0

Frequency Missing = 23

Do entryways lead outdoors

Q2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	18	78.3	18	78.3
2	5	21.7	23	100.0

Frequency Missing = 257

Attached garage

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	182	65.0	182	65.0
2	3	1.1	185	66.1
3	95	33.9	280	100.0

Door from garage to home

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	169	91.4	169	91.4
2	16	8.6	185	100.0

Frequency Missing = 95

STUDY QUESTIONNAIRE

Any vehicles run in garage

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	125	67.6	125	67.6
2	60	32.4	185	100.0

Frequency Missing = 95

For how long (minutes)

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	48	38.4	48	38.4
002	26	20.8	74	59.2
003	13	10.4	87	69.6
004	18	14.4	105	84.0
005	9	7.2	114	91.2
006	6	4.8	120	96.0
007	1	0.8	121	96.8
010	1	0.8	122	97.6
011	1	0.8	123	98.4
012	1	0.8	124	99.2
024	1	0.8	125	100.0

Frequency Missing = 155

Any vehicles diesel powered

Q7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	5.6	7	5.6
2	118	94.4	125	100.0

Frequency Missing = 155

STUDY QUESTIONNAIRE

Did use gas powered heat

Q8A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	126	45.0	126	45.0
2	154	55.0	280	100.0

Did use electric heat

Q8B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	76	27.1	76	27.1
2	204	72.9	280	100.0

Did use central oil heat

Q8C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	5	1.8	5	1.8
2	275	98.2	280	100.0

Did use wood burning fireplace

Q8D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	57	20.4	57	20.4
2	223	79.6	280	100.0

Did use gas burning fireplace

Q8E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	280	100.0	280	100.0

STUDY QUESTIONNAIRE

Did use wood burning stove

Q8F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	96	34.3	96	34.3
2	184	65.7	280	100.0

Did use portable kerosene heater

Q8G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	2.5	7	2.5
2	273	97.5	280	100.0

Did use gas space heater

Q8H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	0.7	2	0.7
2	278	99.3	280	100.0

Did use electric space heater

Q8I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	51	18.2	51	18.2
2	229	81.8	280	100.0

Did use other heating system

Q8J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	1.1	3	1.1
2	277	98.9	280	100.0

Other specify

Q8JA	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No heat used - h	1	33.3	1	33.3
None used - has	1	33.3	2	66.7
electric wall he	1	33.3	3	100.0

Frequency Missing = 277

Primary source of heat

Q9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
01	103	36.8	103	36.8
02	56	20.0	159	56.8
03	5	1.8	164	58.6
04	22	7.9	186	66.4
06	72	25.7	258	92.1
07	4	1.4	262	93.6
08	2	0.7	264	94.3
09	3	1.1	267	95.4
10	13	4.6	280	100.0

STUDY QUESTIONNAIRE

Central gas heat

Q10A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	104	82.5	104	82.5
2	12	9.5	116	92.1
3	10	7.9	126	100.0

Frequency Missing = 154

STUDY QUESTIONNAIRE

How old is the heating system

Q10B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	16	12.7	16	12.7
002	10	7.9	26	20.6
003	10	7.9	36	28.6
004	8	6.3	44	34.9
005	10	7.9	54	42.9
006	3	2.4	57	45.2
007	5	4.0	62	49.2
008	4	3.2	66	52.4
009	3	2.4	69	54.8
010	2	1.6	71	56.3
011	1	0.8	72	57.1
012	4	3.2	76	60.3
013	3	2.4	79	62.7
014	2	1.6	81	64.3
015	4	3.2	85	67.5
016	5	4.0	90	71.4
017	5	4.0	95	75.4
018	1	0.8	96	76.2
019	4	3.2	100	79.4
020	3	2.4	103	81.7
021	1	0.8	104	82.5
022	1	0.8	105	83.3
024	1	0.8	106	84.1
025	3	2.4	109	86.5
026	1	0.8	110	87.3
029	1	0.8	111	88.1
030	3	2.4	114	90.5
031	1	0.8	115	91.3
032	2	1.6	117	92.9
035	3	2.4	120	95.2
039	1	0.8	121	96.0
040	1	0.8	122	96.8
998	4	3.2	126	100.0

Frequency Missing = 154

STUDY QUESTIONNAIRE

How old is the heating system

Q10B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	16	12.7	16	12.7
002	10	7.9	26	20.6
003	10	7.9	36	28.6
004	8	6.3	44	34.9
005	10	7.9	54	42.9
006	3	2.4	57	45.2
007	5	4.0	62	49.2
008	4	3.2	66	52.4
009	3	2.4	69	54.8
010	2	1.6	71	56.3
011	1	0.8	72	57.1
012	4	3.2	76	60.3
013	3	2.4	79	62.7
014	2	1.6	81	64.3
015	4	3.2	85	67.5
016	5	4.0	90	71.4
017	5	4.0	95	75.4
018	1	0.8	96	76.2
019	4	3.2	100	79.4
020	3	2.4	103	81.7
021	1	0.8	104	82.5
022	1	0.8	105	83.3
024	1	0.8	106	84.1
025	3	2.4	109	86.5
026	1	0.8	110	87.3
029	1	0.8	111	88.1
030	3	2.4	114	90.5
031	1	0.8	115	91.3
032	2	1.6	117	92.9
035	3	2.4	120	95.2
039	1	0.8	121	96.0
040	1	0.8	122	96.8
998	4	3.2	126	100.0

Frequency Missing = 154

STUDY QUESTIONNAIRE

Where is heating system located

Q10C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	20	15.9	20	15.9
2	83	65.9	103	81.7
3	23	18.3	126	100.0

Frequency Missing = 154

Is it vented to the outside

Q10D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	94	91.3	94	91.3
2	4	3.9	98	95.1
8	5	4.9	103	100.0

Frequency Missing = 177

Does heating system have pilot light

Q10E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	50	48.5	50	48.5
2	50	48.5	100	97.1
8	3	2.9	103	100.0

Frequency Missing = 177

What type of gas was used

Q10F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	67	65.0	67	65.0
2	36	35.0	103	100.0

Frequency Missing = 177

How many wood burning fireplaces used

Q11A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	57	100.0	57	100.0

Frequency Missing = 223

How long use fireplace in past 24 hours

Q11B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
01	5	8.8	5	8.8
02	3	5.3	8	14.0
03	8	14.0	16	28.1
04	11	19.3	27	47.4
05	5	8.8	32	56.1
06	6	10.5	38	66.7
07	6	10.5	44	77.2
08	4	7.0	48	84.2
10	1	1.8	49	86.0
11	2	3.5	51	89.5
12	1	1.8	52	91.2
16	1	1.8	53	93.0
18	1	1.8	54	94.7
24	3	5.3	57	100.0

Frequency Missing = 223

Did you burn wood logs

Q11C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	52	91.2	52	91.2
2	5	8.8	57	100.0

Frequency Missing = 223

>Q9<

What was the primary source of heat in your home (used most often) during the monitoring period?

<1> central gas heat
<2> central electric heat
<3> central oil heat
<4> wood burning fireplace
<5> gas burning fireplace
<6> woodburning stove
<7> kerosene heater
<8> gas space heater
<9> electric space heater
<10> some other source

<98> DK
<99> RE

===>

>Q10<

[if Q8A ne <1> goto Q11]

>Q10A<

CENTRAL GAS HEAT

What type of gas heating system was used?

<1> central warm air furnace with ducts to room
<2> floor, wall or pipeless furnace
<3> wall furnace
<4> steam or hot water

<8> DK
<9> RE

===>

>Q10B<

How old is the heating system?

<1-100> YEARS

<998> DK
<999> RE

===>

>Q10C<

Where is the heating system located?

<1> basement or garage
<2> other inside
<3> other outside, including roof [goto Q11]
<8> DK
<9> RE

>Q10D<

Is it vented to the outside?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q10E<

Does the heating system have a gas or electric pilot light?

<1> YES, GAS
<2> YES, ELECTRONIC IGNITION
<3> NO
<8> DK
<9> RE

===>

>Q10F<

What type of gas was used?

<1> Natural gas
<2> Propane
<8> DK
<9> RE

===>

>Q11<
[if Q8D ne <1> goto Q12]

>Q11A<

WOODBURNING FIREPLACE

How many woodburning fireplaces were used?

<1-5> FIREPLACES

<8> DK
<9> RE

===>

>Q11B<

IF MORE THAT ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you burn wood in your fireplace during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

>Q11C<

What did you burn in the fireplace?

ANSWER YES FOR ALL THAT APPLY

Wood logs?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11D<

Wood pellets?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11E<

Newspaper or trash?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11F<

Any other type of fuel?

<1> YES [goto Q11G]
<2> NO
<8> DK
<9> RE

===> [goto Q11H]

>Q11G< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q11H<

Was the fireplace used to heat the room where monitoring took place?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11I<

What type of fireplace screen was used?

<1> glass door
<2> wire mesh
<3> none
<8> DK
<9> RE

===>

>Q11J<

Did you remove ashes from your fireplace during the last 24 hours?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11K<

Has your chimney been cleaned this winter?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q11L<

Is this fireplace designed to heat more efficiently than a traditional fireplace?

PROMPT FOR SLIDING VENTS OR INSERTS

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12<

[if Q8E ne <1> goto Q13]

>Q12A<

GAS BURNING FIREPLACE

How many gas burning fireplaces were used?

<1-5> FIREPLACES

<8> DK
<9> RE

===>

>Q12B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you use your gas fireplace during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q12C<

What type of fuel was used?

ANSWER YES FOR ALL THAT APPLY

Natural gas?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12D<

Liquid propane?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12E<

Any other type of gas?

<1> YES [goto Q12F]
<2> NO
<8> DK
<9> RE

===> [goto Q12G]

>Q12F< [allow 50] [no erase]

What other type of gas?

****

===>

>Q12G<

Was the gas fireplace used to heat the monitoring area?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q12H<

What type of fireplace screen was used?

<1> glass door
<2> wire mesh
<3> none
<4> other
<8> DK
<9> RE

===>

>Q13<

[if Q8F ne <1> goto Q14]

>Q13A<

WOODSTOVES

How many woodstoves were used?

<1-5> WOODSTOVES

<8> DK
<9> RE

===>

>Q13B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you burn fuel in your woodstove during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q13C<

What did you burn in the woodstove?

ANSWER YES FOR ALL THAT APPLY

Wood logs?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13D<

Wood pellets?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13E<

Newspaper or trash?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13F<

Any other type of fuel?

<1> YES [goto Q13G]
<2> NO
<8> DK
<9> RE

===> [goto Q13H]

>Q13G< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q13H<

Was the stove used to heat the monitoring area?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13I<

What percent of the time was the woodstove door at least part way open during operation?

<1> less than 25%
<2> 25 - 50%
<3> 50 - 75%
<4> 100%
<8> DK
<9> RE

===>

>Q13J<

How often did you refuel or stoke your woodstove?

<1> once
<2> twice
<3> three times
<4> 4 or more times
<8> DK
<9> RE

===>

>Q13K<

Did you remove ashes from your woodstove during the last 24 hours?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13L<

Has your chimney been cleaned this winter?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q13M<

Are there cracks or leaks in your stove pipe?

(VISUAL CHECK IF NECESSARY)

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q14<

[if Q8G ne <1> goto Q15]

>Q14A<

KEROSENE HEATER

How many kerosene heaters were used in your home or attached garage?

<1-5>

<8> DK
<9> RE

===>

>Q14B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How long did you use your kerosene heater during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q14C<

Was the kerosene heater used to heat the room where monitoring took place?

<1> YES
<2> NO, ELSEWHERE IN HOUSE
<3> NO, IN ATTACHED GARAGE
<8> DK
<9> RE

===>

>Q14D<

Was the heater vented to the outdoors during the monitoring period?

<1> YES, INSTALLED
<2> YES, WINDOW OR DOOR OPEN TO OUTDOORS
<3> NO
<8> DK
<9> RE

===>

>Q15<

[if Q8H ne <1> goto Q16]

>Q15A<

PORTABLE GAS SPACE HEATER
How many gas space heaters were used?

<1-5>

<8> DK
<9> RE

===>

>Q15B<

IF MORE THAN ONE WAS USED, DESCRIBE THE ONE IN OR NEAREST THE MONITORING ROOM

How many hours did you use your gas space heater during the last 24 hours?

<1-24> HOURS

<98> DK
<99> RE

===>

>Q15C<

Was the gas space heater used to heat the room where monitoring took place?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q15D<

Was the heater vented to the outdoors during the monitoring period?

<1> YES, WINDOW OR DOOR OPEN
<2> NO
<8> DK
<9> RE

===>

>Q16<

Has a clothes dryer been used in your home, including in an attached garage or an attached shed, in the past 24 hours?

<1> YES [goto Q17]
<2> NO
<8> DK
<9> RE

===> [goto Q19A]

>Q17<

Is the clothes dryer

<1> natural gas
<2> propane
<3> electric [goto Q19A]
<8> DK
<9> RE

===>

>Q18<

Where is the dryer located?

<1> basement
<2> attached garage or shed
<3> other inside home
<8> DK
<9> RE

===>

>Q19<

Where is the dryer vented?

<1> to the outdoors
<2> same room
<3> other
<8> DK
<9> RE

===>

>Q19A<

Do you have a gas water heater?

<1> YES [goto Q19B]
<2> NO
<8> DK
<9> RE

===> [goto Q20]

>Q19B<

Where is it located?

<1> Basement or garage
<2> other inside
<3> outside [goto Q20]
<8> DK
<9> RE

===>

>Q19C<

Does it have a gas or electric pilot light?

<1> YES, GAS
<2> YES, ELECTRONIC IGNITION
<3> NO
<8> DK
<9> RE

===>

>Q19D<

What type of gas is used?

<1> Natural gas
<2> propane
<8> DK
<9> RE

===>

>Q20<

Do you have a gas oven in your home?

<1> YES [goto Q21]
<2> NO
<8> DK
<9> RE

===> [goto Q22]

>Q21<

What fuel does your oven use?

<1> natural gas
<2> liquid propane
<3> other type of fuel [goto Q21A]
<8> DK
<9> RE

===> [goto Q21B]

>Q21A< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q21B<

How old is your oven?

<1> less than 3 years
<2> 3 to 10 years
<3> older than 10 years
<8> DK
<9> RE

===>

>Q21C<

What type of pilot light(s) does your oven have?

<1> electronic ignition
<2> nonstanding, light by hand
<3> constantly burning
<8> DK
<9> RE

===>

>Q21D<

How long was your oven on during the last 24 hours?

<0-240> MINUTES

<998> DK
<999> RE

===>

>Q22<

Do you have a gas stove in your home?

<1> YES [goto Q22A]
<2> NO
<8> DK
<9> RE

===> [goto Q27]

>Q22A<

What fuel does your stove use?

<1> natural gas
<2> liquid propane
<3> other type of fuel [goto Q22B]
<8> DK
<9> RE

===> [goto Q22C]

>Q22B< [allow 50] [no erase]
What other type of fuel?

****

===>

>Q22C<

How old is your stove?

<1> less than 3 years
<2> 3 to 10 years
<3> older than 10 years
<8> DK
<9> RE

===>

>Q22D<

What type of pilot light(s) does your stove have?

<1> electronic ignition [goto Q22F]
<2> nonstanding, light by hand [goto Q22F]
<3> constantly burning
<8> DK
<9> RE

===> [goto Q22E]

>Q22E<

How many pilot lights does your stove have?

<1-4>

<8> DK
<9> RE

===>

>Q22F<

How long were any of the burners on during the last 24 hours?

<0-240> MINUTES (TOTAL BURNER TIME)

<998> DK
<999> RE

===>

>Q27<
[if Q22F gt <0> goto Q28]
[if Q21D gt <0> goto Q28]

[goto Q28A]

>Q28<

Did you use an exhaust fan to vent air outdoors during cooking?

<1> never
<2> sometimes
<3> always
<8> DK
<9> RE

===>

>Q28A<

Was indoor grilling performed in your home over the past 24 hours?

<1> Yes, electric grill [goto Q28C]
<2> Yes, gas grill [goto Q28C]
<3> Yes, some other type [goto Q28B]
<4> No
<8> DK
<9> RE

===> [goto Q28F]

>Q28B< [allow 50] [no erase]

What other type of fuel?

****

===>

>Q28C<

How long was the grill on during the last 24 hours?

<1-240> MINUTES

<998> DK
<999> RE

===>

>Q28D<

How long was the food actually grilled?

<1-240> MINUTES

<998> DK
<999> RE

===>

>Q28E<

Was an exhaust fan to the outdoors used?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q28F<

Was frying performed in your home
over the past 24 hours?

<1> YES [goto Q28G]
<2> NO
<8> DK
<9> RE

===> [goto Q29]

>Q28G<

How long was the food actually fried uncovered?

<1-240> MINUTES

<998> DK
<999> RE

===>

>Q28H<

Was an exhaust fan to the outdoors used?

<1> YES
<2> NO
<8> DK
<9> RE

===>

>Q29<

Including visitors and other family members, were any tobacco products smoked in your home during the past 24 hours?

<1> YES [goto Q30]
<2> NO
<8> DK
<9> RE

===> [goto Q35A]

>Q30<

How many cigarettes?

<0-100>

<998> DK
<999> RE

===>

>Q31<

Cigars?

<0-40>

<98> DK
<99> RE

===>

>Q32<

Pipefuls of Tobacco?

<0-40> MINUTES

<98> DK
<99> RE

===>

>Q35A<

Other than cigarettes, was there any smoke in your home over the past 24 hours? (Such as from candles, wood burning, welding, or incense.)

<1> YES [goto Q35B]
<2> NO
<8> DK
<9> RE

===> [goto Q36]

>Q35B<

Was the smoke light, moderate, or heavy?

<1> LIGHT
<2> MODERATE
<3> HEAVY
<8> DK
<9> RE

===>

>Q35C<

How long did the smoke last?

<1> less than 5 mintues
<2> 5 to 15 minutes
<3> 15 to 30 minutes
<4> longer than 30 minutes
<8> DK
<9> RE

===>

>Q35D<

[no erase] [allow 50]

What was the source of smoke?

****

===>

>Q36<

Did any smoke enter your home from the outdoors during the past 24 hours?

<1> YES [goto Q36A]
<2> NO
<8> DK
<9> RE

===> [goto Q38]

Q36A Was the smoke light, moderate, or heavy?

<1> LIGHT
<2> MODERATE
<3> HEAVY
<8> DK
<9> RE

===>

>Q36B<

How long did the smoke last?

<1> less than 5 mintues
<2> 5 to 15 minutes
<3> 15 to 30 minutes
<4> longer than 30 minutes
<8> DK
<9> RE

===>

>Q37<

[allow 50] [no erase]

What was the source of the smoke?

****

===>

>Q38<

Did you leave any windows or doors open during the monitoring period? If so, for about how long?

<1> No
<2> Yes, less than 30 minutes
<3> Yes, 30 minutes to 3 hours
<4> yes, 3 to 6 hours
<5> yes, 6 to 12 hours
<6> yes, 12 to 24 hours
<8> DK
<9> RE

===>

>Q39<

PROXIMITY TO HEAVILY TRAFFICKED AREA

(VISUAL CHECK)

<1> LESS THAN 100 FT.
<2> 100 FT. TO 100 YARDS
<3> 100 YARDS TO 1/2 MILE
<4> GREATER THAN 1/2 MILE
<8> DK
<9> RE

===>

>Q40<

OUTDOOR GEOGRAPHY (VISUAL CHECK)

<1> NEAR THE TOP OR ON TOP OF A HILL
<2> NEAR THE BOTTOM OF A CANYON OR IN A VALLEY
<3> ON TOP OF THE RIDGE
<4> FLAT TERRAIN
<5> OTHER [goto Q40A]
<8> DK
<9> RE

===> [goto Q41]

>Q40A< [allow 50]

ENTER OTHER TYPE OF TERRAIN

****

===>

>Q41<

RELATION OF KITCHEN TO MONITORING EQUIPMENT (VISUAL CHECK)

<1> SAME ROOM
<2> ADJACENT ROOM, OPEN
<3> ADJACENT ROOM, CLOSED
<4> SAME ZONE, OPEN
<5> SAME ZONE, CLOSED
<6> DIFFERENT ZONE
<8> DK
<9> RE

===>

>DONE< [complete]

APPENDIX H
RATIONALE FOR ADJUSTING PAH CONCENTRATIONS BY SURROGATE RECOVERIES

RESEARCH TRIANGLE INSTITUTE

Analytical and Chemical Sciences

October 14, 1992

Mr. Steve Brown
California Air Resources Board
Research Division
P.O. Box 2815
Sacramento, CA 95812

Dear Steve:

This is a follow-up to our telephone conversation regarding the quantitation of PAH's in sample extracts. The basic question is whether PAH concentrations should be adjusted for recoveries of the three surrogate standards. The three surrogates shown in Table 1 were added to each sample immediately prior to extraction to evaluate method performance for each sample. Table 1 also shows the target PAH's that each surrogate is intended to represent.

Table 2 shows the surrogate recoveries that were achieved during this study and those that were achieved for the Riverside study. The major difference in the data for the two studies is the recovery for the most volatile surrogate, fluorene-d_{10}. On this study the average recovery was 60% with the range generally between 40 to 80%. Higher recoveries were reported for the Riverside study.

Essentially we feel that the lower recovery for fluorene-d_{10} is due to volatility losses during the final extract concentration step performed immediately prior to analysis. We also believe that the same losses should be occurring for the PAH's in the sample extracts.

To evaluate this effect, PAH recoveries in the field controls and NIST standard controls were calculated both with and without adjusting for surrogate recoveries. Results of these calculations are given in Table 3. Data in the table show that for the high molecular weight PAHs where surrogate recoveries are high, adjusting for recovery has very little effect on the results. However, for the more volatile PAH (i.e., acenaphthylene to anthracene) adjusting for recovery improves both accuracy (% recovery) and precision (% RSD) of the analyses for both the field controls and NIST controls.

We may have unwittingly been making this recovery adjustment during the Riverside study when we quantitated the more volatile PAHs using the external quantitation standard (EQS), acenapthene-d_{10}. Since the EQS's was added before the final extract was concentrated to 100 µl, it would have also be subjected to the same volatility losses as the surrogate

Post Office Box 12194 Research Triangle Park, North Carolina 27709-2194
Telephone 919 541-6507 Fax: 919 541-7208

standards and PAH's in the samples. Although we used the same method for adding the EQS's on both studies. We could not use acenaphthene-d_{10} as an EQS on the Placerville study, since sample extracts were "dirty" and there were substantial interferences with this compound. This problem was discussed with your prior to beginning the analyses last winter. Dichloroanthracene was used instead which is less volatile and hence would not be prone to volatility losses during the final concentration step. Under these conditions, dichloroanthracene would not mimic the behavior of the surrogate standard fluorene-d_{10}, or the volatile PAHs.

At this point we have calculated PAH's concentrations both ways, both data sets are on a computer file, and either set can be used for statistical analysis. Summary statistics for both sets are included here as attachments A and B. I would like to recommend using the data set corrected for surrogate recoveries for the following reasons

1) It improves the precision and accuracy of the data.

2) Adjusting for recoveries is an accepted treatment of the data (i.e., it is the basis for isotope dilution techniques; adjustment for recoveries of control data has been used on all TEAM studies).

3) Given the differences in the quantitation procedures between the study and the Riverside, (i.e., elimination of acenaphene-d_{10} as an EQS), it may make the data from the two studies more comparable

We cannot procedure with additional statistical analyses until a decision has been made. If you any questions or need additional information concerning this matter, please contact me at your earliest convenience.

Sincerely,

Linda Sheldon (gcj)

Linda Sheldon
Project Leader

cc: Dr. E. D. Pellizzari
5038-10 File

LS/dac

TABLE 1. SURROGATE STANDARDS FOR PAH ANALYSIS

Surrogate Standard	Target PAH
Fluorene-d_{10}	Quinoline, Acenaphthylene, Phenathrene, Anthracene
Chrysene-d_{12}	Fluoranthene, Pyrene, Benzo[a]anthracene, Chrysene
Benzo[e]pyrene-d_{12}	Benzo[k]Fluoranthene, Benzo[e]pyrene, Indeno[1,2,3-cd]pyrene, Benzo[ghi]perylene, Cornene

TABLE 2. RECOVERY OF SURROGATE STANDARDS

Standard	% Recovery (% RSD)	
	Riverside	This Study
Fluorene-d_{10}	87(26)	59(17)
Chrysene-d_{12}	89(20)	90(13)
Benzo[e]pyrene-d_{12}	89(23)	97(12)

TABLE 3. PAH RECOVERIES IN FIELD CONTROLS AND NIST CONTROL SAMPLES

Compound	% Recovery (RSD %)			
	Field Control		NIST Control	
	Uncorrected	Corrected	Uncorrected	Corrected
TARGETS				
Quinoline	56(26)	100(18)	NA	NA
Acenaphthyline	53(23)	96(9.5)	NA	NA
Phenanthene	54(19)	98(8.0)	55(33)	99(19)
Anthracene	63(27)	113(14)	NA	NA
Fluoranthen	75(17)	84(16)	66(30)	79(15)
Pyrene	75(19)	84(17)	56(30)	67(13)
Benzo[a]anthracene	84(20)	96(18)	NA	NA
Chrysene	85(16)	97(15)	NA	NA
Benzo[f]fluoranthene	119(16)	115(15)	112(30)	126(14)
Benzo[e]pyrene	94(17)	91(15)	71(31)	79(15)
Benzo[a]pyrene	103(91)	101(21)	80(34)	89(20)
Indeno[1,2,3-cd]pyrene	124(14)	121(16)	147(33)	164(19)
Benzo[ghi]perylene	113(9)	110(14)	102(33)	113(18)
Corone	117(13)	114(16)	NA	NA
SURROGATES				
Fluorene-d_{10}	59(31)	100[a]	61(23)	100[a]
Chrysene-d_{12}	92(20)	100[a]	90(15)	100[a]
Benzo[e]pyrene-d_{12}	108(22)	100[a]	95(8)	100[a]

[a] 100% recovery is basis for correction.

APPENDIX I
RESULTS OF CO MEASUREMENTS REPORTED BY SOURCE CATEGORY

TABLE I-1. CARBON MONOXIDE RESULTS
SOURCE CATEGORY A1 – SMOKING

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm)[a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
026	NQ	NQ	5.5	10
034	NQ	NQ	2.5	23
036	NQ	NQ	3	5
036D	NC	NQ	NC	6
043	NQ	NQ	2.5	NQ
045	2	NQ	8	50
054	NQ	NQ	5	52
061	NQ	NQ	2.5	NQ
065	NQ	NQ	3	NQ
069	NQ	NQ	5	103
075	NQ	NQ	NQ	6
076	NQ	NQ	3	5
080	NQ	NQ	8	4.5
088	NQ	NQ	NQ	NQ
092	NQ	NQ	7.5	NQ
101	NQ	NQ	NQ	NQ
102	NQ	NQ	NQ	15
102D	NQ	NC	3.5	NC
108	NQ	NQ	NQ	5.5
115	NQ	NQ	5	20
121	NQ	NQ	4	3.5
131	NQ	NQ	NQ	NQ
134	NQ	NQ	8	NQ
137	NQ	NQ	3.5	NQ
138	NQ	NQ	3	NQ
238	NQ	NQ	4	2.5
244	NQ	NQ	2.5	2
246	NQ	NQ	NQ	NQ
246D	NQ	NC	NQ	NC
254	NQ	NQ	3	3
255	NQ	NQ	4	4.5
270	NQ	NQ	NQ	NQ
272	NQ	NQ	2	28
274	NQ	NC	6	NC
289	2.5	NQ	4.5	NQ
300	4	NQ	6	NQ
308	NQ	NQ	NQ	4
327	NQ	NQ	2	2
331	NQ	NQ	2	NQ
338	NQ	NQ	3	2
346	NQ	NQ	NQ	NQ
347	NQ	NQ	NQ	NQ

NQ – NOT QUANTIFIABLE, < 2 PPM CO
NC – NOT COLLECTED
[a]Highest one-minute concentration measured.

TABLE I-2. CARBON MONOXIDE RESULTS
SOURCE CATEGORY A2 – SMOKING / FIREPLACE

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm)[a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
002	NQ	NQ	2.5	11
042	NQ	NQ	4.5	7
048	NQ	NQ	NQ	6.5
067	NQ	NQ	2	NQ
077	NQ	NQ	NQ	NQ
077D	NQ	NC	NQ	NC
201	NQ	NQ	2.5	NQ
205	NQ	NQ	3.5	3.5
216	ND	NQ	ND	3
217	NQ	NQ	2	NQ

NQ – NOT QUANTIFIABLE, < 2 PPM CO
NC – NOT COLLECTED
ND – NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-3. CARBON MONOXIDE RESULTS
SOURCE CATEGORY B – FIREPLACE

HOUSE ID#	AVERAGE CONC. (ppm) INDOOR	AVERAGE CONC. (ppm) OUTDOOR	PEAK CONC. (ppm) [a] INDOOR	PEAK CONC. (ppm) [a] OUTDOOR
003	NQ	NQ	NQ	20
006	NQ	NQ	2	NQ
018	NQ	NQ	2	3.5
021	NQ	NQ	2	5.5
028	NQ	NQ	NQ	NQ
033	NQ	NQ	3	NQ
039	NQ	NQ	3.5	23
040	NQ	NQ	2	6
052	NQ	NQ	NQ	4
070	NQ	NQ	2	NQ
091	NQ	NQ	NQ	NQ
095	2	NQ	14	5.5
103	NQ	NQ	NQ	NQ
206	NQ	NQ	NQ	13
215	NQ	NQ	NQ	NQ
218	NQ	NQ	3	3.5
220	NQ	NQ	2.5	NQ
221	NQ	NQ	3	7.5
234	3	NQ	7	NQ
236	NQ	NQ	3.5	56
256	ND	NQ	ND	NQ
259	NQ	NQ	3	NQ
278	NQ	NQ	NQ	3.5
286	5	NQ	25	NQ
286D	NC	NQ	NC	NQ
288	NQ	NQ	4	NQ
290	NQ	NQ	NQ	NQ
293	NQ	NQ	NQ	NQ
296	NQ	NQ	NQ	NQ
299	NQ	NQ	9	NQ
304	NQ	NQ	4	NQ
306	NQ	NQ	NQ	3
319	2.5	NQ	4.5	4.5
319D	NQ	NC	NQ	NC
341	NQ	NQ	NQ	NQ

NQ – NOT QUANTIFIABLE, < 2 PPM CO
NC – NOT COLLECTED
ND – NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-4. CARBON MONOXIDE RESULTS
SOURCE CATEGORY C - WOODSTOVE

HOUSE ID#	AVERAGE CONC. (ppm) INDOOR	AVERAGE CONC. (ppm) OUTDOOR	PEAK CONC. (ppm)[a] INDOOR	PEAK CONC. (ppm)[a] OUTDOOR
004	NQ	NQ	NQ	2.5
009	NQ	NQ	NQ	2.5
020	NQ	NQ	NQ	7.5
027	NQ	NQ	5.5	NQ
049	NQ	NQ	NQ	NQ
050	NQ	NQ	3	12.5
053	NQ	NQ	NQ	3
057	NQ	NQ	NQ	2
062	2	NQ	10	3
072	NQ	NQ	NQ	NQ
072D	NQ	NC	NQ	NC
084	NQ	NQ	2.5	NQ
096	NQ	NQ	NQ	NQ
097	NQ	NQ	3	5
098	NQ	NQ	NQ	NQ
099	NQ	NQ	NQ	5
106	NQ	NQ	NQ	NQ
111	NQ	NQ	2	NQ
112	NQ	NQ	NQ	NQ
114	NQ	NQ	2.5	6
114D	NC	NQ	NC	7.5
118	NQ	NQ	NQ	7.5
120	NQ	NQ	NQ	3.5
128	NQ	NQ	NQ	NQ
129	NQ	NQ	2	6
132	NQ	NQ	NQ	NQ
135	NQ	NQ	NQ	NQ
202	NQ	NQ	NQ	2
202D	NC	NQ	NC	2
209	NQ	NQ	NQ	2
209D	NC	NQ	NC	2.5
210	2	NQ	6	2.5
240	2	NQ	7	3.5
245	NQ	NQ	9	NQ
260	NQ	NQ	NQ	NQ
263	NQ	NQ	NQ	NQ
263D	NC	NQ	NC	NQ
264	2	NQ	6	NQ
268	NQ	NQ	4	NQ
268D	NC	NQ	NC	3
275	NQ	NQ	2	NQ
314	NQ	NQ	3	7
345	NQ	NQ	NQ	NQ

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
[a]Highest one-minute concentration measured.

TABLE I-5. CARBON MONOXIDE RESULTS
SOURCE CATEGORY D - WOODSTOVE / GAS HEAT

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm) [a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
010	NQ	NQ	NQ	NQ
011	NQ	ND	NQ	ND
013	NQ	NQ	NQ	4
023	NQ	NQ	NQ	NQ
030	NQ	NQ	NQ	4
031	NQ	NQ	NQ	70
066	NQ	NQ	2	2.5
090	NQ	NQ	NQ	3
090D	NC	NQ	NC	3
105	NQ	NQ	NQ	NQ
122	NQ	NQ	3	NQ
125	NQ	NQ	NQ	3
125D	NQ	NC	NQ	NC
133	NQ	NQ	NQ	NQ
212	4	NQ	7	NQ
224	NQ	NQ	4.5	3.5
224D	2.5	NC	7.5	NC
232	NQ	NQ	5.5	NQ
239	NQ	NQ	3.5	15
291	NQ	NQ	NQ	NQ

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
ND - NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-6. CARBON MONOXIDE RESULTS
SOURCE CATEGORY E – NO SOURCE

	AVERAGE CONC. (ppm)		PEAK CONC. (ppm) [a]	
HOUSE ID#	INDOOR	OUTDOOR	INDOOR	OUTDOOR
014	NQ	NQ	2	8.5
024	NQ	NQ	2	NQ
024D	NQ	NC	NQ	NC
044	NQ	NQ	5	NQ
056	3.5	NQ	6.5	7.5
060	NQ	NQ	3	32
060D	NC	NQ	NC	26
079	NQ	NQ	NQ	NQ
081	3	NQ	42	23
087	NQ	NQ	NQ	8.5
127	NQ	NQ	NQ	9
140	NQ	NQ	NQ	26
203	NQ	NQ	2.5	9
207	NQ	NQ	2.5	24
223	NQ	NQ	3	7
228	3.5	NQ	7.5	8
250	NQ	NQ	NQ	NQ
273	NQ	NQ	2	NQ
298	NQ	NQ	NQ	4
298D	NQ	NC	NQ	NC
302	NQ	NQ	2	NQ
309	NQ	NQ	NQ	3
309D	NC	NQ	NC	2
320	NQ	NQ	2	4.5
321	ND	NQ	ND	NQ
322	2	NQ	4	14
323	NQ	NQ	NQ	2.5
340	NQ	NQ	NQ	NQ
342	NQ	NQ	NQ	NQ
342D	NQ	NC	NQ	NC
344	NQ	NQ	NQ	NQ
351	NQ	NQ	NQ	16

NQ – NOT QUANTIFIABLE, < 2 PPM CO
NC – NOT COLLECTED
ND – NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

TABLE I-7. CARBON MONOXIDE RESULTS
SOURCE CATEGORY F – GAS HEAT

HOUSE ID#	AVERAGE CONC. (ppm)		PEAK CONC. (ppm)[a]	
	INDOOR	OUTDOOR	INDOOR	OUTDOOR
005	NQ	NQ	NQ	NQ
007	NQ	NQ	3	9
015	NQ	NQ	5.5	3
015D	NC	NQ	NC	2
037	NQ	NQ	18.5	24
046	4	NQ	13	14.5
046D	6	NC	16	NC
058	NQ	NQ	NQ	10
073	NQ	NQ	NQ	6
083	NQ	NQ	4	2
085	NQ	NQ	NQ	6
086	NQ	NQ	NQ	NQ
094	2	NQ	22	3
110	NQ	NQ	NQ	NQ
213	NQ	NQ	12.5	2.5
226	2	NQ	5	4
229	2	NQ	3	12
231	NQ	NQ	NQ	2
235	NQ	NQ	5.5	NQ
235D	NQ	NC	5	NC
242	NQ	NQ	3.5	5
248	NQ	NQ	NQ	NQ
251	NQ	NQ	NQ	29
252	NQ	NQ	5	NQ
257	NQ	NQ	2	NQ
266	NQ	NQ	NQ	NQ
267	2.5	NQ	3.5	NQ
271	NQ	NQ	NQ	2
277	NQ	NQ	2	39
281	NQ	NQ	NQ	NQ
282	NQ	NQ	NQ	2
283	NQ	NQ	NQ	2
285	NQ	NQ	2	NQ
294	2.5	NQ	4.5	NQ
301	NQ	NQ	9	2
307	NQ	NQ	NQ	NQ
310	NQ	ND	4.5	ND
313	NQ	NQ	NQ	NQ
315	2	NQ	3	4.5

TABLE I-7. CARBON MONOXIDE RESULTS
SOURCE CATEGORY F - GAS HEAT

HOUSE ID#	AVERAGE CONC. (ppm) INDOOR	AVERAGE CONC. (ppm) OUTDOOR	PEAK CONC. (ppm)[a] INDOOR	PEAK CONC. (ppm)[a] OUTDOOR
318	4.5	NQ	5.5	4
325	NQ	NQ	NQ	10.5
325D	NQ	NC	NQ	NC
329	NQ	NQ	NQ	NQ
330	NQ	NQ	NQ	2
333	NQ	NQ	NQ	NQ
336	NQ	NQ	NQ	NQ
336D	NC	NQ	NC	NQ
339	NQ	NQ	NQ	NQ
349	NQ	NQ	NQ	5

NQ - NOT QUANTIFIABLE, < 2 PPM CO
NC - NOT COLLECTED
ND - NO DATA, SAMPLER MALFUNCTION OR OPERATOR ERROR
[a]Highest one-minute concentration measured.

APPENDIX J
STUDY QUESTIONNAIRE FREQUENCIES

STUDY QUESTIONNAIRE

How old is the house

Q1A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	8	3.1	8	3.1
002	10	3.9	18	7.0
003	17	6.6	35	13.6
004	13	5.1	48	18.7
005	9	3.5	57	22.2
006	19	7.4	76	29.6
007	5	1.9	81	31.5
008	9	3.5	90	35.0
009	9	3.5	99	38.5
010	13	5.1	112	43.6
011	4	1.6	116	45.1
012	15	5.8	131	51.0
013	6	2.3	137	53.3
014	6	2.3	143	55.6
015	4	1.6	147	57.2
016	8	3.1	155	60.3
017	8	3.1	163	63.4
018	1	0.4	164	63.8
019	3	1.2	167	65.0
020	9	3.5	176	68.5
021	2	0.8	178	69.3
022	1	0.4	179	69.6
023	1	0.4	180	70.0
024	1	0.4	181	70.4
025	7	2.7	188	73.2
026	1	0.4	189	73.5
027	2	0.8	191	74.3
028	2	0.8	193	75.1
029	4	1.6	197	76.7
030	9	3.5	206	80.2
031	4	1.6	210	81.7
032	4	1.6	214	83.3
034	1	0.4	215	83.7
035	2	0.8	217	84.4
036	2	0.8	219	85.2
038	1	0.4	220	85.6
039	2	0.8	222	86.4
040	8	3.1	230	89.5
042	3	1.2	233	90.7
045	5	1.9	238	92.6
047	1	0.4	239	93.0
049	1	0.4	240	93.4
050	5	1.9	245	95.3
054	1	0.4	246	95.7
059	1	0.4	247	96.1
070	2	0.8	249	96.9
071	1	0.4	250	97.3
080	1	0.4	251	97.7
090	1	0.4	252	98.1

STUDY QUESTIONNAIRE

How old is the house

Q1A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
104	1	0.4	253	98.4
152	1	0.4	254	98.8
998	3	1.2	257	100.0

Frequency Missing = 23

Do entryways lead outdoors

Q2	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	18	78.3	18	78.3
2	5	21.7	23	100.0

Frequency Missing = 257

Attached garage

Q3	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	182	65.0	182	65.0
2	3	1.1	185	66.1
3	95	33.9	280	100.0

Door from garage to home

Q4	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	169	91.4	169	91.4
2	16	8.6	185	100.0

Frequency Missing = 95

STUDY QUESTIONNAIRE

Any vehicles run in garage

Q5	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	125	67.6	125	67.6
2	60	32.4	185	100.0

Frequency Missing = 95

For how long (minutes)

Q6	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	48	38.4	48	38.4
002	26	20.8	74	59.2
003	13	10.4	87	69.6
004	18	14.4	105	84.0
005	9	7.2	114	91.2
006	6	4.8	120	96.0
007	1	0.8	121	96.8
010	1	0.8	122	97.6
011	1	0.8	123	98.4
012	1	0.8	124	99.2
024	1	0.8	125	100.0

Frequency Missing = 155

Any vehicles diesel powered

Q7	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	5.6	7	5.6
2	118	94.4	125	100.0

Frequency Missing = 155

STUDY QUESTIONNAIRE

Did use gas powered heat

Q8A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	126	45.0	126	45.0
2	154	55.0	280	100.0

Did use electric heat

Q8B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	76	27.1	76	27.1
2	204	72.9	280	100.0

Did use central oil heat

Q8C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	5	1.8	5	1.8
2	275	98.2	280	100.0

Did use wood burning fireplace

Q8D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	57	20.4	57	20.4
2	223	79.6	280	100.0

Did use gas burning fireplace

Q8E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	280	100.0	280	100.0

STUDY QUESTIONNAIRE

Did use wood burning stove

Q8F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	96	34.3	96	34.3
2	184	65.7	280	100.0

Did use portable kerosene heater

Q8G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	2.5	7	2.5
2	273	97.5	280	100.0

Did use gas space heater

Q8H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	0.7	2	0.7
2	278	99.3	280	100.0

Did use electric space heater

Q8I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	51	18.2	51	18.2
2	229	81.8	280	100.0

STUDY QUESTIONNAIRE

Did use other heating system

Q8J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	1.1	3	1.1
2	277	98.9	280	100.0

Other specify

Q8JA	Frequency	Percent	Cumulative Frequency	Cumulative Percent
No heat used - h	1	33.3	1	33.3
None used - has	1	33.3	2	66.7
electric wall he	1	33.3	3	100.0

Frequency Missing = 277

Primary source of heat

Q9	Frequency	Percent	Cumulative Frequency	Cumulative Percent
01	103	36.8	103	36.8
02	56	20.0	159	56.8
03	5	1.8	164	58.6
04	22	7.9	186	66.4
06	72	25.7	258	92.1
07	4	1.4	262	93.6
08	2	0.7	264	94.3
09	3	1.1	267	95.4
10	13	4.6	280	100.0

STUDY QUESTIONNAIRE

Central gas heat

Q10A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	104	82.5	104	82.5
2	12	9.5	116	92.1
3	10	7.9	126	100.0

Frequency Missing = 154

STUDY QUESTIONNAIRE

How old is the heating system

Q10B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	16	12.7	16	12.7
002	10	7.9	26	20.6
003	10	7.9	36	28.6
004	8	6.3	44	34.9
005	10	7.9	54	42.9
006	3	2.4	57	45.2
007	5	4.0	62	49.2
008	4	3.2	66	52.4
009	3	2.4	69	54.8
010	2	1.6	71	56.3
011	1	0.8	72	57.1
012	4	3.2	76	60.3
013	3	2.4	79	62.7
014	2	1.6	81	64.3
015	4	3.2	85	67.5
016	5	4.0	90	71.4
017	5	4.0	95	75.4
018	1	0.8	96	76.2
019	4	3.2	100	79.4
020	3	2.4	103	81.7
021	1	0.8	104	82.5
022	1	0.8	105	83.3
024	1	0.8	106	84.1
025	3	2.4	109	86.5
026	1	0.8	110	87.3
029	1	0.8	111	88.1
030	3	2.4	114	90.5
031	1	0.8	115	91.3
032	2	1.6	117	92.9
035	3	2.4	120	95.2
039	1	0.8	121	96.0
040	1	0.8	122	96.8
998	4	3.2	126	100.0

Frequency Missing = 154

STUDY QUESTIONNAIRE

Where is heating system located

Q10C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	20	15.9	20	15.9
2	83	65.9	103	81.7
3	23	18.3	126	100.0

Frequency Missing = 154

Is it vented to the outside

Q10D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	94	91.3	94	91.3
2	4	3.9	98	95.1
8	5	4.9	103	100.0

Frequency Missing = 177

Does heating system have pilot light

Q10E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	50	48.5	50	48.5
2	50	48.5	100	97.1
8	3	2.9	103	100.0

Frequency Missing = 177

What type of gas was used

Q10F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	67	65.0	67	65.0
2	36	35.0	103	100.0

Frequency Missing = 177

How many wood burning fireplaces used

Q11A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	57	100.0	57	100.0

Frequency Missing = 223

How long use fireplace in past 24 hours

Q11B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
01	5	8.8	5	8.8
02	3	5.3	8	14.0
03	8	14.0	16	28.1
04	11	19.3	27	47.4
05	5	8.8	32	56.1
06	6	10.5	38	66.7
07	6	10.5	44	77.2
08	4	7.0	48	84.2
10	1	1.8	49	86.0
11	2	3.5	51	89.5
12	1	1.8	52	91.2
16	1	1.8	53	93.0
18	1	1.8	54	94.7
24	3	5.3	57	100.0

Frequency Missing = 223

Did you burn wood logs

Q11C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	52	91.2	52	91.2
2	5	8.8	57	100.0

Frequency Missing = 223

STUDY QUESTIONNAIRE

Did you use wood pellets

Q11D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	57	100.0	57	100.0

Frequency Missing = 223

Did you use newspaper or trash

Q11E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	3.5	2	3.5
2	55	96.5	57	100.0

Frequency Missing = 223

Any other type of fuel

Q11F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	10	17.5	10	17.5
2	47	82.5	57	100.0

Frequency Missing = 223

STUDY QUESTIONNAIRE

Other type of fuel

Q11G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
DURAFLAME LOGS	1	10.0	1	10.0
Duraflame logs	1	10.0	2	20.0
PRESTO LOGS TO S	1	10.0	3	30.0
duraflame logs	2	20.0	5	50.0
duraflame logs a	1	10.0	6	60.0
kerosene	1	10.0	7	70.0
pine cones	1	10.0	8	80.0
presto logs	2	20.0	10	100.0

Frequency Missing = 270

Was fireplace used to heat monitor. room

Q11H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	47	82.5	47	82.5
2	10	17.5	57	100.0

Frequency Missing = 223

Type of fireplace screen

Q11I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	12	21.1	12	21.1
2	39	68.4	51	89.5
3	6	10.5	57	100.0

Frequency Missing = 223

Remove ashes from fireplace past 24 hrs.

Q11J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	3.5	2	3.5
2	55	96.5	57	100.0

Frequency Missing = 223

Has chimney been cleaned this winter

Q11K	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	8	14.0	8	14.0
2	49	86.0	57	100.0

Frequency Missing = 223

Is fireplace designed to heat efficient.

Q11L	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	25	43.9	25	43.9
2	32	56.1	57	100.0

Frequency Missing = 223

How many gas burning fireplaces used

Q12A	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

STUDY QUESTIONNAIRE

How long use gas firepl. in past 24 hrs

Q12B	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

Was natural gas used

Q12C	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

Was liquid propane used

Q12D	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

Was any other type of gas used

Q12E	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

What other type of gas was used

Q12F	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

STUDY QUESTIONNAIRE

Was gas firepl. used to heat mon. area

Q12G	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

What type of firepl. screen was used

Q12H	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

How many woodstoves were used

Q13A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	91	94.8	91	94.8
2	4	4.2	95	99.0
8	1	1.0	96	100.0

Frequency Missing = 184

How long did you burn fuel in woodstove

Q13B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
01	2	2.1	2	2.1
02	1	1.0	3	3.1
03	6	6.2	9	9.4
04	3	3.1	12	12.5
05	5	5.2	17	17.7
06	10	10.4	27	28.1
08	4	4.2	31	32.3
09	4	4.2	35	36.5
10	6	6.2	41	42.7
11	3	3.1	44	45.8
12	11	11.5	55	57.3
13	4	4.2	59	61.5
14	5	5.2	64	66.7
15	1	1.0	65	67.7
16	1	1.0	66	68.7
18	2	2.1	68	70.8
19	1	1.0	69	71.9
20	1	1.0	70	72.9
22	1	1.0	71	74.0
24	24	25.0	95	99.0
98	1	1.0	96	100.0

Frequency Missing = 184

Did you burn wood logs in the woodstove

Q13C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	87	90.6	87	90.6
2	8	8.3	95	99.0
8	1	1.0	96	100.0

Frequency Missing = 184

Burn wood pellets in the woodstove

Q13D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	7.3	7	7.3
2	88	91.7	95	99.0
8	1	1.0	96	100.0

Frequency Missing = 184

Burn newspaper or trash in the woodstove

Q13E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	4	4.2	4	4.2
2	91	94.8	95	99.0
8	1	1.0	96	100.0

Frequency Missing = 184

Burn other type of fuel in the woodstove

Q13F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	5	5.2	5	5.2
2	90	93.7	95	99.0
8	1	1.0	96	100.0

Frequency Missing = 184

What other type of fuel

Q13G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2 firestarter bl	1	20.0	1	20.0
Northland logs	1	20.0	2	40.0
coal	1	20.0	3	60.0
duraflame log	1	20.0	4	80.0
piece of "presto	1	20.0	5	100.0

Frequency Missing = 275

Was stove used to heat the mon. area

Q13H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	91	94.8	91	94.8
2	4	4.2	95	99.0
8	1	1.0	96	100.0

Frequency Missing = 184

What % of time was woodstove door open

Q13I	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	89	92.7	89	92.7
2	2	2.1	91	94.8
3	1	1.0	92	95.8
4	1	1.0	93	96.9
8	3	3.1	96	100.0

Frequency Missing = 184

STUDY QUESTIONNAIRE

How often did refuel or stoke woodstove

Q13J	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	17	17.7	17	17.7
2	11	11.5	28	29.2
3	17	17.7	45	46.9
4	48	50.0	93	96.9
8	3	3.1	96	100.0

Frequency Missing = 184

Did remove ashes from woodstove past day

Q13K	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	14	14.6	14	14.6
2	81	84.4	95	99.0
8	1	1.0	96	100.0

Frequency Missing = 184

Has chimney been cleaned this winter

Q13L	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	42	43.7	42	43.7
2	54	56.3	96	100.0

Frequency Missing = 184

Are there cracks or leaks in stove pipe

Q13M	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	4	4.2	4	4.2
2	89	92.7	93	96.9
8	3	3.1	96	100.0

Frequency Missing = 184

Number of kerosene heaters in home

Q14A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	100.0	7	100.0

Frequency Missing = 273

How long use kerosene heater in past day

Q14B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
02	1	14.3	1	14.3
04	2	28.6	3	42.9
05	1	14.3	4	57.1
06	1	14.3	5	71.4
10	2	28.6	7	100.0

Frequency Missing = 273

Kerosene heater used to heat mon. room

Q14C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	6	85.7	6	85.7
2	1	14.3	7	100.0

Frequency Missing = 273

Heater vented to outdoors

Q14D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	2	28.6	2	28.6
3	5	71.4	7	100.0

Frequency Missing = 273

How many gas space heaters were used

Q15A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	100.0	2	100.0

Frequency Missing = 278

Hours used gas space heater in past day

Q15B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
07	1	50.0	1	50.0
16	1	50.0	2	100.0

Frequency Missing = 278

Gas space heater used to heat mon. room

Q15C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	2	100.0	2	100.0

Frequency Missing = 278

Heater vented to outdoors in mon. per.

Q15D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	1	50.0	1	50.0
2	1	50.0	2	100.0

Frequency Missing = 278

Clothes dryer been used in home

Q16	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	153	54.6	153	54.6
2	127	45.4	280	100.0

Type of fuel for clothes dryer

Q17	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	9	5.9	9	5.9
2	9	5.9	18	11.8
3	135	88.2	153	100.0

Frequency Missing = 127

Where is the dryer located

Q18	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	2	11.1	2	11.1
3	16	88.9	18	100.0

Frequency Missing = 262

STUDY QUESTIONNAIRE

Where is the dryer vented

Q19	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	17	94.4	17	94.4
2	1	5.6	18	100.0

Frequency Missing = 262

Do you have a gas water heater

Q19A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	163	58.2	163	58.2
2	116	41.4	279	99.6
8	1	0.4	280	100.0

Location of gas water heater

Q19B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	103	63.2	103	63.2
2	36	22.1	139	85.3
3	24	14.7	163	100.0

Frequency Missing = 117

Does it have a gas or elect. pilot light

Q19C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	103	74.1	103	74.1
2	35	25.2	138	99.3
8	1	0.7	139	100.0

Frequency Missing = 141

STUDY QUESTIONNAIRE

What type of gas is used

Q19D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	109	78.4	109	78.4
2	30	21.6	139	100.0

Frequency Missing = 141

Do you have a gas oven in your home

Q20	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	59	21.1	59	21.1
2	221	78.9	280	100.0

What fuel does your oven use

Q21	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	33	55.9	33	55.9
2	26	44.1	59	100.0

Frequency Missing = 221

What other type of fuel

Q21A	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

STUDY QUESTIONNAIRE

How old is your oven

Q21B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	14	23.7	14	23.7
2	25	42.4	39	66.1
3	19	32.2	58	98.3
8	1	1.7	59	100.0

Frequency Missing = 221

What type of pilot light does oven have

Q21C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	31	52.5	31	52.5
2	2	3.4	33	55.9
3	26	44.1	59	100.0

Frequency Missing = 221

How long was your oven on in past day

Q21D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
000	33	55.9	33	55.9
001	1	1.7	34	57.6
006	1	1.7	35	59.3
010	2	3.4	37	62.7
020	1	1.7	38	64.4
024	1	1.7	39	66.1
030	4	6.8	43	72.9
035	1	1.7	44	74.6
040	3	5.1	47	79.7
045	2	3.4	49	83.1
050	1	1.7	50	84.7
060	4	6.8	54	91.5
090	1	1.7	55	93.2
100	1	1.7	56	94.9
110	1	1.7	57	96.6
150	1	1.7	58	98.3
208	1	1.7	59	100.0

Frequency Missing = 221

Do you have a gas stove in your home

Q22	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	73	26.1	73	26.1
2	207	73.9	280	100.0

What fuel does your stove use

Q22A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	41	56.2	41	56.2
2	32	43.8	73	100.0

Frequency Missing = 207

What other type of fuel

Q22B	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing * 280

How old is your stove

Q22C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	21	28.8	21	28.8
2	27	37.0	48	65.8
3	23	31.5	71	97.3
8	2	2.7	73	100.0

Frequency Missing = 207

What type of pilot light does stove have

Q22D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	44	60.3	44	60.3
2	2	2.7	46	63.0
3	27	37.0	73	100.0

Frequency Missing = 207

How many pilot lights does stove have

Q22E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
2	15	55.6	15	55.6
3	3	11.1	18	66.7
4	9	33.3	27	100.0

Frequency Missing = 253

Burners on in past 24 hours

Q22F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
000	8	11.0	8	11.0
001	1	1.4	9	12.3
004	1	1.4	10	13.7
005	4	5.5	14	19.2
007	1	1.4	15	20.5
013	1	1.4	16	21.9
015	6	8.2	22	30.1
020	3	4.1	25	34.2
022	1	1.4	26	35.6
025	3	4.1	29	39.7
027	1	1.4	30	41.1
028	1	1.4	31	42.5
030	6	8.2	37	50.7
032	1	1.4	38	52.1
040	3	4.1	41	56.2
045	1	1.4	42	57.5
050	3	4.1	45	61.6
060	7	9.6	52	71.2
061	1	1.4	53	72.6
064	1	1.4	54	74.0
065	1	1.4	55	75.3
067	1	1.4	56	76.7
072	1	1.4	57	78.1
075	1	1.4	58	79.5
080	1	1.4	59	80.8
084	1	1.4	60	82.2
090	1	1.4	61	83.6
095	1	1.4	62	84.9
096	1	1.4	63	86.3
100	1	1.4	64	87.7
110	1	1.4	65	89.0
113	1	1.4	66	90.4
118	1	1.4	67	91.8
120	1	1.4	68	93.2
180	1	1.4	69	94.5
225	1	1.4	70	95.9
240	3	4.1	73	100.0

Frequency Missing = 207

STUDY QUESTIONNAIRE

Exhaust fan used to vent air outdoors

Q28	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	47	71.2	47	71.2
2	7	10.6	54	81.8
3	12	18.2	66	100.0

Frequency Missing = 214

Indoor grilling in home in past day

Q28A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	11	3.9	11	3.9
2	2	0.7	13	4.6
4	267	95.4	280	100.0

What other type of fuel

Q28B	Frequency	Percent	Cumulative Frequency	Cumulative Percent

Frequency Missing = 280

How long was the grill on in past day

Q28C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	1	7.7	1	7.7
006	1	7.7	2	15.4
015	1	7.7	3	23.1
020	3	23.1	6	46.2
030	4	30.8	10	76.9
040	1	7.7	11	84.6
060	2	15.4	13	100.0

Frequency Missing = 267

How long was the food actually grilled

Q28D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	1	7.7	1	7.7
006	1	7.7	2	15.4
010	1	7.7	3	23.1
015	1	7.7	4	30.8
020	4	30.8	8	61.5
025	1	7.7	9	69.2
028	1	7.7	10	76.9
030	1	7.7	11	84.6
040	1	7.7	12	92.3
050	1	7.7	13	100.0

Frequency Missing = 267

Was exhaust fan to outdoors used

Q28E	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	8	61.5	8	61.5
2	5	38.5	13	100.0

Frequency Missing = 267

Frying in home over past 24 hours

Q28F	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	101	36.1	101	36.1
2	179	63.9	280	100.0

STUDY QUESTIONNAIRE

How long was frying food uncovered

Q28G	Frequency	Percent	Cumulative Frequency	Cumulative Percent
001	7	6.9	7	6.9
002	3	3.0	10	9.9
003	1	1.0	11	10.9
004	2	2.0	13	12.9
005	15	14.9	28	27.7
006	1	1.0	29	28.7
007	1	1.0	30	29.7
008	1	1.0	31	30.7
010	20	19.8	51	50.5
012	1	1.0	52	51.5
015	16	15.8	68	67.3
020	13	12.9	81	80.2
025	3	3.0	84	83.2
030	11	10.9	95	94.1
040	2	2.0	97	96.0
050	1	1.0	98	97.0
064	1	1.0	99	98.0
070	1	1.0	100	99.0
075	1	1.0	101	100.0

Frequency Missing = 179

Was an exhaust fan to outdoors used

Q28H	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	25	24.8	25	24.8
2	76	75.2	101	100.0

Frequency Missing = 179

STUDY QUESTIONNAIRE

Tobacco products smoked in home past day

Q29	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	84	30.0	84	30.0
2	195	69.6	279	99.6
8	1	0.4	280	100.0

How many cigarettes

Q30	Frequency	Percent	Cumulative Frequency	Cumulative Percent
000	1	1.2	1	1.2
001	2	2.4	3	3.6
002	4	4.8	7	8.3
004	4	4.8	11	13.1
005	4	4.8	15	17.9
006	2	2.4	17	20.2
007	5	6.0	22	26.2
010	10	11.9	32	38.1
011	3	3.6	35	41.7
012	2	2.4	37	44.0
013	2	2.4	39	46.4
014	3	3.6	42	50.0
015	10	11.9	52	61.9
016	2	2.4	54	64.3
017	1	1.2	55	65.5
020	6	7.1	61	72.6
022	2	2.4	63	75.0
025	1	1.2	64	76.2
027	1	1.2	65	77.4
029	1	1.2	66	78.6
030	4	4.8	70	83.3
033	1	1.2	71	84.5
035	1	1.2	72	85.7
036	1	1.2	73	86.9
038	1	1.2	74	88.1
040	2	2.4	76	90.5
042	1	1.2	77	91.7
045	1	1.2	78	92.9
050	3	3.6	81	96.4
063	1	1.2	82	97.6
079	1	1.2	83	98.8
100	1	1.2	84	100.0

Frequency Missing = 196

STUDY QUESTIONNAIRE

Cigars

Q31	Frequency	Percent	Cumulative Frequency	Cumulative Percent
00	82	97.6	82	97.6
01	1	1.2	83	98.8
09	1	1.2	84	100.0

Frequency Missing = 196

Pipefuls of tobacco

Q32	Frequency	Percent	Cumulative Frequency	Cumulative Percent
00	81	96.4	81	96.4
01	1	1.2	82	97.6
04	1	1.2	83	98.8
09	1	1.2	84	100.0

Frequency Missing = 196

Any smoke in home over past 24 hours

Q35A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	51	18.2	51	18.2
2	229	81.8	280	100.0

Was the smoke light, moderate, or heavy

Q35B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	43	84.3	43	84.3
2	5	9.8	48	94.1
3	3	5.9	51	100.0

Frequency Missing = 229

STUDY QUESTIONNAIRE

How long did the smoke last

Q35C	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	20	39.2	20	39.2
2	12	23.5	32	62.7
3	7	13.7	39	76.5
4	12	23.5	51	100.0

Frequency Missing = 229

STUDY QUESTIONNAIRE

What was the source of smoke

Q35D	Frequency	Percent	Cumulative Frequency	Cumulative Percent
3 CANDLES	1	2.0	1	2.0
BURNT FOOD IN FR	1	2.0	2	3.9
Broiling food in	1	2.0	3	5.9
Burning Rice on	1	2.0	4	7.8
CANDLE BURNING	1	2.0	5	9.8
Candle and burne	1	2.0	6	11.8
FIREPLACE	1	2.0	7	13.7
Fireplace	1	2.0	8	15.7
Inscense	1	2.0	9	17.6
OIL LAMP	1	2.0	10	19.6
burned food in e	1	2.0	11	21.6
burning pizza pa	1	2.0	12	23.5
burnt food	1	2.0	13	25.5
candle	4	7.8	17	33.3
candle burning	2	3.9	19	37.3
candle burning,	1	2.0	20	39.2
candles	2	3.9	22	43.1
candles burning	1	2.0	23	45.1
drippings in pan	1	2.0	24	47.1
frying food	1	2.0	25	49.0
incense	4	7.8	29	56.9
inscence	1	2.0	30	58.8
opening and clos	1	2.0	31	60.8
oven	1	2.0	32	62.7
pellet stove doo	1	2.0	33	64.7
soldering iron	1	2.0	34	66.7
wood burning	7	13.7	41	80.4
wood burning sto	2	3.9	43	84.3
wood stove	1	2.0	44	86.3
woodburning stov	1	2.0	45	88.2
woodfire	1	2.0	46	90.2
woodstove	3	5.9	49	96.1
woodstove door	1	2.0	50	98.0
woodstove door o	1	2.0	51	100.0

Frequency Missing = 229

Smoke enter home from outdoors past day

Q36	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	8	2.9	8	2.9
2	272	97.1	280	100.0

Was the smoke light, moderate, or heavy

Q36A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	87.5	7	87.5
2	1	12.5	8	100.0

Frequency Missing = 272

How long did the smoke last

Q36B	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	3	37.5	3	37.5
2	3	37.5	6	75.0
4	1	12.5	7	87.5
8	1	12.5	8	100.0

Frequency Missing = 272

STUDY QUESTIONNAIRE

What was the source of the smoke

Q37	Frequency	Percent	Cumulative Frequency	Cumulative Percent
Woodstove smoke	1	12.5	1	12.5
charcoal barbecu	1	12.5	2	25.0
chimney	1	12.5	3	37.5
fireplace	1	12.5	4	50.0
neighbor startin	1	12.5	5	62.5
neighbor's firep	1	12.5	6	75.0
outdoor fire	1	12.5	7	87.5
wind swirling wo	1	12.5	8	100.0

Frequency Missing = 272

Did leave any windows or doors open

Q38	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	137	48.9	137	48.9
2	19	6.8	156	55.7
3	44	15.7	200	71.4
4	20	7.1	220	78.6
5	19	6.8	239	85.4
6	41	14.6	280	100.0

PROXIMITY TO HEAVILY TRAFFICKED AREA

Q39	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	7	2.5	7	2.5
2	13	4.6	20	7.1
3	81	28.9	101	36.1
4	179	63.9	280	100.0

OUTDOOR GEOGRAPHY

Q40	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	59	21.1	59	21.1
2	34	12.1	93	33.2
3	15	5.4	108	38.6
4	161	57.5	269	96.1
5	11	3.9	280	100.0

OTHER TYPE OF TERRAIN

Q40A	Frequency	Percent	Cumulative Frequency	Cumulative Percent
MIDWAY UP A HILL	1	9.1	1	9.1
MIDWAY UP A RIDG	1	9.1	2	18.2
halfway up hill	3	27.3	5	45.5
middle of hill	1	9.1	6	54.5
midway between b	1	9.1	7	63.6
moderately hilly	1	9.1	8	72.7
on side of hill	2	18.2	10	90.9
rolling terrain,	1	9.1	11	100.0

Frequency Missing = 269

RELATION OF KITCHEN TO MONITOR. EQUIP.

Q41	Frequency	Percent	Cumulative Frequency	Cumulative Percent
1	14	5.0	14	5.0
2	203	72.5	217	77.5
3	4	1.4	221	78.9
4	35	12.5	256	91.4
6	24	8.6	280	100.0

STUDY QUESTIONNAIRE

House type

Q1	Frequency	Percent	Cumulative Frequency	Cumulative Percent
01	229	81.8	229	81.8
02	12	4.3	241	86.1
03	16	5.7	257	91.8
04	23	8.2	280	100.0

APPENDIX K
AIR EXCHANGE RATE MEASUREMENTS

SOURCES	N	AIR EXCHANGE RATES (HR^{-1})				
		MEAN	PC25	MED	PC75	MAX
A1-SMOKING	52	0.77	0.45	0.59	1.03	2.25
A2-SMOKING & FIRE PL	11	1.00	0.75	1.01	1.19	1.66
B-FIRE PL	44	0.78	0.50	0.69	0.95	2.21
C-WOOD ST NO GH	54	0.51	0.32	0.43	0.60	1.46
D-WOOD ST & GH	22	0.61	0.40	0.53	0.79	1.55
E-NONE	36	0.51	0.32	0.43	0.70	1.29
F-GAS HEAT	49	0.55	0.33	0.45	0.66	2.38

APPENDIX L
WEATHER DATA

Town	Date for Weather Data	Start Date of Monitoring Period	Temperatures (°F) Max	Min	Precipitation (inches)
P	010892	010792	49	31	0.14
P	010992	010892	53	31	0.00
P	011092	010992	57	33	0.00
P	011192	011092	62	28	0.00
P	011292	011192	53	25	0.00
P	011392	011292	56	29	0.00
P	011492	011392	55	31	0.00
P	011592	011492	57	31	0.00
P	011692	011592	61	36	0.00
P	011792	011692	61	32	0.00
P	011892	011792	58	34	0.00
P	011992	011892	57	30	0.00
P	012092	011992	61	33	0.00
P	012192	012092	63	33	0.00
P	012292	012192	59	30	0.00
P	012392	012292	54	23	0.00
P	012492	012392	55	25	0.00
P	012592	012492	61	32	0.00
P	012692	012592	62	32	0.00
P	012792	012692	62	30	0.00
R	012892	012792	55	44	0.27
R	012992	012892	51	40	0.01
R	013092	012992	51	36	0.01
R	013192	013092	53	45	0.00
R	020192	013192	61	45	0.11
R	020292	020192	61	40	0.00
R	020392	020292	68	32	0.00
R	020492	020392	61	32	0.00
R	020592	020492	61	35	0.00
R	020692	020592	55	47	0.12
R	020792	020692	58	48	0.05
R	020892	020792	61	52	0.25
R	020992	020892	61	52	0.28
R	021092	020992	58	51	0.33
R	021192	021092	65	49	0.49
R	021292	021192	60	50	1.20
R	021392	021292	59	49	0.44
R	021492	021392	55	47	1.34
R	021592	021492	56	42	0.31
R	021692	021592	55	45	0.40
R	021792	021692	58	45	0.02
R	021892	021792	59	44	0.19
R	021992	021892	61	53	0.93

Note: Temperature data for Roseville was taken from Sacramento airport station. Precipitation data for Roseville was taken from Sacramento downtown station and should be used only as an indicator of rain; rain amounts may be unreliable.

Town	Date for Weather Data	Start Date of Monitoring Period	Temperatures (°F) Max	Min	Precipitation (inches)
R	022092	021992	64	52	0.06
R	022192	022092	58	52	0.37
R	022292	022192	65	49	0.00
R	022392	022292	66	46	0.00
R	022492	022392	68	41	0.00
R	022592	022492	73	42	0.00
R	022692	022592	74	46	0.00
R	022792	022692	76	45	0.00
R	022892	022792	72	45	0.00
R	022992	022892	67	47	0.00
R	030192	022992	66	51	0.11
R	030292	030192	65	52	0.03
R	030392	030292	65	49	0.05
R	030492	030392	63	46	0.02
R	030592	030492	55	50	1.00
R	030692	030592	62	48	0.48
P	030792	030692	52	45	0.49
P	030892	030792	58	36	0.00
P	030992	030892	60	37	0.00
P	031092	030992	63	41	0.00
P	031192	031092	66	40	0.00
P	031292	031192	67	43	0.00
P	031392	031292	69	44	0.00
P	031492	031392	63	43	0.00
P	031592	031492	61	41	0.43
P	031692	031592	58	42	0.61
P	031792	031692	52	40	0.18
P	031892	031792	60	38	0.00
P	031992	031892	64	40	0.00
P	032092	031992	60	44	0.00
P	032192	032092	63	50	0.00
P	032292	032192	60	48	0.05
P	032392	032292	61	40	0.66

Note: Temperature data for Roseville was taken from Sacramento airport station. Precipitation data for Roseville was taken from Sacramento downtown station and should be used only as an indicator of rain; rain amounts may be unreliable.

APPENDIX M
UNIVARIATE STATISTICS FOR PAH DATA

M-1

Summary Statistics for PAH Concentrations
by Source Category - Adjusted for Recovery

------------------ COMPOUND=Acenaphthylene TYPE=INDOOR CONCENTRATION ------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	48	25.03	23.75	17.59	2.34	3.00	10.33	15.50	32.00	120.00	95
2-SMOK & FIRE PL	11	29.47	22.95	23.36	2.02	8.40	13.00	24.00	31.00	84.00	78
-FIRE PL	43	15.20	15.76	9.51	2.97	0.00	5.70	10.00	15.00	72.00	104
-WOOD ST NO GH	49	13.75	18.21	7.87	2.86	0.91	3.70	7.80	17.00	110.00	132
-WOOD ST & GH	21	10.66	10.31	7.48	2.30	2.30	4.40	6.10	14.00	41.00	97
-NONE	31	11.80	15.23	7.12	2.97	0.00	3.90	8.65	11.00	84.00	129
-GAS HEAT	43	8.32	6.13	6.03	2.66	0.00	4.30	7.80	11.00	31.00	74

------------------ COMPOUND=Acenaphthylene TYPE=OUTDOOR CONCENTRATION ------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	18.47	20.95	10.74	2.92	1.70	4.00	11.40	24.00	110.00	113
A2-SMOK & FIRE PL	11	20.15	16.48	13.90	2.64	3.70	4.70	19.00	31.00	56.00	82
B-FIRE PL	44	21.36	21.59	12.45	3.40	0.14	6.30	13.50	35.00	110.00	101
C-WOOD ST NO GH	55	18.61	19.77	10.15	3.26	1.00	4.10	9.50	26.00	72.00	106
D-WOOD ST & GH	22	16.70	10.02	13.52	2.07	1.90	8.00	14.50	26.00	41.00	60
E-NONE	37	21.84	24.11	12.64	3.01	0.61	6.10	11.00	38.00	110.00	110
F-GAS HEAT	48	15.02	17.97	9.42	2.70	0.50	4.85	8.40	19.00	110.00	120

------------------ COMPOUND=Acenaphthylene TYPE=INDOOR/OUTDOOR RATIO ------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	45	3.41	4.56	1.72	3.28	0.22	0.75	1.25	4.31	20.00	134
A2-SMOK & FIRE PL	11	2.18	1.61	1.68	2.15	0.52	0.93	1.24	3.54	5.11	74
B-FIRE PL	41	1.46	2.51	0.78	3.08	0.00	0.48	0.87	1.28	15.71	172
C-WOOD ST NO GH	49	1.73	4.55	0.76	2.86	0.11	0.39	0.64	1.40	31.43	262
D-WOOD ST & GH	21	0.64	0.45	0.50	2.12	0.12	0.36	0.58	0.81	1.94	70
E-NONE	29	0.91	0.97	0.53	3.43	0.00	0.32	0.50	1.05	3.67	106
F-GAS HEAT	40	1.20	1.62	0.71	2.78	0.00	0.42	0.67	1.16	9.20	134

------------------ COMPOUND=Phenanthrene TYPE=INDOOR CONCENTRATION --------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	49	34.24	20.67	29.57	1.71	8.00	21.00	29.00	40.00	100.00	60
2-SMOK & FIRE PL	11	30.82	20.16	26.01	1.82	11.00	17.00	25.00	43.00	76.00	65
-FIRE PL	45	19.18	12.50	16.28	1.74	6.20	11.00	13.00	20.00	53.00	65
-WOOD ST NO GH	51	19.85	15.64	16.61	1.74	6.30	12.00	16.50	22.00	100.00	79
-WOOD ST & GH	21	17.46	6.51	16.34	1.46	6.70	13.00	16.00	21.00	33.00	37
-NONE	35	18.98	11.39	16.93	1.56	8.70	13.00	14.00	23.00	64.00	60
-GAS HEAT	49	19.14	12.56	16.60	1.66	6.40	12.00	15.00	20.00	68.00	66

------------------ COMPOUND=Phenanthrene TYPE=OUTDOOR CONCENTRATION -------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	25.38	21.21	19.01	2.13	4.80	9.50	18.75	34.00	99.00	84
2-SMOK & FIRE PL	11	22.19	11.01	19.82	1.66	9.10	12.00	22.00	27.00	44.00	50
-FIRE PL	44	26.53	19.55	20.10	2.28	1.25	13.00	21.50	36.50	100.00	74
-WOOD ST NO GH	55	26.60	21.66	19.60	2.27	1.60	12.00	18.00	36.00	110.00	81
-WOOD ST & GH	22	24.06	10.44	21.24	1.78	3.70	18.00	26.00	30.00	50.00	43
-NONE	37	25.65	21.82	19.72	2.05	4.00	12.00	19.00	35.00	120.00	85
-GAS HEAT	48	21.29	17.51	16.99	1.93	4.50	11.00	17.00	26.00	110.00	82

------------------- COMPOUND=Phenanthrene TYPE=INDOOR/OUTDOOR RATIO --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	46	2.18	1.78	1.55	2.39	0.18	0.75	1.65	3.57	7.79	82
A2-SMOK & FIRE PL	11	1.55	0.96	1.31	1.83	0.46	0.98	1.17	2.11	3.45	62
B-FIRE PL	43	1.14	1.12	0.84	2.14	0.13	0.52	0.76	1.42	6.72	98
C-WOOD ST NO GH	51	2.35	8.74	0.85	2.68	0.25	0.43	0.87	1.17	62.50	372
D-WOOD ST & GH	21	0.89	0.87	0.71	1.84	0.25	0.48	0.64	0.90	4.31	97
E-NONE	33	1.01	0.61	0.84	1.90	0.13	0.57	0.76	1.33	2.64	60
F-GAS HEAT	44	1.31	0.97	1.02	2.07	0.23	0.61	1.00	1.68	4.08	74

-------------------- COMPOUND=Anthracene TYPE=INDOOR CONCENTRATION --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	49	3.24	2.49	2.48	2.09	0.48	1.60	2.30	4.30	10.00	77
2-SMOK & FIRE PL	11	3.13	2.47	2.40	2.23	0.44	1.60	2.20	3.60	9.40	79
-FIRE PL	44	1.24	1.48	0.80	2.43	0.12	0.47	0.75	1.15	6.90	119
-WOOD ST NO GH	52	1.24	1.55	0.82	2.35	0.17	0.42	0.75	1.35	9.40	125
-WOOD ST & GH	21	0.89	0.64	0.67	2.30	0.12	0.40	0.70	1.20	2.70	72
-NONE	35	0.87	0.66	0.72	1.81	0.28	0.46	0.67	1.10	3.60	76
-GAS HEAT	49	1.71	4.32	0.80	2.62	0.13	0.45	0.67	1.20	28.00	253

-------------------- COMPOUND=Anthracene TYPE=OUTDOOR CONCENTRATION --------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	2.67	3.16	1.63	2.66	0.24	0.75	1.50	3.40	16.00	118
A2-SMOK & FIRE PL	11	2.20	1.58	1.72	2.11	0.67	0.80	1.90	3.40	5.20	71
B-FIRE PL	44	2.87	2.84	1.82	2.90	0.05	0.94	1.90	3.65	15.00	99
C-WOOD ST NO GH	55	3.22	3.79	1.83	3.01	0.14	0.93	1.60	4.50	21.00	118
D-WOOD ST & GH	22	2.35	1.23	1.97	1.97	0.42	1.40	2.25	3.10	4.80	52
E-NONE	37	2.67	2.97	1.72	2.63	0.14	1.00	1.60	2.90	16.00	111
F-GAS HEAT	48	2.16	3.12	1.38	2.40	0.19	0.80	1.15	2.50	21.00	145

-------------------- COMPOUND=Anthracene TYPE=INDOOR/OUTDOOR RATIO --------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	46	2.63	2.79	1.51	3.15	0.05	0.67	1.33	3.85	12.74	106
A2-SMOK & FIRE PL	11	1.68	0.92	1.39	2.09	0.23	1.02	1.55	2.75	3.28	55
B-FIRE PL	42	0.71	0.70	0.46	2.66	0.05	0.22	0.48	0.89	2.58	98
C-WOOD ST NO GH	52	1.09	2.58	0.45	3.20	0.04	0.22	0.38	0.79	16.49	236
D-WOOD ST & GH	21	0.56	0.67	0.32	2.94	0.05	0.15	0.30	0.54	2.24	120
E-NONE	33	0.62	0.63	0.41	2.57	0.03	0.26	0.41	0.71	2.79	102
F-GAS HEAT	44	1.86	5.56	0.64	3.61	0.06	0.25	0.67	1.43	36.84	299

------------------ COMPOUND=Fluoranthene TYPE=INDOOR CONCENTRATION --------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	52	4.49	4.41	3.20	2.19	1.00	1.65	2.75	5.00	20.50	98
-SMOK & FIRE PL	11	3.45	2.92	2.68	2.07	0.75	1.60	2.60	3.60	11.00	85
FIRE PL	45	1.90	1.99	1.39	2.07	0.45	0.88	1.20	1.90	10.00	105
WOOD ST NO GH	54	2.34	2.71	1.64	2.18	0.39	0.90	1.55	2.30	16.00	116
WOOD ST & GH	22	1.78	0.81	1.60	1.63	0.57	1.30	1.65	2.20	3.80	46
NONE	36	1.61	1.13	1.35	1.76	0.58	0.90	1.15	2.22	5.40	70
GAS HEAT	51	1.36	0.79	1.19	1.66	0.59	0.79	1.10	1.70	3.90	58

------------------ COMPOUND=Fluoranthene TYPE=OUTDOOR CONCENTRATION -------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	5.31	6.03	3.58	2.30	0.98	1.90	3.22	5.60	33.00	114
2-SMOK & FIRE PL	11	4.48	2.55	3.74	1.97	1.10	1.90	4.10	5.90	8.60	57
-FIRE PL	45	5.30	5.19	3.73	2.35	0.25	2.40	3.40	6.50	29.00	98
-WOOD ST NO GH	55	6.99	8.57	4.15	2.72	0.44	2.10	3.80	7.90	43.00	123
-WOOD ST & GH	22	4.60	2.09	4.00	1.85	0.75	3.20	4.80	5.90	8.70	45
-NONE	38	5.16	5.67	3.49	2.30	1.10	1.90	2.70	6.20	28.00	110
-GAS HEAT	50	4.72	7.66	3.09	2.22	0.56	1.90	2.85	4.50	54.00	162

------------------ COMPOUND=Fluoranthene TYPE=INDOOR/OUTDOOR RATIO --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	49	1.45	1.58	0.91	2.67	0.08	0.37	0.95	1.73	8.33	109
2-SMOK & FIRE PL	11	0.84	0.46	0.72	1.90	0.19	0.44	0.68	1.34	1.64	55
-FIRE PL	44	0.53	0.60	0.38	2.09	0.10	0.24	0.32	0.57	3.04	113
-WOOD ST NO GH	54	1.05	3.28	0.39	2.88	0.04	0.20	0.37	0.58	22.50	313
-WOOD ST & GH	22	0.45	0.25	0.40	1.65	0.18	0.29	0.41	0.52	1.10	55
-NONE	35	0.43	0.21	0.37	1.81	0.10	0.22	0.42	0.60	0.84	49
-GAS HEAT	48	0.50	0.44	0.39	2.01	0.07	0.27	0.41	0.58	2.86	88

---------------------- COMPOUND=Pyrene TYPE=INDOOR CONCENTRATION ----------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	52	4.11	3.74	3.11	2.02	1.10	1.70	2.70	4.30	16.50	91
A2-SMOK & FIRE PL	11	3.89	4.08	2.74	2.23	1.00	1.50	2.10	3.00	13.00	105
B-FIRE PL	44	1.99	1.95	1.53	1.90	0.62	1.05	1.30	2.10	10.00	98
C-WOOD ST NO GH	53	2.47	2.60	1.89	1.95	0.51	1.25	1.80	2.60	17.00	105
D-WOOD ST & GH	22	1.88	0.75	1.74	1.54	0.66	1.50	1.75	2.30	3.70	40
E-NONE	36	1.84	1.12	1.59	1.68	0.69	1.02	1.45	2.25	5.70	61
F-GAS HEAT	51	1.56	0.70	1.43	1.52	0.68	1.00	1.40	2.10	4.10	45

---------------------- COMPOUND=Pyrene TYPE=OUTDOOR CONCENTRATION ----------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	5.25	6.40	3.33	2.44	0.76	1.60	2.90	5.70	35.00	122
A2-SMOK & FIRE PL	11	4.87	3.54	3.86	2.06	1.50	1.90	3.60	7.80	13.00	73
B-FIRE PL	45	5.05	5.13	3.44	2.50	0.17	2.10	3.30	6.30	29.00	102
C-WOOD ST NO GH	55	6.53	8.35	3.73	2.84	0.38	1.90	3.20	7.30	40.00	128
D-WOOD ST & GH	22	4.17	2.07	3.54	1.94	0.61	2.90	4.20	5.20	8.90	50
E-NONE	38	5.01	5.65	3.26	2.43	0.75	1.80	2.65	6.20	28.00	113
F-GAS HEAT	50	4.54	8.19	2.83	2.31	0.39	1.70	2.40	4.60	58.00	181

---------------------- COMPOUND=Pyrene TYPE=INDOOR/OUTDOOR RATIO ----------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	1.49	1.76	0.94	2.61	0.10	0.44	1.05	1.91	10.67	118
A2-SMOK & FIRE PL	11	0.90	0.64	0.71	2.10	0.22	0.38	0.81	1.25	2.41	71
B-FIRE PL	43	0.65	0.88	0.46	2.11	0.13	0.27	0.42	0.71	5.71	135
C-WOOD ST NO GH	53	0.96	2.00	0.49	2.64	0.07	0.30	0.49	0.68	10.63	208
D-WOOD ST & GH	22	0.57	0.38	0.49	1.69	0.22	0.33	0.50	0.63	1.97	67
E-NONE	35	0.57	0.35	0.47	1.96	0.12	0.31	0.54	0.77	1.50	61
F-GAS HEAT	48	0.70	0.77	0.52	2.13	0.06	0.32	0.58	0.80	5.38	110

--------------- COMPOUND=Benzo(a)anthracene TYPE=INDOOR CONCENTRATION -----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	51	1.34	1.88	0.69	3.19	0.05	0.29	0.58	2.00	11.00	140
-SMOK & FIRE PL	11	1.14	1.39	0.71	2.71	0.14	0.31	0.68	1.50	5.10	122
FIRE PL	45	0.43	0.55	0.21	3.46	0.02	0.09	0.17	0.57	2.30	127
WOOD ST NO GH	54	0.52	1.13	0.24	2.97	0.04	0.11	0.20	0.44	7.80	216
WOOD ST & GH	22	0.32	0.22	0.26	1.95	0.08	0.16	0.26	0.37	0.88	69
NONE	36	0.32	0.47	0.14	3.62	0.00	0.05	0.10	0.36	1.95	148
GAS HEAT	50	0.17	0.18	0.11	2.52	0.02	0.06	0.11	0.19	0.89	107

--------------- COMPOUND=Benzo(a)anthracene TYPE=OUTDOOR CONCENTRATION -----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	50	1.22	1.66	0.62	3.16	0.10	0.23	0.56	1.10	7.90	136
2-SMOK & FIRE PL	11	1.28	1.14	0.79	3.26	0.07	0.30	0.85	2.10	3.90	89
-FIRE PL	45	1.28	1.85	0.62	3.68	0.01	0.29	0.61	1.40	11.00	145
-WOOD ST NO GH	55	1.44	1.70	0.78	3.11	0.07	0.37	0.65	1.90	7.30	118
-WOOD ST & GH	22	1.03	0.51	0.88	1.88	0.19	0.66	0.92	1.50	2.10	50
-NONE	38	1.28	1.89	0.59	3.35	0.10	0.24	0.39	1.40	8.70	147
-GAS HEAT	50	0.93	1.75	0.46	3.10	0.04	0.20	0.42	1.00	12.00	188

--------------- COMPOUND=Benzo(a)anthracene TYPE=INDOOR/OUTDOOR RATIO -----------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	48	2.92	5.54	1.12	3.73	0.11	0.44	0.85	2.90	31.33	190
2-SMOK & FIRE PL	11	1.16	0.88	0.89	2.16	0.31	0.47	0.71	2.09	2.83	76
-FIRE PL	44	0.54	0.65	0.35	2.41	0.08	0.20	0.28	0.73	3.18	121
-WOOD ST NO GH	54	1.29	7.03	0.30	2.69	0.04	0.17	0.31	0.48	52.00	545
-WOOD ST & GH	22	0.34	0.21	0.29	1.76	0.10	0.20	0.28	0.42	0.92	61
-NONE	35	0.25	0.12	0.22	1.80	0.00	0.15	0.25	0.34	0.59	49
-GAS HEAT	47	0.35	0.36	0.26	2.08	0.07	0.16	0.23	0.38	1.94	103

---------------------- COMPOUND=Chrysene TYPE=INDOOR CONCENTRATION ----------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	52	1.98	2.26	1.16	2.82	0.15	0.53	0.96	3.10	11.00	114
A2-SMOK & FIRE PL	11	1.52	1.22	1.10	2.48	0.22	0.67	1.30	2.30	4.30	80
B-FIRE PL	45	0.56	0.70	0.29	3.18	0.03	0.10	0.27	0.75	2.90	124
C-WOOD ST NO GH	54	0.61	1.12	0.33	2.70	0.06	0.16	0.28	0.60	7.60	183
D-WOOD ST & GH	22	0.41	0.25	0.35	1.85	0.10	0.23	0.35	0.52	1.10	61
E-NONE	36	0.40	0.54	0.21	3.15	0.00	0.09	0.18	0.50	2.50	135
F-GAS HEAT	47	0.24	0.22	0.18	2.19	0.04	0.09	0.18	0.30	1.00	91

---------------------- COMPOUND=Chrysene TYPE=OUTDOOR CONCENTRATION ----------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	1.56	1.88	0.93	2.68	0.22	0.36	0.80	1.60	8.70	120
A2-SMOK & FIRE PL	11	1.71	1.28	1.18	2.82	0.13	0.62	1.30	2.80	4.30	75
B-FIRE PL	45	1.66	2.11	0.96	3.00	0.03	0.49	0.95	1.75	12.00	127
C-WOOD ST NO GH	55	1.91	1.99	1.17	2.74	0.13	0.60	1.10	2.60	8.20	104
D-WOOD ST & GH	22	1.47	0.68	1.27	1.88	0.26	0.99	1.40	2.00	2.60	46
E-NONE	38	1.64	2.13	0.90	2.88	0.22	0.40	0.57	2.10	9.80	130
F-GAS HEAT	50	1.26	2.05	0.73	2.66	0.09	0.34	0.68	1.40	14.00	162

---------------------- COMPOUND=Chrysene TYPE=INDOOR/OUTDOOR RATIO ----------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	2.64	4.05	1.29	3.19	0.13	0.56	1.16	2.79	21.18	153
A2-SMOK & FIRE PL	11	1.18	0.93	0.93	2.03	0.29	0.53	0.97	1.54	3.61	79
B-FIRE PL	44	0.43	0.45	0.31	2.09	0.09	0.19	0.25	0.45	2.70	106
C-WOOD ST NO GH	54	0.86	4.10	0.27	2.50	0.05	0.15	0.28	0.42	30.40	478
D-WOOD ST & GH	22	0.30	0.14	0.27	1.60	0.10	0.21	0.25	0.37	0.57	48
E-NONE	35	0.25	0.11	0.22	1.72	0.00	0.18	0.24	0.32	0.48	46
F-GAS HEAT	45	0.31	0.27	0.24	1.94	0.07	0.16	0.21	0.34	1.38	89

-------------- COMPOUND=Benzo(k)fluoranthene TYPE=INDOOR CONCENTRATION ----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	51	3.73	5.39	2.19	2.72	0.25	1.10	2.00	4.60	36.00	145
-SMOK & FIRE PL	10	3.74	4.34	1.70	5.94	0.00	0.86	2.80	4.30	15.00	116
FIRE PL	45	1.64	1.80	0.95	2.91	0.15	0.39	0.84	2.10	6.35	110
WOOD ST NO GH	54	1.98	3.24	1.03	2.95	0.10	0.51	0.79	1.90	21.00	163
WOOD ST & GH	22	1.47	0.97	1.19	2.00	0.32	0.80	1.25	2.00	4.40	66
NONE	34	1.52	2.09	0.71	3.44	0.05	0.31	0.64	1.50	8.25	138
GAS HEAT	47	0.81	0.98	0.51	2.63	0.04	0.28	0.56	0.88	5.90	121

-------------- COMPOUND=Benzo(k)fluoranthene TYPE=OUTDOOR CONCENTRATION ----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	50	3.22	3.66	1.85	2.97	0.18	0.82	1.70	4.30	18.00	114
2-SMOK & FIRE PL	11	3.34	2.57	2.30	2.71	0.39	1.10	2.40	6.20	7.60	77
-FIRE PL	45	3.21	3.91	1.78	3.17	0.07	0.83	1.90	4.00	21.00	122
-WOOD ST NO GH	55	3.53	3.64	2.17	2.79	0.17	1.00	2.00	4.90	16.00	103
-WOOD ST & GH	22	3.15	1.56	2.72	1.82	0.60	2.10	2.95	4.20	6.70	50
NONE	38	3.29	4.46	1.62	3.50	0.00	0.78	1.30	3.70	22.00	136
GAS HEAT	50	2.46	3.60	1.37	2.87	0.13	0.71	1.04	3.20	23.00	146

-------------- COMPOUND=Benzo(k)fluoranthene TYPE=INDOOR/OUTDOOR RATIO ----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	48	2.22	3.42	1.24	2.69	0.26	0.66	1.06	2.09	20.00	154
2-SMOK & FIRE PL	10	0.99	0.71	0.65	3.76	0.00	0.57	0.79	1.49	2.34	72
-FIRE PL	44	0.67	0.52	0.54	1.85	0.21	0.35	0.41	0.78	2.33	78
-WOOD ST NO GH	54	1.62	8.34	0.47	2.37	0.14	0.27	0.46	0.65	61.76	513
-WOOD ST & GH	22	0.52	0.32	0.44	1.79	0.18	0.27	0.46	0.67	1.38	62
-NONE	33	0.58	1.15	0.38	1.99	0.10	0.28	0.37	0.50	6.94	199
-GAS HEAT	45	0.44	0.37	0.36	1.88	0.07	0.28	0.36	0.48	2.15	84

----------------- COMPOUND=Benzo(e)pyrene TYPE=INDOOR CONCENTRATION -------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	52	1.09	1.61	0.66	2.56	0.08	0.34	0.61	1.40	11.00	148
2-SMOK & FIRE PL	11	0.98	0.93	0.70	2.35	0.18	0.29	0.69	1.30	3.50	95
-FIRE PL	45	0.49	0.48	0.30	2.92	0.02	0.16	0.24	0.72	1.50	97
-WOOD ST NO GH	54	0.55	0.80	0.31	2.78	0.03	0.15	0.27	0.59	5.10	145
-WOOD ST & GH	22	0.40	0.23	0.34	1.91	0.10	0.25	0.42	0.52	0.99	57
-NONE	35	0.42	0.53	0.22	3.11	0.03	0.10	0.23	0.47	2.05	126
-GAS HEAT	49	0.25	0.26	0.16	2.50	0.03	0.08	0.19	0.30	1.60	107

----------------- COMPOUND=Benzo(e)pyrene TYPE=OUTDOOR CONCENTRATION -------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	0.84	0.85	0.55	2.55	0.09	0.26	0.53	1.20	4.20	101
A2-SMOK & FIRE PL	11	0.90	0.65	0.66	2.46	0.11	0.32	0.75	1.40	2.30	72
B-FIRE PL	45	0.85	0.92	0.51	3.01	0.02	0.26	0.50	1.10	4.90	107
C-WOOD ST NO GH	55	0.89	0.82	0.60	2.57	0.05	0.30	0.55	1.30	3.70	92
D-WOOD ST & GH	22	0.82	0.37	0.73	1.72	0.15	0.52	0.78	0.98	1.60	46
E-NONE	38	0.88	1.01	0.53	2.69	0.12	0.24	0.45	1.20	4.80	115
F-GAS HEAT	50	0.66	0.80	0.42	2.56	0.04	0.22	0.35	0.87	4.90	121

----------------- COMPOUND=Benzo(e)pyrene TYPE=INDOOR/OUTDOOR RATIO -------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	2.28	3.87	1.28	2.59	0.28	0.76	1.04	2.18	24.44	170
A2-SMOK & FIRE PL	11	1.25	0.81	1.06	1.78	0.48	0.75	0.92	1.64	2.96	64
B-FIRE PL	44	0.74	0.65	0.59	1.88	0.23	0.39	0.46	0.80	3.16	88
C-WOOD ST NO GH	54	1.32	5.72	0.52	2.23	0.17	0.32	0.52	0.67	42.50	433
D-WOOD ST & GH	22	0.51	0.25	0.46	1.59	0.23	0.33	0.43	0.63	1.03	48
E-NONE	34	0.41	0.16	0.38	1.50	0.17	0.28	0.38	0.54	0.77	38
F-GAS HEAT	47	0.48	0.47	0.40	1.68	0.15	0.29	0.36	0.48	3.33	99

------------------ COMPOUND=Benzo(a)pyrene TYPE=INDOOR CONCENTRATION --------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	52	2.23	3.96	1.24	2.76	0.11	0.68	1.10	2.55	28.00	178
-SMOK & FIRE PL	11	2.08	2.34	1.34	2.66	0.29	0.47	1.30	2.80	8.60	112
-FIRE PL	43	1.01	1.07	0.55	3.33	0.02	0.26	0.47	1.80	3.40	106
-WOOD ST NO GH	54	1.20	2.31	0.55	3.22	0.05	0.23	0.41	1.20	16.00	193
-WOOD ST & GH	22	0.79	0.53	0.62	2.15	0.11	0.39	0.83	1.00	2.40	68
-NONE	35	0.83	1.24	0.34	3.87	0.03	0.15	0.25	0.82	4.80	149
-GAS HEAT	49	0.41	0.52	0.24	2.83	0.02	0.11	0.29	0.51	3.20	126

------------------ COMPOUND=Benzo(a)pyrene TYPE=OUTDOOR CONCENTRATION -------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	1.30	1.68	0.61	3.77	0.03	0.22	0.72	1.80	8.60	129
2-SMOK & FIRE PL	11	1.39	1.21	0.87	3.14	0.16	0.20	0.91	2.20	4.00	87
-FIRE PL	45	1.35	1.81	0.61	4.01	0.01	0.20	0.59	1.85	9.90	134
-WOOD ST NO GH	55	1.39	1.58	0.71	3.44	0.05	0.29	0.57	2.20	6.30	114
-WOOD ST & GH	22	1.25	0.65	1.07	1.85	0.18	0.77	1.20	1.50	2.60	52
-NONE	38	1.32	2.01	0.52	3.86	0.07	0.17	0.33	1.50	9.50	152
-GAS HEAT	49	0.99	1.71	0.44	3.51	0.03	0.19	0.25	1.20	11.00	173

------------------ COMPOUND=Benzo(a)pyrene TYPE=INDOOR/OUTDOOR RATIO --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	49	5.81	12.97	2.18	3.45	0.30	0.79	1.94	3.54	80.77	223
2-SMOK & FIRE PL	11	2.08	2.15	1.54	2.09	0.57	1.05	1.36	2.30	8.13	103
-FIRE PL	42	1.16	1.12	0.88	1.99	0.35	0.52	0.83	1.22	4.94	96
-WOOD ST NO GH	54	2.59	12.70	0.76	2.55	0.20	0.40	0.76	1.09	94.12	490
-WOOD ST & GH	22	0.67	0.38	0.58	1.76	0.17	0.38	0.52	0.92	1.71	57
-NONE	34	0.61	0.26	0.56	1.56	0.21	0.41	0.59	0.77	1.12	42
-GAS HEAT	46	0.63	0.36	0.56	1.64	0.17	0.40	0.54	0.73	2.12	57

COMPOUND=Indeno[1,2,3-cd]pyrene TYPE=INDOOR CONCENTRATION

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	2.83	4.53	1.83	2.35	0.19	1.20	1.67	2.80	32.00	160
2-SMOK & FIRE PL	11	2.56	2.31	1.91	2.21	0.46	1.10	1.50	3.30	8.80	90
-FIRE PL	44	1.65	1.50	1.03	3.07	0.00	0.57	1.04	2.70	5.70	91
-WOOD ST NO GH	54	1.87	2.58	1.09	2.78	0.08	0.55	0.83	2.20	17.00	138
-WOOD ST & GH	22	1.40	0.88	1.13	2.05	0.28	0.70	1.40	1.90	3.80	63
-NONE	36	1.44	1.73	0.80	3.01	0.11	0.40	0.80	1.55	6.60	120
-GAS HEAT	51	0.92	0.80	0.64	2.52	0.07	0.36	0.77	1.30	4.90	88

COMPOUND=Indeno[1,2,3-cd]pyrene TYPE=OUTDOOR CONCENTRATION

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	48	2.02	1.98	1.27	2.79	0.10	0.60	1.45	2.85	9.70	98
2-SMOK & FIRE PL	11	2.10	1.55	1.57	2.35	0.34	0.69	1.50	3.30	5.30	74
-FIRE PL	44	2.04	2.07	1.17	3.53	0.01	0.60	1.25	3.02	9.90	102
-WOOD ST NO GH	55	2.03	1.95	1.31	2.64	0.13	0.65	1.20	3.10	8.80	96
-WOOD ST & GH	22	1.93	1.00	1.67	1.83	0.27	1.30	1.75	2.30	4.30	52
-NONE	38	2.02	2.40	1.15	2.89	0.13	0.53	0.92	3.20	11.00	119
-GAS HEAT	50	1.62	2.01	0.99	2.66	0.14	0.55	0.79	2.10	12.00	124

COMPOUND=Indeno[1,2,3-cd]pyrene TYPE=INDOOR/OUTDOOR RATIO

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	46	3.03	5.58	1.60	2.64	0.35	0.82	1.45	2.45	29.09	184
A2-SMOK & FIRE PL	11	1.32	0.58	1.22	1.50	0.66	1.00	1.09	1.45	2.51	44
B-FIRE PL	43	1.31	1.62	0.89	2.23	0.00	0.59	0.75	1.13	8.00	124
C-WOOD ST NO GH	54	1.56	5.05	0.82	2.10	0.29	0.52	0.74	1.05	37.78	323
D-WOOD ST & GH	22	0.78	0.44	0.68	1.68	0.33	0.47	0.59	0.87	1.81	57
E-NONE	35	0.75	0.59	0.63	1.73	0.23	0.41	0.66	0.86	3.70	79
F-GAS HEAT	48	0.96	1.20	0.67	2.07	0.20	0.41	0.59	0.79	6.14	125

--------------- COMPOUND=Benzo(ghi)perylene TYPE=INDOOR CONCENTRATION ------------------

RCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
SMOKING	52	1.96	2.43	1.38	2.20	0.21	0.86	1.20	2.15	17.00	124
SMOK & FIRE PL	11	1.91	1.71	1.41	2.27	0.39	0.99	1.20	2.40	6.50	89
IRE PL	45	1.36	1.48	0.87	2.68	0.03	0.49	0.73	1.50	8.40	109
OOD ST NO GH	54	1.47	1.73	0.92	2.63	0.12	0.41	0.92	1.70	11.00	118
OOD ST & GH	22	1.08	0.65	0.87	2.05	0.15	0.52	1.04	1.60	2.70	61
ONE	36	1.29	1.53	0.74	2.92	0.12	0.32	0.70	1.45	7.00	119
AS HEAT	50	0.78	0.65	0.58	2.19	0.15	0.26	0.63	1.00	3.70	84

--------------- COMPOUND=Benzo(ghi)perylene TYPE=OUTDOOR CONCENTRATION -----------------

RCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	50	1.64	1.56	1.12	2.40	0.23	0.50	1.10	2.10	7.80	95
-SMOK & FIRE PL	11	1.69	1.19	1.28	2.31	0.30	0.79	1.30	2.60	4.00	70
FIRE PL	45	1.65	1.65	1.01	3.03	0.02	0.56	0.95	2.60	8.20	100
WOOD ST NO GH	55	1.58	1.53	1.03	2.64	0.07	0.48	0.92	2.40	8.30	97
WOOD ST & GH	22	1.52	0.81	1.29	1.87	0.21	0.98	1.45	1.80	3.30	53
NONE	38	1.86	1.96	1.17	2.63	0.27	0.57	1.15	3.20	9.40	106
GAS HEAT	50	1.40	1.59	0.88	2.66	0.07	0.41	0.83	1.70	8.80	114

--------------- COMPOUND=Benzo(ghi)perylene TYPE=INDOOR/OUTDOOR RATIO -----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	49	1.99	3.39	1.31	2.14	0.37	0.80	1.12	1.96	23.94	171
-SMOK & FIRE PL	11	1.16	0.40	1.10	1.39	0.63	0.85	1.13	1.33	2.10	34
FIRE PL	44	1.22	1.73	0.87	1.91	0.42	0.60	0.74	0.98	10.63	142
WOOD ST NO GH	54	1.66	5.26	0.87	2.12	0.32	0.51	0.74	1.25	39.29	316
WOOD ST & GH	22	0.75	0.39	0.67	1.61	0.27	0.48	0.57	0.94	1.69	51
NONE	35	0.68	0.49	0.59	1.65	0.25	0.41	0.56	0.73	2.86	72
GAS HEAT	48	1.26	3.95	0.67	2.02	0.22	0.49	0.61	0.76	27.94	313

COMPOUND=Coronene TYPE=INDOOR CONCENTRATION

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	52	1.25	1.27	0.92	2.16	0.15	0.56	0.94	1.50	8.50	101
A2-SMOK & FIRE PL	11	1.30	0.86	1.03	2.15	0.29	0.66	1.20	1.70	3.20	67
B-FIRE PL	44	1.27	2.42	0.67	2.87	0.04	0.32	0.54	1.58	16.00	190
C-WOOD ST NO GH	54	1.19	1.57	0.67	2.93	0.10	0.25	0.63	1.40	8.60	131
D-WOOD ST & GH	22	0.86	0.68	0.62	2.41	0.07	0.37	0.65	1.10	2.40	79
E-NONE	36	1.23	1.68	0.66	3.08	0.08	0.33	0.55	1.47	9.20	137
F-GAS HEAT	51	0.68	0.68	0.48	2.23	0.13	0.26	0.49	0.80	4.10	100

COMPOUND=Coronene TYPE=OUTDOOR CONCENTRATION

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	1.00	0.87	0.69	2.45	0.14	0.35	0.70	1.25	3.80	87
A2-SMOK & FIRE PL	11	1.02	0.77	0.78	2.24	0.20	0.48	0.81	1.60	2.80	75
B-FIRE PL	45	1.05	1.05	0.66	2.84	0.00	0.35	0.61	1.40	4.90	100
C-WOOD ST NO GH	55	0.89	0.91	0.56	2.68	0.07	0.25	0.52	1.40	5.10	103
D-WOOD ST & GH	22	0.88	0.56	0.72	2.02	0.11	0.54	0.73	1.00	2.20	63
E-NONE	38	1.27	1.30	0.78	2.75	0.14	0.31	0.65	1.80	5.20	102
F-GAS HEAT	50	0.89	0.93	0.61	2.35	0.14	0.33	0.59	1.00	4.60	105

COMPOUND=Coronene TYPE=INDOOR/OUTDOOR RATIO

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	2.24	3.85	1.42	2.23	0.47	0.84	1.10	2.11	26.56	172
A2-SMOK & FIRE PL	11	1.38	0.41	1.32	1.35	0.75	1.00	1.34	1.59	2.10	30
B-FIRE PL	43	1.64	3.33	1.00	2.07	0.32	0.66	0.87	1.16	21.05	204
C-WOOD ST NO GH	54	2.11	5.23	1.16	2.22	0.39	0.75	0.98	1.47	37.39	248
D-WOOD ST & GH	22	0.97	0.57	0.87	1.61	0.31	0.65	0.84	1.14	3.12	58
E-NONE	35	1.06	1.32	0.77	1.95	0.35	0.46	0.68	0.93	6.98	125
F-GAS HEAT	48	1.35	3.61	0.82	1.92	0.39	0.55	0.74	0.94	25.62	267

------------------- COMPOUND=Quinoline TYPE=INDOOR CONCENTRATION --------------------

RCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	45	34.75	56.24	6.07	9.91	0.00	0.00	9.40	45.00	220.00	162
-SMOK & FIRE PL	11	54.92	55.16	22.91	6.13	0.00	5.80	36.00	100.00	160.00	100
IRE PL	44	3.08	6.76	1.14	3.94	0.00	0.00	0.00	3.62	40.00	219
OOD ST NO GH	52	2.13	4.58	0.88	3.54	0.00	0.00	0.00	2.40	22.00	215
OOD ST & GH	21	2.03	2.71	1.17	3.13	0.00	0.00	0.80	2.80	8.70	134
ONE	33	1.94	4.55	0.82	3.45	0.00	0.00	0.00	2.00	23.00	235
AS HEAT	47	2.30	5.66	0.78	3.65	0.00	0.00	0.00	0.00	28.00	246

------------------- COMPOUND=Quinoline TYPE=OUTDOOR CONCENTRATION --------------------

RCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	50	1.87	3.03	0.38	7.47	0.00	0.00	0.00	3.20	13.25	162
-SMOK & FIRE PL	11	1.47	1.74	0.45	6.83	0.00	0.00	0.63	3.00	4.60	118
IRE PL	44	1.38	1.96	0.34	6.62	0.00	0.00	0.00	2.25	7.30	142
OOD ST NO GH	55	0.95	1.80	0.22	5.47	0.00	0.00	0.00	1.75	8.10	190
WOOD ST & GH	22	1.54	1.83	0.47	6.65	0.00	0.00	1.35	2.30	5.60	118
NONE	37	1.76	3.42	0.31	7.34	0.00	0.00	0.00	2.50	18.00	194
GAS HEAT	48	3.40	18.70	0.24	6.23	0.00	0.00	0.00	0.95	130.00	550

------------------- COMPOUND=Quinoline TYPE=INDOOR/OUTDOOR RATIO --------------------

RCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	43	185.66	467.21	15.04	16.11	0.00	0.00	13.18	144.62	2615.4	252
-SMOK & FIRE PL	11	487.63	888.58	50.97	12.80	0.00	3.20	52.38	661.54	2461.5	182
FIRE PL	42	14.08	42.09	2.85	6.87	0.00	0.00	0.00	1.19	200.00	299
WOOD ST NO GH	52	16.54	58.53	4.28	5.21	0.00	0.00	0.00	0.87	338.46	354
WOOD ST & GH	21	8.32	29.03	2.25	5.69	0.00	0.00	0.51	1.89	133.85	349
NONE	31	14.81	64.13	2.68	7.59	0.00	0.00	0.00	0.61	353.85	433
GAS HEAT	43	15.58	67.61	3.50	7.40	0.00	0.00	0.00	0.90	430.77	434

M-2

Summary Statistics for PAH Concentrations
by Source Category - Not Adjusted for Recovery

------------------ COMPOUND=Acenaphthylene TYPE=INDOOR CONCENTRATION ------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	16.46	19.25	10.29	2.54	2.50	4.90	8.85	18.00	97.00	117
2-SMOK & FIRE PL	11	17.87	11.70	14.36	2.08	3.70	8.30	16.00	24.00	41.00	65
-FIRE PL	43	9.36	9.51	5.76	3.03	0.00	3.20	5.90	12.00	38.00	102
-WOOD ST NO GH	51	8.61	12.09	4.66	3.00	0.45	2.10	3.90	11.00	72.00	140
-WOOD ST & GH	21	7.26	8.22	4.83	2.44	0.81	2.50	4.10	9.60	38.00	113
-NONE	32	7.02	7.78	4.29	3.00	0.00	2.20	4.78	7.15	37.00	111
-GAS HEAT	44	4.45	3.45	3.17	2.68	0.00	2.35	3.65	5.50	15.00	78

------------------ COMPOUND=Acenaphthylene TYPE=OUTDOOR CONCENTRATION ------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	10.86	13.65	5.81	3.12	0.90	2.00	6.25	13.00	71.00	126
A2-SMOK & FIRE PL	11	12.35	9.22	8.42	2.78	1.80	3.00	11.00	20.00	27.00	75
B-FIRE PL	45	13.29	15.41	7.12	3.55	0.09	3.30	6.90	20.50	80.00	116
C-WOOD ST NO GH	55	13.17	17.78	5.98	3.65	0.53	2.50	4.90	19.00	72.00	135
D-WOOD ST & GH	22	9.65	5.28	7.88	2.09	1.10	5.70	9.95	13.00	19.00	55
E-NONE	38	11.97	14.95	6.36	3.12	0.41	3.50	5.40	15.00	56.00	125
F-GAS HEAT	50	9.22	18.52	4.73	3.02	0.19	2.30	4.45	10.00	130.00	201

------------------ COMPOUND=Acenaphthylene TYPE=INDOOR/OUTDOOR RATIO ------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	47	4.02	5.64	1.89	3.40	0.17	0.86	1.46	5.07	23.66	140
A2-SMOK & FIRE PL	11	2.39	2.36	1.70	2.27	0.51	0.99	1.41	3.67	8.57	99
B-FIRE PL	42	1.49	2.42	0.81	3.21	0.00	0.47	0.92	1.44	15.14	163
C-WOOD ST NO GH	51	1.93	4.94	0.74	3.44	0.03	0.37	0.66	1.21	34.29	256
D-WOOD ST & GH	21	0.79	0.64	0.56	2.52	0.06	0.38	0.62	1.00	2.42	81
E-NONE	31	1.12	1.30	0.63	3.45	0.00	0.39	0.65	1.29	5.33	116
F-GAS HEAT	42	1.31	2.30	0.70	3.09	0.00	0.43	0.70	1.22	14.74	176

------------------ COMPOUND=Phenanthrene TYPE=INDOOR CONCENTRATION ---------------------

JRCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	52	20.45	13.17	17.26	1.77	6.70	11.50	15.50	29.00	61.50	64
-SMOK & FIRE PL	11	20.68	19.87	15.94	1.99	6.40	10.00	13.00	25.00	77.00	96
FIRE PL	45	11.74	8.15	9.88	1.74	5.00	6.30	8.50	13.00	37.00	69
WOOD ST NO GH	53	12.75	12.18	10.17	1.83	3.60	7.00	9.20	13.00	81.00	96
WOOD ST & GH	21	11.37	4.61	10.52	1.50	5.20	7.90	9.60	15.00	21.00	41
NONE	36	11.51	5.79	10.53	1.49	6.30	8.10	9.35	12.50	31.00	50
GAS HEAT	51	9.99	5.78	8.89	1.59	3.60	7.00	8.10	12.00	36.00	58

------------------ COMPOUND=Phenanthrene TYPE=OUTDOOR CONCENTRATION --------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	50	14.71	13.72	10.29	2.31	2.60	5.00	10.00	18.00	66.00	93
2-SMOK & FIRE PL	11	13.71	6.55	11.95	1.80	5.00	5.30	14.00	20.00	21.00	48
-FIRE PL	45	16.43	13.99	11.97	2.33	0.86	7.30	12.00	23.00	76.00	85
-WOOD ST NO GH	55	18.32	20.30	11.54	2.61	1.10	6.10	9.20	23.00	89.00	111
-WOOD ST & GH	22	14.36	6.30	12.50	1.85	2.20	11.00	14.00	19.00	25.00	44
-NONE	38	13.82	12.92	9.97	2.21	2.70	5.80	8.75	17.00	58.00	94
-GAS HEAT	50	12.59	18.16	8.79	2.15	1.70	5.60	8.05	13.00	130.00	144

------------------ COMPOUND=Phenanthrene TYPE=INDOOR/OUTDOOR RATIO --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	49	2.45	2.11	1.70	2.46	0.14	0.83	1.47	3.61	9.62	86
2-SMOK & FIRE PL	11	1.64	1.21	1.33	1.94	0.46	0.90	1.20	1.89	4.28	74
-FIRE PL	44	1.12	1.05	0.85	2.10	0.14	0.54	0.78	1.48	6.24	93
WOOD ST NO GH	53	2.65	10.09	0.87	3.09	0.05	0.41	0.87	1.69	73.64	381
WOOD ST & GH	21	1.08	1.30	0.77	2.09	0.27	0.48	0.78	1.00	6.18	120
-NONE	35	1.27	0.75	1.05	1.98	0.16	0.67	1.08	1.81	2.94	59
-GAS HEAT	48	1.35	1.07	1.03	2.15	0.22	0.63	1.00	1.88	5.29	79

-------------------- COMPOUND=Anthracene TYPE=INDOOR CONCENTRATION --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	52	2.05	1.77	1.47	2.28	0.32	0.77	1.30	2.95	7.40	86
2-SMOK & FIRE PL	11	1.88	1.31	1.46	2.24	0.25	0.96	1.40	3.10	4.60	70
-FIRE PL	44	0.78	1.06	0.48	2.48	0.08	0.28	0.44	0.77	5.50	136
-WOOD ST NO GH	54	0.78	1.01	0.50	2.38	0.11	0.30	0.44	0.80	6.00	130
-WOOD ST & GH	21	0.60	0.45	0.44	2.37	0.11	0.25	0.52	0.98	1.70	76
-NONE	36	0.55	0.39	0.46	1.77	0.14	0.29	0.42	0.67	1.90	71
-GAS HEAT	51	0.81	1.81	0.43	2.42	0.09	0.25	0.38	0.63	11.00	222

-------------------- COMPOUND=Anthracene TYPE=OUTDOOR CONCENTRATION --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	1.59	2.06	0.89	2.92	0.09	0.37	0.84	1.70	11.00	129
2-SMOK & FIRE PL	11	1.36	0.92	1.04	2.27	0.35	0.39	1.10	2.40	2.50	67
-FIRE PL	45	1.81	2.05	1.07	3.00	0.03	0.52	0.94	2.30	11.00	113
-WOOD ST NO GH	55	2.34	3.46	1.07	3.45	0.10	0.42	0.85	2.80	17.00	148
-WOOD ST & GH	22	1.40	0.72	1.15	2.06	0.23	0.89	1.45	2.10	2.70	52
-NONE	38	1.42	1.65	0.85	2.77	0.09	0.48	0.78	1.50	7.50	116
-GAS HEAT	50	1.41	3.50	0.71	2.71	0.07	0.38	0.61	1.30	25.00	248

-------------------- COMPOUND=Anthracene TYPE=INDOOR/OUTDOOR RATIO --------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	3.21	3.99	1.69	3.36	0.03	0.85	1.44	4.23	19.57	124
A2-SMOK & FIRE PL	11	1.71	0.98	1.40	2.12	0.23	1.10	1.65	2.46	3.78	57
B-FIRE PL	43	0.70	0.66	0.46	2.65	0.05	0.20	0.51	0.89	2.50	94
C-WOOD ST NO GH	54	1.24	2.83	0.46	3.68	0.02	0.22	0.46	0.84	17.65	228
D-WOOD ST & GH	21	0.69	0.93	0.35	3.17	0.06	0.14	0.41	0.76	3.26	135
E-NONE	35	0.80	0.79	0.53	2.66	0.04	0.30	0.60	0.82	3.32	99
F-GAS HEAT	48	1.64	4.33	0.64	3.54	0.04	0.27	0.69	1.47	29.73	264

------------------ COMPOUND=Fluoranthene TYPE=INDOOR CONCENTRATION --------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	52	3.70	3.35	2.73	2.11	0.97	1.40	2.40	4.70	15.50	91
-SMOK & FIRE PL	11	3.08	2.53	2.36	2.13	0.64	1.40	2.20	3.60	8.90	82
FIRE PL	45	1.79	1.98	1.26	2.16	0.40	0.70	1.10	1.80	10.00	110
WOOD ST NO GH	54	2.08	2.53	1.44	2.17	0.30	0.81	1.35	2.00	16.00	122
WOOD ST & GH	22	1.61	0.81	1.43	1.66	0.45	1.00	1.40	2.10	3.60	50
NONE	36	1.45	1.08	1.19	1.83	0.58	0.73	0.99	1.95	5.20	75
GAS HEAT	51	1.16	0.69	1.00	1.67	0.49	0.61	0.92	1.40	3.50	60

------------------ COMPOUND=Fluoranthene TYPE=OUTDOOR CONCENTRATION --------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	50	4.92	5.45	3.24	2.38	0.87	1.60	2.77	5.40	27.00	111
2-SMOK & FIRE PL	11	4.10	2.31	3.31	2.14	0.76	1.50	4.30	6.30	7.20	56
-FIRE PL	45	5.15	5.04	3.50	2.49	0.20	2.00	3.10	6.60	26.00	98
-WOOD ST NO GH	55	6.64	8.27	3.85	2.79	0.36	2.00	3.30	7.00	38.00	125
-WOOD ST & GH	22	4.49	2.00	3.89	1.88	0.74	3.20	4.55	6.00	7.80	44
-NONE	38	4.73	5.52	3.09	2.38	0.81	1.70	2.35	5.50	28.00	117
-GAS HEAT	50	4.23	6.94	2.76	2.25	0.44	1.80	2.25	4.70	49.00	164

------------------ COMPOUND=Fluoranthene TYPE=INDOOR/OUTDOOR RATIO --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	49	1.35	1.37	0.86	2.63	0.07	0.37	0.76	1.68	6.13	102
2-SMOK & FIRE PL	11	0.86	0.52	0.71	1.99	0.17	0.51	0.65	1.27	1.84	60
-FIRE PL	44	0.53	0.66	0.37	2.14	0.09	0.24	0.30	0.48	3.40	125
-WOOD ST NO GH	54	1.05	3.33	0.37	2.95	0.03	0.20	0.34	0.53	22.22	316
-WOOD ST & GH	22	0.43	0.28	0.37	1.76	0.14	0.24	0.38	0.50	1.24	65
-NONE	35	0.42	0.19	0.37	1.75	0.08	0.22	0.42	0.58	0.73	45
-GAS HEAT	48	0.48	0.42	0.37	2.04	0.07	0.25	0.40	0.56	2.73	88

---------------------- COMPOUND=Pyrene TYPE=INDOOR CONCENTRATION ----------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	52	3.40	2.83	2.65	1.95	0.96	1.50	2.30	4.00	12.50	83
2-SMOK & FIRE PL	11	3.50	3.85	2.40	2.29	0.86	1.40	1.80	3.00	13.00	110
-FIRE PL	44	1.87	1.92	1.40	1.99	0.49	0.93	1.20	2.05	9.80	103
-WOOD ST NO GH	53	2.20	2.51	1.66	1.95	0.36	1.10	1.50	2.10	17.00	114
-WOOD ST & GH	22	1.70	0.71	1.56	1.56	0.52	1.30	1.60	1.90	3.50	42
-NONE	36	1.66	1.11	1.40	1.74	0.63	0.91	1.30	2.03	5.50	67
-GAS HEAT	51	1.32	0.60	1.21	1.52	0.57	0.86	1.20	1.60	3.40	45

---------------------- COMPOUND=Pyrene TYPE=OUTDOOR CONCENTRATION ----------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	4.86	5.77	3.01	2.53	0.68	1.40	2.45	5.10	29.00	119
A2-SMOK & FIRE PL	11	4.63	3.98	3.44	2.25	1.20	1.30	3.80	6.00	15.00	86
B-FIRE PL	45	4.91	4.96	3.23	2.64	0.14	1.80	3.20	6.20	26.00	101
C-WOOD ST NO GH	55	6.24	8.20	3.45	2.92	0.31	1.80	2.70	7.70	37.00	131
D-WOOD ST & GH	22	4.07	1.99	3.44	1.98	0.60	2.90	4.20	5.10	8.00	49
E-NONE	38	4.62	5.56	2.91	2.51	0.61	1.50	2.35	5.90	28.00	120
F-GAS HEAT	50	4.08	7.46	2.53	2.34	0.31	1.60	2.15	3.90	53.00	183

---------------------- COMPOUND=Pyrene TYPE=INDOOR/OUTDOOR RATIO ----------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	1.40	1.53	0.89	2.61	0.09	0.41	0.83	1.83	8.17	109
A2-SMOK & FIRE PL	11	0.91	0.70	0.70	2.20	0.19	0.34	0.70	1.23	2.65	77
B-FIRE PL	43	0.66	0.99	0.44	2.15	0.12	0.26	0.41	0.65	6.36	150
C-WOOD ST NO GH	53	0.97	2.14	0.46	2.71	0.05	0.25	0.48	0.65	12.14	221
D-WOOD ST & GH	22	0.54	0.42	0.45	1.77	0.21	0.30	0.43	0.60	2.00	76
E-NONE	35	0.56	0.31	0.47	1.90	0.10	0.31	0.52	0.77	1.26	56
F-GAS HEAT	48	0.67	0.74	0.49	2.16	0.06	0.31	0.54	0.80	5.16	110

---------------- COMPOUND=Benzo(a)anthracene TYPE=INDOOR CONCENTRATION -----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	51	1.09	1.44	0.58	3.12	0.04	0.25	0.50	1.70	8.40	132
2-SMOK & FIRE PL	11	1.01	1.18	0.63	2.80	0.11	0.27	0.68	1.50	4.30	117
-FIRE PL	45	0.43	0.57	0.19	3.74	0.02	0.07	0.16	0.55	2.20	133
-WOOD ST NO GH	54	0.48	1.13	0.21	3.04	0.03	0.10	0.17	0.33	8.00	234
-WOOD ST & GH	22	0.29	0.21	0.23	2.00	0.08	0.13	0.23	0.36	0.82	72
-NONE	36	0.31	0.49	0.12	3.93	0.00	0.04	0.09	0.37	2.00	160
-GAS HEAT	50	0.14	0.16	0.09	2.59	0.01	0.05	0.10	0.17	0.84	113

---------------- COMPOUND=Benzo(a)anthracene TYPE=OUTDOOR CONCENTRATION ----------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	50	1.14	1.51	0.56	3.29	0.09	0.19	0.46	1.10	6.50	132
A2-SMOK & FIRE PL	11	1.17	0.97	0.71	3.53	0.05	0.24	0.76	1.90	3.00	83
B-FIRE PL	45	1.24	1.73	0.58	3.91	0.01	0.26	0.58	1.40	9.60	139
C-WOOD ST NO GH	55	1.39	1.70	0.72	3.21	0.06	0.31	0.61	1.80	6.50	122
D-WOOD ST & GH	22	1.03	0.55	0.86	1.95	0.19	0.71	0.93	1.40	2.20	54
E-NONE	38	1.20	1.87	0.52	3.47	0.08	0.21	0.34	1.20	8.70	155
F-GAS HEAT	50	0.85	1.62	0.41	3.18	0.03	0.17	0.39	0.92	11.00	190

---------------- COMPOUND=Benzo(a)anthracene TYPE=INDOOR/OUTDOOR RATIO -----------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	48	2.67	4.65	1.05	3.70	0.10	0.44	0.76	2.72	23.33	174
A2-SMOK & FIRE PL	11	1.16	0.90	0.89	2.14	0.29	0.50	0.63	2.26	2.80	78
B-FIRE PL	44	0.57	0.79	0.34	2.57	0.06	0.18	0.27	0.62	4.14	139
C-WOOD ST NO GH	54	1.46	8.33	0.29	2.77	0.03	0.17	0.28	0.48	61.54	573
D-WOOD ST & GH	22	0.32	0.21	0.27	1.87	0.09	0.16	0.28	0.42	0.91	65
E-NONE	35	0.25	0.12	0.22	1.85	0.00	0.16	0.25	0.34	0.51	49
F-GAS HEAT	47	0.34	0.35	0.24	2.14	0.06	0.15	0.23	0.37	1.86	103

--------------------- COMPOUND=Chrysene TYPE=INDOOR CONCENTRATION ---------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	52	1.60	1.70	0.98	2.74	0.12	0.46	0.88	2.75	8.40	106
2-SMOK & FIRE PL	11	1.38	1.09	0.98	2.58	0.17	0.58	1.10	2.30	3.60	79
-FIRE PL	45	0.55	0.71	0.27	3.42	0.03	0.10	0.24	0.80	2.80	128
-WOOD ST NO GH	54	0.56	1.12	0.29	2.76	0.04	0.13	0.25	0.51	7.80	199
-WOOD ST & GH	22	0.37	0.23	0.31	1.89	0.10	0.17	0.33	0.50	1.00	62
-NONE	36	0.39	0.56	0.18	3.39	0.00	0.07	0.17	0.51	2.45	144
-GAS HEAT	47	0.21	0.20	0.15	2.25	0.03	0.09	0.15	0.25	0.95	95

--------------------- COMPOUND=Chrysene TYPE=OUTDOOR CONCENTRATION ---------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	1.46	1.72	0.84	2.80	0.19	0.31	0.67	1.50	7.10	118
2-SMOK & FIRE PL	11	1.59	1.16	1.06	3.10	0.09	0.50	1.20	2.50	3.40	73
-FIRE PL	45	1.64	2.06	0.90	3.19	0.03	0.40	0.91	1.90	11.00	126
-WOOD ST NO GH	55	1.83	1.99	1.09	2.83	0.12	0.52	0.92	2.40	7.30	108
-WOOD ST & GH	22	1.46	0.73	1.23	1.94	0.25	1.00	1.40	1.85	3.00	50
-NONE	38	1.53	2.10	0.80	3.00	0.18	0.37	0.54	1.80	9.80	137
-GAS HEAT	50	1.16	1.92	0.65	2.74	0.07	0.33	0.56	1.30	13.00	165

--------------------- COMPOUND=Chrysene TYPE=INDOOR/OUTDOOR RATIO ---------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	2.42	3.55	1.20	3.14	0.11	0.51	1.03	2.65	15.36	146
A2-SMOK & FIRE PL	11	1.16	0.95	0.92	2.02	0.27	0.64	0.82	1.44	3.67	82
B-FIRE PL	44	0.43	0.50	0.30	2.20	0.07	0.17	0.24	0.49	2.87	115
C-WOOD ST NO GH	54	0.97	5.02	0.26	2.57	0.04	0.15	0.26	0.42	37.14	518
D-WOOD ST & GH	22	0.29	0.15	0.25	1.72	0.09	0.19	0.27	0.38	0.62	52
E-NONE	35	0.24	0.11	0.22	1.71	0.00	0.16	0.23	0.33	0.53	46
F-GAS HEAT	45	0.30	0.27	0.23	2.01	0.07	0.15	0.21	0.34	1.35	91

-------------- COMPOUND=Benzo(k)fluoranthene TYPE=INDOOR CONCENTRATION ----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	51	3.30	4.61	2.01	2.61	0.25	0.95	1.90	3.90	31.00	140
-SMOK & FIRE PL	10	3.29	3.47	1.60	5.44	0.00	0.87	2.55	4.50	12.00	106
FIRE PL	45	1.64	1.79	0.94	2.95	0.15	0.38	0.76	2.20	7.00	109
WOOD ST NO GH	54	1.95	3.36	1.01	2.89	0.09	0.51	0.70	1.90	22.00	173
WOOD ST & GH	22	1.46	0.94	1.18	1.99	0.31	0.72	1.40	1.70	4.20	64
NONE	34	1.53	2.20	0.70	3.47	0.06	0.26	0.58	1.50	8.00	143
GAS HEAT	47	0.79	1.01	0.49	2.60	0.05	0.27	0.50	0.86	6.30	128

-------------- COMPOUND=Benzo(k)fluoranthene TYPE=OUTDOOR CONCENTRATION ---------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	50	3.01	3.14	1.81	2.84	0.22	0.71	1.65	3.80	13.00	104
2-SMOK & FIRE PL	11	3.27	2.42	2.25	2.77	0.34	1.00	2.50	5.80	6.60	74
-FIRE PL	45	3.11	3.63	1.78	3.09	0.08	0.79	1.90	3.80	19.00	117
-WOOD ST NO GH	55	3.38	3.39	2.14	2.69	0.18	1.15	1.90	4.40	12.00	100
-WOOD ST & GH	22	3.04	1.43	2.66	1.79	0.59	2.20	2.70	4.10	6.20	47
-NONE	38	3.08	4.04	1.57	3.41	0.00	0.78	1.25	3.40	19.00	131
-GAS HEAT	50	2.31	3.28	1.33	2.80	0.13	0.65	1.05	2.80	21.00	142

-------------- COMPOUND=Benzo(k)fluoranthene TYPE=INDOOR/OUTDOOR RATIO ----------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	48	1.97	3.00	1.16	2.53	0.23	0.65	1.07	1.81	18.24	152
2-SMOK & FIRE PL	10	0.91	0.63	0.62	3.36	0.00	0.64	0.69	1.44	2.07	69
-FIRE PL	44	0.67	0.51	0.54	1.88	0.17	0.34	0.41	0.80	2.11	76
-WOOD ST NO GH	54	1.64	8.49	0.46	2.37	0.15	0.28	0.39	0.67	62.86	517
-WOOD ST & GH	22	0.53	0.33	0.45	1.79	0.18	0.28	0.45	0.70	1.51	63
-NONE	33	0.58	1.09	0.39	1.97	0.10	0.29	0.38	0.52	6.58	188
-GAS HEAT	45	0.44	0.37	0.36	1.84	0.06	0.28	0.38	0.48	2.23	83

------------------ COMPOUND=Benzo(e)pyrene TYPE=INDOOR CONCENTRATION -------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	52	0.96	1.35	0.61	2.45	0.08	0.32	0.55	1.15	9.30	141
2-SMOK & FIRE PL	11	0.88	0.75	0.65	2.34	0.15	0.29	0.61	1.30	2.80	86
-FIRE PL	45	0.49	0.47	0.29	2.96	0.02	0.14	0.25	0.78	1.70	97
-WOOD ST NO GH	54	0.54	0.85	0.31	2.73	0.03	0.15	0.28	0.56	5.50	156
-WOOD ST & GH	22	0.40	0.23	0.33	1.92	0.10	0.23	0.41	0.55	0.95	57
-NONE	35	0.42	0.54	0.22	3.11	0.04	0.10	0.20	0.43	1.90	127
-GAS HEAT	49	0.24	0.27	0.16	2.47	0.02	0.08	0.19	0.28	1.70	113

------------------ COMPOUND=Benzo(e)pyrene TYPE=OUTDOOR CONCENTRATION ------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	0.78	0.72	0.53	2.44	0.10	0.24	0.51	1.10	3.00	92
2-SMOK & FIRE PL	11	0.89	0.59	0.66	2.51	0.10	0.30	0.80	1.30	2.00	67
-FIRE PL	45	0.83	0.87	0.51	2.95	0.02	0.25	0.51	1.00	4.50	104
-WOOD ST NO GH	55	0.86	0.76	0.59	2.48	0.05	0.30	0.55	1.20	2.80	89
-WOOD ST & GH	22	0.79	0.34	0.71	1.68	0.15	0.54	0.82	0.96	1.50	43
E-NONE	38	0.82	0.90	0.51	2.61	0.11	0.23	0.43	1.10	4.20	110
F-GAS HEAT	50	0.63	0.74	0.41	2.54	0.04	0.21	0.38	0.78	4.50	117

------------------ COMPOUND=Benzo(e)pyrene TYPE=INDOOR/OUTDOOR RATIO -------------------

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	2.07	3.48	1.20	2.46	0.24	0.80	1.05	2.00	21.63	168
A2-SMOK & FIRE PL	11	1.13	0.70	0.98	1.72	0.43	0.70	0.81	1.50	2.68	62
B-FIRE PL	44	0.74	0.65	0.58	1.90	0.19	0.39	0.47	0.79	3.16	88
C-WOOD ST NO GH	54	1.38	6.17	0.51	2.25	0.18	0.32	0.46	0.71	45.83	448
D-WOOD ST & GH	22	0.52	0.24	0.47	1.59	0.24	0.30	0.44	0.69	0.96	46
E-NONE	34	0.43	0.16	0.40	1.51	0.17	0.33	0.41	0.53	0.84	38
F-GAS HEAT	47	0.48	0.48	0.40	1.72	0.13	0.28	0.36	0.50	3.42	99

------------------ COMPOUND=Benzo(a)pyrene TYPE=INDOOR CONCENTRATION -------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	52	1.95	3.37	1.14	2.63	0.11	0.65	0.98	2.15	24.00	173
-SMOK & FIRE PL	11	1.85	1.92	1.22	2.64	0.24	0.47	1.10	2.70	7.00	104
FIRE PL	43	1.01	1.06	0.55	3.33	0.02	0.27	0.46	1.60	3.70	105
WOOD ST NO GH	54	1.18	2.43	0.54	3.18	0.04	0.22	0.43	1.20	17.00	206
WOOD ST & GH	22	0.79	0.53	0.62	2.19	0.09	0.35	0.81	1.00	2.30	67
NONE	35	0.83	1.24	0.33	3.88	0.03	0.14	0.26	0.75	4.40	149
GAS HEAT	49	0.40	0.53	0.24	2.77	0.03	0.11	0.26	0.50	3.40	133

------------------ COMPOUND=Benzo(a)pyrene TYPE=OUTDOOR CONCENTRATION -------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	1.19	1.40	0.59	3.62	0.03	0.21	0.71	1.70	6.20	117
2-SMOK & FIRE PL	11	1.37	1.10	0.86	3.21	0.15	0.19	0.96	2.30	3.50	80
-FIRE PL	45	1.31	1.70	0.61	3.91	0.01	0.24	0.62	1.90	9.10	130
-WOOD ST NO GH	55	1.32	1.48	0.70	3.30	0.06	0.29	0.59	2.10	5.10	112
-WOOD ST & GH	22	1.21	0.60	1.04	1.84	0.18	0.75	1.25	1.50	2.50	50
-NONE	38	1.23	1.82	0.50	3.78	0.07	0.17	0.32	1.50	8.30	148
-GAS HEAT	49	0.92	1.55	0.43	3.43	0.03	0.17	0.32	1.10	10.00	168

------------------ COMPOUND=Benzo(a)pyrene TYPE=INDOOR/OUTDOOR RATIO -------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	49	5.03	10.36	2.05	3.23	0.34	0.96	1.79	3.08	60.71	206
2-SMOK & FIRE PL	11	1.89	1.93	1.41	2.06	0.51	0.88	1.17	2.21	7.33	102
-FIRE PL	42	1.15	1.06	0.88	1.98	0.36	0.52	0.85	1.32	4.48	92
-WOOD ST NO GH	54	2.70	13.51	0.76	2.56	0.20	0.39	0.67	1.09	100.00	501
-WOOD ST & GH	22	0.69	0.38	0.59	1.78	0.17	0.39	0.52	0.92	1.53	55
-NONE	34	0.63	0.27	0.58	1.57	0.20	0.44	0.61	0.82	1.40	42
-GAS HEAT	46	0.64	0.37	0.56	1.65	0.16	0.38	0.54	0.73	2.33	58

COMPOUND=Indeno[1,2,3-cd]pyrene TYPE=INDOOR CONCENTRATION

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	2.55	3.94	1.70	2.27	0.19	1.20	1.65	2.50	28.00	154
2-SMOK & FIRE PL	11	2.29	1.88	1.74	2.20	0.39	1.10	1.60	3.00	7.10	82
-FIRE PL	44	1.65	1.50	1.03	3.06	0.00	0.58	1.00	2.70	5.80	91
-WOOD ST NO GH	54	1.83	2.68	1.07	2.75	0.07	0.51	0.86	2.20	18.00	146
-WOOD ST & GH	22	1.40	0.88	1.12	2.07	0.26	0.68	1.40	2.00	3.60	63
-NONE	36	1.42	1.74	0.79	2.97	0.12	0.36	0.81	1.35	7.00	122
-GAS HEAT	51	0.90	0.83	0.63	2.48	0.08	0.36	0.68	1.30	5.20	92

COMPOUND=Indeno[1,2,3-cd]pyrene TYPE=OUTDOOR CONCENTRATION

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	48	1.89	1.67	1.24	2.73	0.08	0.55	1.40	2.80	7.00	89
2-SMOK & FIRE PL	11	2.07	1.41	1.55	2.39	0.30	0.66	1.60	3.30	4.60	68
-FIRE PL	44	1.99	1.97	1.17	3.46	0.01	0.63	1.20	3.00	9.10	99
-WOOD ST NO GH	55	1.94	1.78	1.29	2.55	0.13	0.66	1.10	2.80	6.70	92
-WOOD ST & GH	22	1.88	0.93	1.63	1.82	0.26	1.20	1.80	2.30	4.10	50
E-NONE	38	1.90	2.19	1.10	2.82	0.13	0.52	0.88	3.00	9.80	115
F-GAS HEAT	50	1.53	1.84	0.96	2.61	0.14	0.50	0.85	2.00	11.00	120

COMPOUND=Indeno[1,2,3-cd]pyrene TYPE=INDOOR/OUTDOOR RATIO

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	46	2.77	5.04	1.52	2.52	0.38	0.83	1.38	2.26	25.45	182
A2-SMOK & FIRE PL	11	1.20	0.51	1.12	1.47	0.69	0.86	1.00	1.38	2.22	43
B-FIRE PL	43	1.31	1.63	0.90	2.23	0.00	0.57	0.74	1.31	8.00	124
C-WOOD ST NO GH	54	1.58	5.23	0.81	2.11	0.30	0.52	0.71	1.10	39.13	330
D-WOOD ST & GH	22	0.78	0.42	0.69	1.68	0.33	0.44	0.63	0.87	1.64	54
E-NONE	35	0.76	0.57	0.65	1.69	0.24	0.45	0.67	0.89	3.59	75
F-GAS HEAT	48	0.96	1.19	0.68	2.04	0.23	0.45	0.58	0.81	6.29	124

--------------- COMPOUND=Benzo(ghi)perylene TYPE=INDOOR CONCENTRATION -----------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	52	1.76	2.13	1.27	2.14	0.19	0.79	1.15	2.05	15.00	121
-SMOK & FIRE PL	11	1.72	1.40	1.29	2.26	0.33	0.91	1.20	2.20	5.30	81
FIRE PL	45	1.36	1.49	0.87	2.70	0.03	0.45	0.70	1.60	8.50	110
WOOD ST NO GH	54	1.45	1.82	0.90	2.60	0.10	0.43	0.88	1.80	12.00	126
WOOD ST & GH	22	1.08	0.65	0.87	2.07	0.13	0.51	1.10	1.40	2.60	60
NONE	36	1.27	1.54	0.73	2.88	0.12	0.33	0.65	1.37	6.40	121
GAS HEAT	50	0.76	0.67	0.56	2.18	0.15	0.27	0.59	0.95	4.00	88

--------------- COMPOUND=Benzo(ghi)perylene TYPE=OUTDOOR CONCENTRATION -----------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	1.53	1.32	1.09	2.31	0.24	0.51	1.10	2.00	5.60	86
2-SMOK & FIRE PL	11	1.66	1.08	1.26	2.35	0.26	0.74	1.40	2.70	3.50	65
-FIRE PL	45	1.61	1.55	1.01	2.97	0.02	0.58	0.99	2.50	7.50	96
-WOOD ST NO GH	55	1.50	1.34	1.02	2.53	0.08	0.52	0.91	2.20	6.20	89
-WOOD ST & GH	22	1.47	0.75	1.26	1.85	0.21	0.93	1.32	1.90	3.10	51
-NONE	38	1.74	1.78	1.13	2.54	0.26	0.54	1.05	2.80	8.20	102
-GAS HEAT	50	1.32	1.44	0.85	2.63	0.07	0.45	0.84	1.60	8.00	109

--------------- COMPOUND=Benzo(ghi)perylene TYPE=INDOOR/OUTDOOR RATIO -----------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	49	1.82	3.15	1.23	2.05	0.41	0.81	1.04	1.80	22.06	173
2-SMOK & FIRE PL	11	1.07	0.34	1.02	1.34	0.71	0.74	1.05	1.27	1.89	32
-FIRE PL	44	1.21	1.72	0.87	1.92	0.41	0.58	0.73	1.02	10.63	142
-WOOD ST NO GH	54	1.70	5.55	0.86	2.14	0.33	0.51	0.77	1.21	41.38	326
-WOOD ST & GH	22	0.77	0.37	0.69	1.60	0.29	0.50	0.56	0.92	1.57	49
-NONE	35	0.70	0.51	0.61	1.64	0.25	0.43	0.58	0.76	2.96	72
-GAS HEAT	48	1.27	4.01	0.68	2.03	0.21	0.48	0.60	0.78	28.36	315

COMPOUND=Coronene TYPE=INDOOR CONCENTRATION

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	52	1.14	1.12	0.85	2.11	0.14	0.50	0.85	1.40	7.40	99
2-SMOK & FIRE PL	11	1.19	0.77	0.94	2.20	0.25	0.58	1.10	1.70	2.60	64
-FIRE PL	44	1.28	2.43	0.66	2.92	0.04	0.32	0.49	1.60	16.00	190
-WOOD ST NO GH	54	1.18	1.63	0.65	2.91	0.09	0.25	0.64	1.40	9.20	138
-WOOD ST & GH	22	0.85	0.66	0.62	2.43	0.06	0.33	0.69	0.94	2.30	77
-NONE	36	1.21	1.62	0.65	3.04	0.09	0.29	0.55	1.37	8.50	134
-GAS HEAT	51	0.67	0.69	0.47	2.23	0.13	0.23	0.48	0.78	4.20	103

COMPOUND=Coronene TYPE=OUTDOOR CONCENTRATION

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	0.94	0.77	0.67	2.36	0.13	0.35	0.68	1.25	2.80	82
2-SMOK & FIRE PL	11	1.00	0.69	0.77	2.27	0.19	0.50	0.91	1.50	2.40	69
-FIRE PL	45	1.03	1.01	0.66	2.76	0.00	0.38	0.62	1.30	4.80	99
-WOOD ST NO GH	55	0.84	0.77	0.56	2.57	0.07	0.27	0.50	1.50	3.80	92
-WOOD ST & GH	22	0.87	0.55	0.70	2.04	0.11	0.47	0.76	0.91	2.10	63
-NONE	38	1.20	1.21	0.75	2.66	0.17	0.31	0.60	1.60	4.50	101
-GAS HEAT	50	0.85	0.86	0.59	2.31	0.13	0.33	0.57	1.00	4.50	101

COMPOUND=Coronene TYPE=INDOOR/OUTDOOR RATIO

SOURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
A1-SMOKING	49	2.04	3.43	1.34	2.14	0.40	0.80	1.08	1.91	23.87	168
A2-SMOK & FIRE PL	11	1.25	0.32	1.22	1.29	0.85	0.92	1.19	1.37	1.87	26
B-FIRE PL	43	1.63	3.29	1.00	2.09	0.34	0.67	0.87	1.25	20.78	202
C-WOOD ST NO GH	54	2.16	5.60	1.14	2.24	0.41	0.73	0.96	1.41	40.00	259
D-WOOD ST & GH	22	0.99	0.53	0.88	1.60	0.32	0.65	0.85	1.22	2.87	54
E-NONE	35	1.08	1.35	0.79	1.95	0.37	0.50	0.75	0.88	7.32	125
F-GAS HEAT	48	1.37	3.69	0.82	1.95	0.35	0.54	0.78	1.00	26.25	270

-------------------- COMPOUND=Quinoline TYPE=INDOOR CONCENTRATION --------------------

URCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
-SMOKING	47	23.86	45.24	3.31	10.54	0.00	0.00	3.40	27.00	190.00	190
-SMOK & FIRE PL	11	34.97	35.71	13.88	6.44	0.00	4.30	21.00	81.00	92.00	102
FIRE PL	44	1.95	4.20	0.67	4.22	0.00	0.00	0.00	2.15	24.50	215
WOOD ST NO GH	54	1.19	2.47	0.48	3.61	0.00	0.00	0.00	1.40	11.00	208
WOOD ST & GH	21	1.34	1.76	0.73	3.41	0.00	0.00	0.57	2.60	6.90	131
NONE	34	1.25	2.98	0.46	3.68	0.00	0.00	0.00	0.85	15.00	239
GAS HEAT	48	1.32	3.23	0.43	3.73	0.00	0.00	0.00	0.00	16.00	244

-------------------- COMPOUND=Quinoline TYPE=OUTDOOR CONCENTRATION --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	50	1.05	1.75	0.24	6.68	0.00	0.00	0.00	1.50	7.70	167
2-SMOK & FIRE PL	11	0.93	1.04	0.31	6.56	0.00	0.00	0.51	2.00	2.70	113
-FIRE PL	45	0.82	1.19	0.22	6.17	0.00	0.00	0.00	1.20	4.60	146
-WOOD ST NO GH	55	0.66	1.16	0.16	5.48	0.00	0.00	0.00	1.09	4.30	176
-WOOD ST & GH	22	0.87	0.92	0.30	6.09	0.00	0.00	0.97	1.30	2.60	106
-NONE	38	0.92	1.93	0.20	6.29	0.00	0.00	0.00	1.40	11.00	210
-GAS HEAT	50	2.05	11.84	0.15	5.57	0.00	0.00	0.00	0.64	84.00	579

-------------------- COMPOUND=Quinoline TYPE=INDOOR/OUTDOOR RATIO --------------------

OURCES	N	MEAN	STD	GEOMEAN	GEOSTD	MIN	PC25	MED	PC75	MAX	CV
1-SMOKING	45	165.20	467.77	13.08	14.09	0.00	0.00	10.00	84.06	2888.9	283
2-SMOK & FIRE PL	11	410.64	758.92	45.46	12.60	0.00	2.14	41.18	422.22	2044.4	185
3-FIRE PL	43	16.06	46.03	2.75	7.25	0.00	0.00	0.00	1.82	220.00	287
C-WOOD ST NO GH	54	13.28	45.68	3.07	5.67	0.00	0.00	0.00	0.79	244.44	344
D-WOOD ST & GH	21	9.24	33.23	2.18	5.52	0.00	0.00	0.73	2.00	153.33	359
E-NONE	33	12.73	58.32	2.29	6.37	0.00	0.00	0.00	0.66	333.33	458
F-GAS HEAT	46	12.28	54.26	2.85	6.86	0.00	0.00	0.00	0.00	355.56	442

APPENDIX N
DETAILED MODELING RESULTS FOR INDOOR PAH CONCENTRATIONS

TABLE N-1 INDOOR MODEL ESTIMATION RESULTS - ALL DATA

COMPOUND	PARAMETER[a]	ESTIMATE	SIGNIFICANCE	STD.ERROR	95% CONFIDENCE LIMITS	
Acenaphthylene						
	g	0.4977	***	0.0511	0.3969	0.5985
	b1	13.2715		93.8521	-171.7118	198.2547
	b2	48.7953		46.2550	-42.3737	139.9643
	b3	17.4418	**	7.6375	2.3881	32.4955
	b4	-230.9735	***	49.1221	-327.7934	-134.1535
	b5	-109.7015		111.2839	-329.0430	109.6399
	b6	77.7877	***	18.0189	42.2723	113.3031
	b7	303.9620		250.0232	-188.8355	796.7596
	b8	-276.1326	***	111.5031	-495.9061	-56.3590
	b9	153.7711		164.0647	-169.6017	477.1438
	b10	17.9753		77.1879	-134.1626	170.1132
	b11	700.5612	***	143.2611	418.1925	982.9299
	b12	5509.7867		4274.9050	-2916.0830	13935.6564
Phenanthrene						
	g	0.4590	***	0.0504	0.3597	0.5584
	b1	587.8776	***	248.3131	98.6183	1077.1368
	b2	150.2339	**	75.6138	1.2497	299.2181
	b3	32.7619	*	17.6214	-1.9582	67.4820
	b4	-187.3265		124.1786	-431.9996	57.3466
	b5	-108.1480		279.2886	-658.4392	442.1432
	b6	96.3602	***	19.4813	57.9755	134.7448
	b7	-727.9646	*	382.6399	-1481.8920	25.9629
	b8	611.9577		397.4576	-171.1657	1395.0811
	b9	-106.1510		345.0025	-785.9204	573.6183
	b10	811.8461	***	203.0631	411.7444	1211.9478
	b11	358.3167		245.7135	-125.8204	842.4538
	b12	2220.9649		2362.0400	-2433.0376	6874.9674
Anthracene						
	g	0.1812	***	0.0289	0.1243	0.2380
	b1	45.9636	***	17.1158	12.2398	79.6873
	b2	12.0241	**	5.9183	0.3631	23.6851
	b3	1.6603		1.0960	-0.4993	3.8198
	b4	-12.3709		8.9673	-30.0394	5.2976
	b5	8.1772		17.1502	-25.6144	41.9687
	b6	14.6557	***	2.5166	9.6971	19.6143
	b7	-33.3362		24.6109	-81.8278	15.1553
	b8	1.3703		23.9891	-45.8962	48.6367
	b9	-18.7650		22.2491	-62.6031	25.0731
	b10	51.8945	***	13.0120	26.2567	77.5324
	b11	0.4780		13.9955	-27.0978	28.0537
	b12	53.9518		162.8280	-266.8733	374.7769

* = 0.10 level of significance; ** = 0.05 level; *** = 0.01 level

[a] g = penetration factor; definitions for b1 to b12 are given in Table 7-17

(continued)

TABLE N-1 (continued)

COMPOUND	PARAMETER[a]	ESTIMATE	SIGNIFICANCE	STD.ERROR	95% CONFIDENCE LIMITS	
Fluoranthene						
	g	0.2235	***	0.0233	0.1776	0.2695
	b1	35.1212	*	17.9062	-0.1492	70.3917
	b2	16.4380	**	7.5505	1.5655	31.3104
	b3	5.5652	***	1.7870	2.0453	9.0850
	b4	-17.1815		10.5756	-38.0126	3.6497
	b5	-5.3620		21.2843	-47.2864	36.5623
	b6	12.2074	***	2.1128	8.0458	16.3689
	b7	-12.4657		35.3855	-82.1656	57.2343
	b8	10.5842		29.3269	-47.1820	68.3505
	b9	17.0589		27.9675	-38.0296	72.1475
	b10	52.4856	***	15.9662	21.0364	83.9348
	b11	-2.0249		18.7377	-38.9331	34.8833
	b12	496.5273		348.6963	-190.3116	1183.3662
Pyrene						
	g	0.2425	***	0.0255	0.1922	0.2928
	b1	49.1392	***	20.6627	8.4376	89.8409
	b2	21.0745	***	8.5167	4.2981	37.8508
	b3	6.2091	***	1.8729	2.5198	9.8984
	b4	-20.4198	*	12.0390	-44.1344	3.2949
	b5	-2.0856		24.0305	-49.4213	45.2502
	b6	9.8745	***	1.9094	6.1133	13.6356
	b7	-13.3519		41.3892	-94.8809	68.1771
	b8	-3.5613		32.1243	-66.8403	59.7177
	b9	8.5979		31.1250	-52.7125	69.9084
	b10	75.2683	***	18.1089	39.5971	110.9396
	b11	12.8049		20.9056	-28.3754	53.9851
	b12	433.2901		310.3974	-178.1354	1044.7155
Benzo(a)anthracene						
	g	0.2271	***	0.0174	0.1929	0.2614
	b1	5.1872	***	1.5324	2.1687	8.2057
	b2	3.4085	***	1.0262	1.3871	5.4299
	b3	0.3642	**	0.1744	0.0207	0.7078
	b4	-2.1865		1.5496	-5.2389	0.8659
	b5	2.5328		1.5354	-0.4916	5.5573
	b6	3.4708	***	0.4779	2.5295	4.4121
	b7	-0.4694		2.5911	-5.5734	4.6346
	b8	-3.5576	**	1.7428	-6.9904	-0.1247
	b9	-5.8338	***	1.4107	-8.6125	-3.0551
	b10	0.7144		1.2448	-1.7376	3.1664
	b11	-3.7108	***	1.5289	-6.7223	-0.6993
	b12	130.7360		87.7874	-42.1853	303.6574

* = 0.10 level of significance; ** = 0.05 level; *** = 0.01 level

[a] g = penetration factor; definitions for b1 to b12 are given in Table 7-17

(continued)

TABLE N-1 (continued)

COMPOUND	PARAMETER[a]	ESTIMATE	SIGNIFICANCE	STD.ERROR	95% CONFIDENCE LIMITS	
Chrysene						
	g	0.2220	***	0.0162	0.1902	0.2538
	b1	7.6364	***	2.2129	3.2775	11.9954
	b2	3.9047	***	1.2354	1.4711	6.3383
	b3	0.3516		0.2321	-0.1056	0.8087
	b4	-3.2243	*	1.8979	-6.9629	0.5142
	b5	4.1871	**	2.0762	0.0973	8.2770
	b6	6.5696	***	0.7717	5.0496	8.0896
	b7	1.5335		4.3678	-7.0702	10.1373
	b8	-1.2062		3.5303	-8.1602	5.7477
	b9	-7.8670	***	1.9786	-11.7645	-3.9695
	b10	0.2133		1.9138	-3.5566	3.9831
	b11	-6.3194	***	2.1826	-10.6188	-2.0200
	b12	143.9099		101.7396	-56.4982	344.3180
Benzo(k)fluoranthene						
	g	0.3866	***	0.0234	0.3405	0.4326
	b1	-3.8587		5.2994	-14.2989	6.5815
	b2	11.3374	***	3.8324	3.7872	18.8875
	b3	0.2648		0.6195	-0.9556	1.4853
	b4	-4.7637		5.5730	-15.7428	6.2155
	b5	3.3707		7.1308	-10.6773	17.4188
	b6	8.5046	***	1.1806	6.1787	10.8306
	b7	19.3612		13.0722	-6.3920	45.1144
	b8	-0.0796		7.5988	-15.0498	14.8905
	b9	-17.7558	***	7.4007	-32.3356	-3.1760
	b10	-3.5584		4.3984	-12.2237	5.1068
	b11	10.4810		6.6892	-2.6973	23.6592
	b12	580.7605	*	310.8778	-31.6895	1193.2105
Benzo(e)pyrene						
	g	0.4463	***	0.0242	0.3986	0.4940
	b1	2.0137		1.6071	-1.1519	5.1794
	b2	2.1150	***	0.7482	0.6412	3.5887
	b3	0.1512		0.1779	-0.1992	0.5017
	b4	1.1068		1.5876	-2.0205	4.2340
	b5	-2.0491		2.1039	-6.1934	2.0951
	b6	2.7270	***	0.3299	2.0772	3.3768
	b7	8.0848	**	3.6557	0.8838	15.2859
	b8	-0.9641		2.3197	-5.5335	3.6052
	b9	-3.4945		2.3367	-8.0974	1.1084
	b10	-2.5808	**	1.2867	-5.1154	-0.0462
	b11	1.1946		1.8918	-2.5318	4.9211
	b12	128.9266	*	73.0855	-15.0383	272.8915

* = 0.10 level of significance; ** = 0.05 level; *** = 0.01 level

[a] g = penetration factor; definitions for b1 to b12 are given in Table 7-17

(continued)

TABLE N-1 (continued)

COMPOUND	PARAMETER[a]	ESTIMATE	SIGNIFICANCE	STD.ERROR	95% CONFIDENCE LIMITS	
Benzo(a)pyrene						
	g	0.5410	***	0.0315	0.4789	0.6030
	b1	0.8596		2.6487	-4.3582	6.0774
	b2	3.7176	***	1.3942	0.9711	6.4640
	b3	0.6895	**	0.3162	0.0666	1.3124
	b4	4.1537		2.9989	-1.7541	10.0614
	b5	-1.5890		3.3519	-8.1919	5.0140
	b6	5.5894	***	0.6690	4.2715	6.9073
	b7	5.1166		8.7125	-12.0465	22.2798
	b8	2.9892		4.0656	-5.0198	10.9982
	b9	-4.4221		2.9448	-10.2232	1.3789
	b10	0.7940		1.8451	-2.8408	4.4289
	b11	2.4710		2.8679	-3.1786	8.1206
	b12	279.7334	*	155.9902	-27.5577	587.0246
Indeno[1,2,3-cd]pyrene						
	g	0.6440	***	0.0400	0.5653	0.7228
	b1	18.5533	***	6.8261	5.1065	32.0000
	b2	6.0543	***	2.2006	1.7195	10.3892
	b3	1.3573	**	0.6709	0.0358	2.6789
	b4	10.5340		7.2753	-3.7977	24.8657
	b5	8.1215		8.4524	-8.5289	24.7718
	b6	6.1842	***	1.0224	4.1702	8.1981
	b7	1.0100		8.7464	-16.2195	18.2395
	b8	-30.2887	***	7.1381	-44.3501	-16.2274
	b9	-10.5132		9.6889	-29.5994	8.5730
	b10	-5.2736		5.1337	-15.3865	4.8393
	b11	0.2311		6.6251	-12.8196	13.2818
	b12	364.2317		233.0723	-94.8969	823.3602
Benzo(ghi)perylene						
	g	0.6146	***	0.0353	0.5450	0.6841
	b1	4.2570		5.8949	-7.3544	15.8684
	b2	4.8394	***	1.8050	1.2839	8.3949
	b3	1.0413	**	0.4939	0.0686	2.0141
	b4	4.9279		4.8356	-4.5969	14.4527
	b5	-0.6424		7.4479	-15.3128	14.0280
	b6	3.7693	***	0.6424	2.5039	5.0347
	b7	42.7846	**	18.9401	5.4775	80.0916
	b8	-1.3283		10.1995	-21.4185	18.7620
	b9	-12.1934		7.7649	-27.4882	3.1014
	b10	-3.4836		3.8518	-11.0706	4.1035
	b11	14.8073	**	6.5318	1.9413	27.6733
	b12	268.8237	*	154.8864	-36.2613	573.9088

* = 0.10 level of significance; ** = 0.05 level; *** = 0.01 level

[a] g = penetration factor; definitions for b1 to b12 are given in Table 7-17

(continued)

TABLE N-1 (continued)

COMPOUND	PARAMETER[a]	ESTIMATE	SIGNIFICANCE	STD.ERROR	95% CONFIDENCE LIMITS	
Coronene						
	g	0.7571	***	0.0504	0.6579	0.8564
	b1	1.0771		5.2400	-9.2446	11.3988
	b2	4.1168	***	1.6254	0.9150	7.3186
	b3	0.9326	***	0.3954	0.1538	1.7114
	b4	4.2774		4.5812	-4.7466	13.3014
	b5	-0.9497		6.8265	-14.3964	12.4970
	b6	2.0155	***	0.4778	1.0743	2.9566
	b7	36.1312	*	18.6211	-0.5483	72.8106
	b8	-5.9637		9.5238	-24.7234	12.7961
	b9	-7.2433		7.2679	-21.5593	7.0728
	b10	-1.1813		3.9065	-8.8762	6.5136
	b11	14.0155	***	5.9059	2.3823	25.6487
	b12	149.1766		106.3385	-60.2863	358.6395

* = 0.10 level of significance; ** = 0.05 level; *** = 0.01 level

[a] g = penetration factor; definitions for b1 to b12 are given in Table 7-17

TABLE N-2

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ALL DATA

COMPOUND	N	MEAN	USS	CSS	REGDF	REGSS
Acenaphthylene	229	2.20785	1485.1602	368.87957	13	1310.3767
Phenanthrene	243	2.93180	2164.3839	75.68934	13	2069.9697
Anthracene	243	0.01292	214.24564	214.20504	13	39.33238
Fluoranthene	257	0.51099	207.43966	140.33306	13	96.19055
Pyrene	255	0.61381	200.79242	104.71941	13	101.50318
Benzo(a)anthracene	256	-1.44039	927.44829	396.31793	13	803.64455
Chrysene	255	-1.04102	640.28899	363.94095	13	536.82536
Benzo(k)fluoranthene	249	0.01321	304.41430	304.37082	13	223.65290
Benzo(e)pyrene	255	-1.15954	620.42505	277.56810	13	553.37430
Benzo(a)pyrene	252	-0.61763	455.53101	359.39995	13	379.01787
Indeno[1,2,3-cd]pyrene	253	0.04329	281.46815	280.99391	13	199.94353
Benzo(ghi)perylene	257	-0.12778	216.02639	211.83014	13	149.56275
Coronene	256	-0.40076	271.33110	230.21523	13	182.99884

COMPOUND	REGMS	RESDF	_SSE_	RESMS	RSQ
Acenaphthylene	100.79821	216	174.78351	0.80918	52.6
Phenanthrene	159.22844	230	94.41418	0.41050	-25
Anthracene	3.02557	230	174.91326	0.76049	18.3
Fluoranthene	7.39927	244	111.24911	0.45594	20.7
Pyrene	7.80794	242	99.28924	0.41029	5.2
Benzo(a)anthracene	61.81881	243	123.80374	0.50948	68.8
Chrysene	41.29426	242	103.46362	0.42754	71.6
Benzo(k)fluoranthene	17.20407	236	80.76140	0.34221	73.5
Benzo(e)pyrene	42.56725	242	67.05075	0.27707	75.8
Benzo(a)pyrene	29.15522	239	76.51313	0.32014	78.7
Indeno[1,2,3-cd]pyrene	15.38027	240	81.52461	0.33969	71.0
Benzo(ghi)perylene	11.50483	244	66.46364	0.27239	68.6
Coronene	14.07683	243	88.33227	0.36351	61.6

NOTE: All statistics refer to base-e logarithms of concentrations.
N = sample size
USS = total uncorrected sum of squares (SS)
CSS = total sum of squares, corrected for the MEAN
REGDF = regression (model) degrees of freedom (DF)
REGSS = regression sum of squares
REGMS = regression mean square = REGSS/REGDF
RESDF = residual DF = N-REGDF
SSE = residual sum of squares = SS(deviations from model predictions)
RESMS = residual mean square = _SSE_/RESDF
RSQ = percent of variation accounted for by the model
= (1-_SSE_/CSS)x100%.

On the following pages, STDERR values denote the standard errors of the corresponding parameter estimates. Asterisks in the column labeled "SIG" denote those estimates that are statistically significant at the 0.10 level (*), at the 0.05 level (**), or at the 0.01 level (***).

TABLE N-3

SUMMARY OF NONLINEAR ESTIMATION RESULTS: PLACERVILLE DATA

COMPOUND	_TYPE_	N	MEAN	USS	CSS	REGDF	REGSS
Acenaphthylene	FINAL	117	2.13669	750.91993	216.76232	13	665.95853
Pyrene	FINAL	125	0.83221	147.17847	60.60659	13	83.78567
Benzo(a)anthracene	FINAL	126	-0.95491	272.29060	157.39659	13	211.62931
Benzo(ghi)perylene	FINAL	126	0.04496	109.99663	109.74192	13	81.78028
Coronene	FINAL	126	-0.39903	130.78635	110.72360	13	94.46752

COMPOUND	_TYPE_	REGMS	RESDF	_SSE_	RESMS	RSQ
Acenaphthylene	FINAL	51.22758	104	84.96140	0.81694	60.8
Pyrene	FINAL	6.44505	112	63.39280	0.56601	-4.6
Benzo(a)anthracene	FINAL	16.27918	113	60.66129	0.53683	61.5
Benzo(ghi)perylene	FINAL	6.29079	113	28.21635	0.24970	74.3
Coronene	FINAL	7.26673	113	36.31883	0.32141	67.2

NOTE: All statistics refer to base-e logarithms of concentrations.
N = sample size
USS = total uncorrected sum of squares (SS)
CSS = total sum of squares, corrected for the MEAN
REGDF = regression (model) degrees of freedom (DF)
REGSS = regression sum of squares
REGMS = regression mean square = REGSS/REGDF
RESDF = residual DF = N-REGDF
SSE = residual sum of squares = SS(deviations from model predictions)
RESMS = residual mean square = _SSE_/RESDF
RSQ = percent of variation accounted for by the model
= (1-_SSE_/CSS)x100%.

On the following pages, STDERR values denote the standard errors of the corresponding parameter estimates. Asterisks in the column labeled "SIG" denote those estimates that are statistically significant at the 0.10 level (*), at the 0.05 level (**), or at the 0.01 level (***).

TABLE N-4

SUMMARY OF NONLINEAR ESTIMATION RESULTS: PLACERVILLE DATA

Acenaphthylene ---------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.3851	***	0.0633	0.2596	0.5106
b1	169.1685		160.6493	-149.4051	487.7421
b2	66.1889		46.7242	-26.4669	158.8447
b3	10.4243		9.7455	-8.9014	29.7499
b4	-174.2378	***	51.8182	-276.9952	-71.4805
b5	-154.8025		246.6227	-643.8645	334.2595
b6	97.6257	***	26.7923	44.4955	150.7559
b7	14.8946		280.1558	-540.6649	570.4541
b8	282.3155		397.3888	-505.7213	1070.3524
b9	64.5551		235.1570	-401.7701	530.8803
b10	124.1872		108.7697	-91.5072	339.8816
b11	9.6707		138.4761	-264.9326	284.2739
b12	5724.8155		4403.0359	-3006.5699	14456.2010

Pyrene ------------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2218	***	0.0375	0.1475	0.2961
b1	45.9659		35.1926	-23.7637	115.6956
b2	35.7255	**	15.2628	5.4842	65.9669
b3	7.0515	***	2.7897	1.5240	12.5789
b4	-39.3861		29.4701	-97.7772	19.0051
b5	-19.4583		58.8781	-136.1177	97.2011
b6	10.1517	***	3.3340	3.5459	16.7576
b7	-26.6538		76.8841	-178.9898	125.6823
b8	70.7892		95.1313	-117.7013	259.2798
b9	7.9969		70.8613	-132.4056	148.3994
b10	75.0949	***	29.5555	16.5344	133.6553
b11	31.5475		41.3563	-50.3946	113.4897
b12	405.8673		365.1386	-317.6080	1129.3426

TABLE N-4 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: PLACERVILLE DATA

Benzo(a)anthracene ------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2538	***	0.0287	0.1970	0.3106
b1	3.1896		3.6338	-4.0095	10.3888
b2	2.4626	*	1.4542	-0.4184	5.3436
b3	-0.0152		0.2660	-0.5421	0.5117
b4	-3.7219		3.7480	-11.1474	3.7037
b5	-4.4081		7.1736	-18.6204	9.8042
b6	4.4499	***	0.9357	2.5962	6.3036
b7	3.7781		8.5449	-13.1509	20.7070
b8	0.1296		7.6169	-14.9608	15.2200
b9	0.2988		6.6187	-12.8140	13.4116
b10	3.0268		2.7570	-2.4354	8.4890
b11	1.5301		4.7440	-7.8687	10.9289
b12	98.4865		89.7449	-79.3143	276.2874

Benzo(ghi)perylene ------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.6839	***	0.0523	0.5802	0.7875
b1	-3.9159		7.2833	-18.3455	10.5136
b2	3.4466		2.1710	-0.8545	7.7477
b3	0.7550		0.6132	-0.4599	1.9699
b4	-4.6108		7.0175	-18.5137	9.2921
b5	-8.9076		14.8270	-38.2826	20.4673
b6	3.5067	***	0.8816	1.7602	5.2533
b7	-3.8849		19.0140	-41.5551	33.7853
b8	-11.3901		22.9754	-56.9085	34.1283
b9	-6.0142		12.4022	-30.5852	18.5568
b10	-1.6385		5.6756	-12.8829	9.6059
b11	21.8087	**	10.6971	0.6158	43.0016
b12	239.1160		149.4564	-56.9842	535.2161

TABLE N-4 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: PLACERVILLE DATA

Coronene ------------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.7632	***	0.0707	0.6232	0.9032
b1	-0.5121		6.1924	-12.7804	11.7562
b2	3.8312	**	1.8866	0.0934	7.5690
b3	1.1573	***	0.4779	0.2106	2.1041
b4	-1.7600		6.0066	-13.6603	10.1402
b5	-4.2630		11.5555	-27.1566	18.6306
b6	1.5440	***	0.5371	0.4798	2.6081
b7	-7.0169		13.9611	-34.6764	20.6426
b8	-6.6729		19.1182	-44.5494	31.2037
b9	-3.5486		10.1629	-23.6831	16.5859
b10	-0.2087		4.7176	-9.5551	9.1377
b11	17.8312	**	8.8423	0.3129	35.3494
b12	152.9856		101.1473	-47.4055	353.3767

TABLE N-5

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ROSEVILLE DATA

COMPOUND	_TYPE_	N	MEAN	USS	CSS	REGDF	REGSS
Phenanthrene	FINAL	121	2.91979	1055.9511	24.40809	12	1023.0438
Fluoranthene	FINAL	131	0.28352	57.12022	46.59010	12	21.03753
Pyrene	FINAL	130	0.40380	53.61395	32.41690	12	20.76240
Benzo(a)anthracene	FINAL	130	-1.91093	655.15769	180.44114	12	599.19207
Chrysene	FINAL	129	-1.46335	448.81724	172.57583	12	403.98953
Benzo(k)fluoranthene	FINAL	127	-0.47285	150.57143	122.17638	12	108.37925
Benzo(e)pyrene	FINAL	129	-1.51848	419.50514	122.06010	12	385.58621
Benzo(a)pyrene	FINAL	126	-1.00039	288.55196	162.45356	12	252.13947
Indeno[1,2,3-cd]pyrene	FINAL	127	-0.18580	155.58306	151.19864	12	107.93771
Benzo(ghi)perylene	FINAL	131	-0.29393	106.02976	94.71212	12	71.39351
Coronene	FINAL	130	-0.40243	140.54475	119.49089	12	93.17099

COMPOUND	_TYPE_	REGMS	RESDF	_SSE_	RESMS	RSQ
Phenanthrene	FINAL	85.25365	109	32.90729	0.30190	-35
Fluoranthene	FINAL	1.75313	119	36.08269	0.30322	22.6
Pyrene	FINAL	1.73020	118	32.85155	0.27840	-1.3
Benzo(a)anthracene	FINAL	49.93267	118	55.96562	0.47428	69.0
Chrysene	FINAL	33.66579	117	44.82770	0.38314	74.0
Benzo(k)fluoranthene	FINAL	9.03160	115	42.19218	0.36689	65.5
Benzo(e)pyrene	FINAL	32.13218	117	33.91893	0.28991	72.2
Benzo(a)pyrene	FINAL	21.01162	114	36.41249	0.31941	77.6
Indeno[1,2,3-cd]pyrene	FINAL	8.99481	115	47.64535	0.41431	68.5
Benzo(ghi)perylene	FINAL	5.94946	119	34.63625	0.29106	63.4
Coronene	FINAL	7.76425	118	47.37376	0.40147	60.4

NOTE: All statistics refer to base-e logarithms of concentrations.
N = sample size
USS = total uncorrected sum of squares (SS)
CSS = total sum of squares, corrected for the MEAN
REGDF = regression (model) degrees of freedom (DF)
REGSS = regression sum of squares
REGMS = regression mean square = REGSS/REGDF
RESDF = residual DF = N-REGDF
SSE = residual sum of squares = SS(deviations from model predictions)
RESMS = residual mean square = _SSE_/RESDF
RSQ = percent of variation accounted for by the model
= (1-_SSE_/CSS)x100%.

On the following pages, STDERR values denote the standard errors of the corresponding parameter estimates. Asterisks in the column labeled "SIG" denote those estimates that are statistically significant at the 0.10 level (*), at the 0.05 level (**), or at the 0.01 level (***).

TABLE N-6

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ROSEVILLE DATA

Phenanthrene ----------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.5451	***	0.0754	0.3955	0.6946
b1	626.2349	*	334.6226	-36.9762	1289.4459
b2	3.3355		120.5245	-235.5402	242.2111
b3	-4.3443		33.5381	-70.8156	62.1271
b4	-120.0407		157.6683	-432.5343	192.4528
b5	237.6762		367.1885	-490.0795	965.4320
b6	117.2609	***	30.1828	57.4396	177.0822
b7	-798.1824		522.1637	-1833.0938	236.7290
b8	488.6004		446.2880	-395.9280	1373.1287
b9	-566.7805		396.1591	-1351.9550	218.3940
b10	651.3565	**	304.1368	48.5672	1254.1458
b11	318.8418		332.2395	-339.6462	977.3297
b12	0.0000		0.0000	0.0000	0.0000

Fluoranthene ----------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2677	***	0.0332	0.2019	0.3336
b1	25.9425		20.5608	-14.7699	66.6550
b2	0.6273		8.8568	-16.9100	18.1646
b3	2.3622		2.5207	-2.6291	7.3536
b4	-5.0786		10.8823	-26.6268	16.4695
b5	-0.6112		24.1192	-48.3696	47.1471
b6	12.5266	***	2.3761	7.8217	17.2315
b7	13.9874		37.8722	-61.0034	88.9783
b8	-8.2798		25.5778	-58.9265	42.3668
b9	-1.4073		25.1708	-51.2480	48.4334
b10	47.4757	***	19.3795	9.1024	85.8490
b11	-3.2086		22.4125	-47.5877	41.1704
b12	0.0000		0.0000	0.0000	0.0000

TABLE N-6 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ROSEVILLE DATA

Pyrene -------------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2768	***	0.0370	0.2035	0.3502
b1	45.0259	*	23.7996	-2.1038	92.1556
b2	-4.2238		8.5201	-21.0959	12.6483
b3	3.0238		2.8070	-2.5349	8.5824
b4	2.4646		11.4217	-20.1535	25.0826
b5	2.8210		26.7935	-50.2373	55.8794
b6	9.6194	***	2.1775	5.3074	13.9313
b7	-0.0432		42.9066	-85.0100	84.9236
b8	-22.0423		29.5615	-80.5821	36.4976
b9	-1.4200		30.2407	-61.3048	58.4649
b10	76.8174	***	22.4866	32.2878	121.3469
b11	5.4835		24.7547	-43.5375	54.5045
b12	0.0000		0.0000	0.0000	0.0000

Benzo(a)anthracene ------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.1999	***	0.0233	0.1537	0.2461
b1	3.9191	**	1.7546	0.4444	7.3937
b2	1.6987		1.2619	-0.8002	4.1976
b3	0.2172		0.3049	-0.3867	0.8210
b4	0.0916		1.7266	-3.3275	3.5107
b5	3.6458	**	1.7279	0.2240	7.0676
b6	2.9912	***	0.5247	1.9522	4.0301
b7	-0.4974		2.6169	-5.6796	4.6849
b8	-2.4214		1.8817	-6.1477	1.3049
b9	-4.5182	***	1.5019	-7.4925	-1.5440
b10	0.1490		1.4612	-2.7446	3.0426
b11	-3.3874	*	1.7611	-6.8749	0.1001
b12	0.0000		0.0000	0.0000	0.0000

TABLE N-6 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ROSEVILLE DATA

Chrysene ------------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.1878	***	0.0215	0.1453	0.2304
b1	6.1684	**	2.6712	0.8783	11.4585
b2	2.1576		1.5535	-0.9191	5.2342
b3	0.2397		0.4023	-0.5571	1.0365
b4	-0.8391		2.1100	-5.0179	3.3397
b5	5.7995	***	2.4044	1.0376	10.5613
b6	6.1389	***	0.8861	4.3839	7.8938
b7	0.7006		4.7018	-8.6111	10.0124
b8	0.1447		3.7414	-7.2649	7.5543
b9	-6.1686	***	2.1756	-10.4773	-1.8599
b10	0.1739		2.2152	-4.2133	4.5610
b11	-5.8023	**	2.6160	-10.9832	-0.6215
b12	0.0000		0.0000	0.0000	0.0000

Benzo(k)fluoranthene ------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.3239	***	0.0334	0.2577	0.3900
b1	-0.7003		7.2426	-15.0466	13.6460
b2	4.9959		4.6384	-4.1920	14.1837
b3	0.5833		1.0515	-1.4995	2.6661
b4	3.6170		6.4261	-9.1118	16.3459
b5	6.4813		8.7294	-10.8100	23.7726
b6	8.1641	***	1.4340	5.3237	11.0045
b7	16.7901		15.0305	-12.9824	46.5625
b8	4.9500		8.7858	-12.4529	22.3529
b9	-18.0445	**	8.4940	-34.8695	-1.2194
b10	-5.7417		4.5840	-14.8217	3.3383
b11	11.1736		7.9529	-4.5795	26.9267
b12	0.0000		0.0000	0.0000	0.0000

TABLE N-6 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ROSEVILLE DATA

Benzo(e)pyrene ---------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.3835	***	0.0341	0.3160	0.4509
b1	2.6311		2.0854	-1.4989	6.7610
b2	1.8326		1.3364	-0.8140	4.4793
b3	0.3418		0.3032	-0.2586	0.9422
b4	2.4085		2.0559	-1.6631	6.4802
b5	-0.5320		2.6778	-5.8351	4.7712
b6	2.5875	***	0.4063	1.7827	3.3922
b7	7.6532	*	4.2480	-0.7598	16.0662
b8	-0.6801		2.6429	-5.9142	4.5541
b9	-3.0466		2.7846	-8.5613	2.4681
b10	-2.5305		1.5523	-5.6047	0.5438
b11	0.6302		2.3827	-4.0887	5.3490
b12	0.0000		0.0000	0.0000	0.0000

Benzo(a)pyrene ---------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.4924	***	0.0461	0.4012	0.5837
b1	2.3546		3.3683	-4.3180	9.0272
b2	3.8071		2.6659	-1.4740	9.0881
b3	1.2308	**	0.5958	0.0505	2.4111
b4	5.5193		3.9480	-2.3016	13.3402
b5	-1.8489		4.1195	-10.0095	6.3117
b6	5.4764	***	0.8148	3.8623	7.0906
b7	5.7960		11.9643	-17.9052	29.4972
b8	4.2958		4.5238	-4.6659	13.2574
b9	-3.4402		3.2778	-9.9334	3.0530
b10	0.0470		2.0621	-4.0379	4.1319
b11	2.7341		3.2660	-3.7358	9.2039
b12	0.0000		0.0000	0.0000	0.0000

TABLE N-6 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ROSEVILLE DATA

Indeno[1,2,3-cd]pyrene -----------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.6251	***	0.0683	0.4899	0.7604
b1	29.7474	***	10.7423	8.4690	51.0257
b2	5.0588		4.6139	-4.0805	14.1981
b3	2.2468		1.4426	-0.6107	5.1043
b4	13.3232		10.0639	-6.6115	33.2579
b5	6.9985		13.1134	-18.9767	32.9737
b6	6.8746	***	1.5993	3.7067	10.0425
b7	4.1695		12.0088	-19.6176	27.9567
b8	-28.9380	***	9.2532	-47.2668	-10.6092
b9	-14.9267		14.1419	-42.9392	13.0857
b10	-8.1440		7.7102	-23.4164	7.1285
b11	1.3022		11.1740	-20.8314	23.4359
b12	0.0000		0.0000	0.0000	0.0000

Benzo(ghi)perylene ------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.5708	***	0.0525	0.4669	0.6748
b1	9.3818		9.2854	-9.0042	27.7678
b2	4.6939		4.1864	-3.5957	12.9834
b3	0.6935		0.9180	-1.1242	2.5112
b4	8.0502		6.7567	-5.3288	21.4292
b5	8.7597		10.5722	-12.1742	29.6937
b6	4.0766	***	0.9392	2.2170	5.9363
b7	68.7798	**	30.8201	7.7530	129.8067
b8	-1.7515		12.1172	-25.7447	22.2418
b9	-11.5545		10.8670	-33.0723	9.9633
b10	-6.8679		4.8805	-16.5317	2.7960
b11	6.2350		9.2852	-12.1507	24.6207
b12	0.0000		0.0000	0.0000	0.0000

TABLE N-6 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: ROSEVILLE DATA

Coronene -----------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.7673	***	0.0779	0.6129	0.9216
b1	-0.6279		9.6307	-19.6993	18.4436
b2	2.3241		3.8983	-5.3956	10.0438
b3	0.2660		0.7872	-1.2928	1.8248
b4	8.7816		6.7715	-4.6278	22.1910
b5	5.2662		10.5605	-15.6465	26.1790
b6	2.6469	***	0.8249	1.0133	4.2805
b7	95.0389	**	43.1462	9.5977	180.4801
b8	-4.9917		11.7036	-28.1680	18.1845
b9	-7.9791		11.3917	-30.5378	14.5795
b10	-5.8498		6.7433	-19.2034	7.5039
b11	10.3484		9.2699	-8.0084	28.7053
b12	0.0000		0.0000	0.0000	0.0000

TABLE N-7. SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

NOTE: ALTERNATIVE SUBSET USED TO ACQUIRE CONVERGENCE FOR BENZO(K)FLUORANTHENE

COMPOUND	_TYPE_	N	MEAN	USS	CSS	REGDF	REGSS
Acenaphthylene	FINAL	169	2.20751	1049.4479	225.89520	13	939.62710
Phenanthrene	FINAL	179	2.93654	1597.1941	53.63211	13	1522.7287
Anthracene	FINAL	180	-0.02107	151.54424	151.46436	13	18.92926
Fluoranthene	FINAL	186	0.51893	145.19498	95.10755	13	61.90093
Pyrene	FINAL	184	0.62409	143.04894	71.38371	13	68.52649
Benzo(a)anthracene	FINAL	185	-1.41281	655.67977	286.41279	13	573.88281
Chrysene	FINAL	185	-1.03649	465.40658	266.66079	13	398.29371
Benzo(k)fluoranthene	FINAL	199	0.08372	239.79457	238.39970	13	173.69833
Benzo(e)pyrene	FINAL	184	-1.11281	416.82674	188.97223	13	371.55461
Benzo(a)pyrene	FINAL	182	-0.56074	303.17688	245.95104	13	251.52495
Indeno[1,2,3-cd]pyrene	FINAL	185	0.08843	199.29007	197.84339	13	144.45616
Benzo(ghi)perylene	FINAL	186	-0.09349	137.06006	135.43451	13	95.04514
Coronene	FINAL	186	-0.38103	166.07728	139.07275	13	111.15788

COMPOUND	_TYPE_	REGMS	RESDF	_SSE_	RESMS	RSQ
Acenaphthylene	FINAL	72.27901	156	109.82084	0.70398	51.4
Phenanthrene	FINAL	117.13298	166	74.46537	0.44859	-39
Anthracene	FINAL	1.45610	167	132.61498	0.79410	12.4
Fluoranthene	FINAL	4.76161	173	83.29405	0.48147	12.4
Pyrene	FINAL	5.27127	171	74.52244	0.43580	-4.4
Benzo(a)anthracene	FINAL	44.14483	172	81.79696	0.47556	71.4
Chrysene	FINAL	30.63798	172	67.11287	0.39019	74.8
Benzo(k)fluoranthene	FINAL	13.36141	186	66.09624	0.35536	72.3
Benzo(e)pyrene	FINAL	28.58112	171	45.27212	0.26475	76.0
Benzo(a)pyrene	FINAL	19.34807	169	51.65194	0.30563	79.0
Indeno[1,2,3-cd]pyrene	FINAL	11.11201	172	54.83392	0.31880	72.3
Benzo(ghi)perylene	FINAL	7.31116	173	42.01492	0.24286	69.0
Coronene	FINAL	8.55061	173	54.91940	0.31745	60.5

NOTE: All statistics refer to base-e logarithms of concentrations.
N = sample size
USS = total uncorrected sum of squares (SS)
CSS = total sum of squares, corrected for the MEAN
REGDF = regression (model) degrees of freedom (DF)
REGSS = regression sum of squares
REGMS = regression mean square = REGSS/REGDF
RESDF = residual DF = N-REGDF
SSE = residual sum of squares = SS(deviations from model predictions)
RESMS = residual mean square = _SSE_/RESDF
RSQ = percent of variation accounted for by the model
= (1-_SSE_/CSS)x100%.

On the following pages, STDERR values denote the standard errors of the corresponding parameter estimates. Asterisks in the column labeled "SIG" denote those estimates that are statistically significant at the 0.10 level (*), at the 0.05 level (**), or at the 0.01 level (***).

TABLE N-8. SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

Acenaphthylene --------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.4331	***	0.0548	0.3250	0.5413
b1	170.5609		137.4538	-100.9499	442.0717
b2	81.2577	*	46.9960	-11.5729	174.0882
b3	16.9754	*	9.5423	-1.8734	35.8243
b4	-204.5809	***	51.7566	-306.8150	-102.3468
b5	215.2225		186.0798	-152.3385	582.7836
b6	78.7937	***	18.9625	41.3373	116.2502
b7	-3.3091		189.9122	-378.4404	371.8222
b8	-16.6387		224.1272	-459.3544	426.0771
b9	-1.8942		213.3948	-423.4102	419.6219
b10	-18.8031		69.9255	-156.9261	119.3199
b11	203.3751		138.8969	-70.9863	477.7364
b12	6108.0258		6648.7504	-7025.1677	19241.2194

Phenanthrene ---------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.4678	***	0.0619	0.3456	0.5900
b1	660.8006	**	287.4552	93.2613	1228.3399
b2	168.8476	*	85.9872	-0.9219	338.6172
b3	37.6749		23.0296	-7.7938	83.1436
b4	-131.5521		175.6027	-478.2547	215.1505
b5	-71.1464		324.0864	-711.0090	568.7162
b6	87.3201	***	21.5306	44.8111	129.8292
b7	-646.2890		420.3503	-1476.2108	183.6327
b8	473.8134		463.3457	-440.9969	1388.6236
b9	-105.9672		401.5934	-898.8562	686.9218
b10	592.9532	***	246.8319	105.6187	1080.2878
b11	410.1445		285.2905	-153.1210	973.4100
b12	4916.7712		5801.9368	-6538.3278	16371.8702

TABLE N-8 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

Anthracene ----------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.1723	***	0.0325	0.1082	0.2364
b1	36.4891	**	17.4052	2.1265	70.8518
b2	13.0416	**	6.5564	0.0975	25.9857
b3	1.7696		1.2654	-0.7285	4.2678
b4	-4.7990		11.8621	-28.2180	18.6200
b5	9.7865		18.8625	-27.4531	47.0261
b6	13.9336	***	2.8159	8.3742	19.4930
b7	-28.9228		25.5084	-79.2832	21.4377
b8	-3.0331		26.6673	-55.6816	49.6154
b9	-10.5021		24.7291	-59.3241	38.3198
b10	42.6880	***	15.1836	12.7115	72.6645
b11	3.4336		15.3171	-26.8065	33.6737
b12	218.2441		454.7239	-679.5041	1115.9923

Fluoranthene ---------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2222	***	0.0283	0.1663	0.2781
b1	34.7899		21.3682	-7.3860	76.9658
b2	21.1306	**	9.2068	2.9585	39.3026
b3	6.7994	***	2.2619	2.3349	11.2638
b4	-13.1306		15.2841	-43.2980	17.0368
b5	-6.4988		26.1618	-58.1363	45.1386
b6	11.9154	***	2.4164	7.1460	16.6849
b7	-3.9703		39.3352	-81.6090	73.6684
b8	-1.7045		37.2235	-75.1751	71.7661
b9	20.1088		32.0358	-43.1225	83.3400
b10	37.1469	*	19.1774	-0.7050	74.9988
b11	5.1016		23.2685	-40.8252	51.0284
b12	383.3012		598.2086	-797.4258	1564.0282

TABLE N-8 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

Pyrene -------------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2331	***	0.0307	0.1724	0.2937
b1	53.8721	**	24.7160	5.0843	102.6599
b2	27.7992	***	10.4760	7.1203	48.4781
b3	8.6596	***	2.5204	3.6846	13.6347
b4	-19.2254		16.9376	-52.6591	14.2083
b5	-3.2578		29.6185	-61.7227	55.2072
b6	9.7828	***	2.1639	5.5115	14.0542
b7	-16.3754		44.6180	-104.4483	71.6976
b8	-27.3021		39.2942	-104.8663	50.2621
b9	8.2910		35.8706	-62.5153	79.0973
b10	57.6583	***	22.0250	14.1824	101.1342
b11	23.2039		25.9843	-28.0875	74.4953
b12	302.9106		510.1561	-704.1039	1309.9250

Benzo(a)anthracene ------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2300	***	0.0196	0.1914	0.2686
b1	5.3950	***	1.6069	2.2233	8.5667
b2	3.7463	***	1.1427	1.4908	6.0017
b3	0.4734	**	0.2060	0.0668	0.8800
b4	-4.1301	**	1.8267	-7.7357	-0.5245
b5	2.1297		1.6201	-1.0682	5.3276
b6	3.6597	***	0.5683	2.5379	4.7814
b7	-0.1340		2.4996	-5.0678	4.7998
b8	-4.4692	***	1.7964	-8.0151	-0.9232
b9	-5.3638	***	1.5609	-8.4447	-2.2828
b10	0.1415		1.4848	-2.7892	3.0723
b11	-3.7223	**	1.6899	-7.0579	-0.3868
b12	137.6946		160.0884	-178.2962	453.6854

TABLE N-8 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

Chrysene ----------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.2284	***	0.0178	0.1933	0.2636
b1	7.0519	***	2.3736	2.3667	11.7371
b2	4.6044	***	1.4473	1.7477	7.4610
b3	0.5899	**	0.2574	0.0818	1.0980
b4	-5.7750	***	2.2192	-10.1553	-1.3946
b5	4.5867	**	2.2217	0.2013	8.9721
b6	6.3890	***	0.8524	4.7064	8.0715
b7	3.8597		4.3376	-4.7020	12.4214
b8	-7.1294	*	4.1318	-15.2848	1.0261
b9	-6.0973	***	2.0399	-10.1238	-2.0708
b10	-1.2618		2.2374	-5.6780	3.1545
b11	-7.0247	***	2.4385	-11.8379	-2.2115
b12	131.5630		176.5981	-217.0156	480.1416

Benzo(k)fluoranthene (NOTE: To acquire convergence, an alternate random subset of observations was chosen.)

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.3669	***	0.0278	0.3120	0.4217
b1	-1.3450		7.6600	-16.4567	13.7666
b2	12.9604	***	5.1997	2.7025	23.2183
b3	2.2825	*	1.1636	-0.0130	4.5780
b4	-6.5201		6.6356	-19.6108	6.5706
b5	5.9993		9.5302	-12.8019	24.8004
b6	7.2058	***	1.3648	4.5133	9.8983
b7	9.4786		14.7928	-19.7046	38.6618
b8	3.6213		12.5442	-21.1259	28.3684
b9	-21.0537	**	9.5645	-39.9224	-2.1849
b10	-3.3800		5.7409	-14.7056	7.9457
b11	9.0917		9.3153	-9.2856	27.4690
b12	618.7258	*	318.1792	-8.9782	1246.4298

TABLE N-8 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

Benzo(e)pyrene ---------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.4649	***	0.0287	0.4082	0.5216
b1	2.7315		2.0201	-1.2561	6.7191
b2	2.0468	***	0.8194	0.4294	3.6641
b3	0.1823		0.2176	-0.2472	0.6119
b4	-2.5620		1.7351	-5.9870	0.8630
b5	-4.6222	*	2.5056	-9.5682	0.3237
b6	2.6093	***	0.3682	1.8824	3.3362
b7	9.3877	***	3.7709	1.9442	16.8311
b8	-3.5270		2.8906	-9.2328	2.1788
b9	-2.6297		2.9189	-8.3915	3.1321
b10	-2.8704	*	1.6320	-6.0918	0.3510
b11	2.3700		2.2699	-2.1106	6.8506
b12	157.2600		137.3025	-113.7662	428.2862

Benzo(a)pyrene --------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.5637	***	0.0369	0.4908	0.6366
b1	2.6034		3.4677	-4.2421	9.4489
b2	4.0655	***	1.5356	1.0341	7.0969
b3	0.6447		0.3978	-0.1407	1.4301
b4	-1.2392		2.9872	-7.1362	4.6578
b5	-3.2198		3.9057	-10.9300	4.4905
b6	5.5039	***	0.7694	3.9852	7.0227
b7	4.2540		9.2750	-14.0558	22.5638
b8	-0.5189		5.0407	-10.4698	9.4319
b9	-6.8281	**	3.3523	-13.4459	-0.2103
b10	1.2329		2.3383	-3.3832	5.8490
b11	2.2675		3.2030	-4.0556	8.5906
b12	299.2851		275.3108	-244.2061	842.7763

TABLE N-8 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

Indeno[1,2,3-cd]pyrene ----------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.6537	***	0.0467	0.5614	0.7460
b1	20.4305	**	8.9110	2.8416	38.0195
b2	6.9579	***	2.4265	2.1684	11.7475
b3	1.6776	*	0.8866	-0.0724	3.4275
b4	-4.3943		7.3605	-18.9228	10.1342
b5	5.4640		10.8869	-16.0251	26.9532
b6	5.6530	***	1.0642	3.5524	7.7536
b7	-3.8695		12.3826	-28.3109	20.5718
b8	-32.8192	***	10.2004	-52.9534	-12.6850
b9	-20.9553	*	11.2004	-43.0633	1.1526
b10	-1.2711		7.2858	-15.6522	13.1101
b11	5.0877		8.4939	-11.6779	21.8533
b12	418.0447		402.4923	-376.4156	1212.5050

Benzo(ghi)perylene -------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.6458	***	0.0399	0.5670	0.7245
b1	9.7406		7.0944	-4.2621	23.7432
b2	5.9882	***	1.8726	2.2922	9.6842
b3	1.0233		0.6341	-0.2283	2.2750
b4	-5.0064		5.1574	-15.1859	5.1731
b5	-8.4703		8.2474	-24.7488	7.8081
b6	3.3876	***	0.6515	2.1018	4.6734
b7	43.8457	***	18.0787	8.1624	79.5290
b8	-6.7958		11.7288	-29.9457	16.3541
b9	-22.1087	***	8.9921	-39.8570	-4.3605
b10	-3.2837		4.8358	-12.8284	6.2611
b11	14.8047	**	7.2696	0.4562	29.1531
b12	335.1379		265.2749	-188.4541	858.7300

TABLE N-8 (Continued)

SUMMARY OF NONLINEAR ESTIMATION RESULTS: RANDOM SUBSET

Coronene ------------------------

PARAMETER	ESTIMATE	SIG	STDERR	95% Confidence Limits	
g	0.7771	***	0.0547	0.6691	0.8852
b1	5.8389		6.3554	-6.7053	18.3830
b2	3.8338	**	1.6985	0.4813	7.1863
b3	0.9583	*	0.5107	-0.0498	1.9663
b4	-2.5883		4.3689	-11.2116	6.0349
b5	-9.0015		7.7880	-24.3731	6.3702
b6	1.5573	***	0.4377	0.6934	2.4213
b7	32.6317	*	17.0996	-1.1191	66.3825
b8	-5.0398		11.2596	-27.2637	17.1840
b9	-3.9740		8.8477	-21.4374	13.4894
b10	-1.2233		4.4698	-10.0456	7.5991
b11	15.6291	**	6.7668	2.2731	28.9852
b12	201.6655		186.1170	-165.6868	569.0178

APPENDIX O

ESTIMATED Z VARIABLES ASSOCIATED WITH OUTDOOR PAH CONCENTRATIONS

TABLE 0-1. MODEL ESTIMATION SUMMARY FOR OUTDOOR CONCENTRATIONS

COMPOUND	n	Mean of ln(conc)	Sums of Squares Total Uncorr.	Sums of Squares Total Corrected	Sums of Squares Model Residual	%Var*	Residual Standard Deviation
PLACERVILLE:							
Acenaphthylene	132	2.4135	966.91	198.01	153.71	22.4	1.1001
Phenanthrene	132	3.0281	1301.91	91.56	69.45	24.1	0.7395
Anthracene	132	0.6525	225.01	168.81	132.29	21.6	1.0206
Fluoranthene	132	1.5425	440.95	126.88	93.00	26.7	0.8557
Pyrene	132	1.4389	421.19	147.91	106.73	27.8	0.9167
Benzo(a)anthracene	132	-0.0582	188.36	187.92	142.41	24.2	1.0589
Chrysene	132	0.3356	154.93	140.07	101.45	27.6	0.8938
Benzo(k)fluoranthene	131	1.0982	286.02	128.02	94.60	26.1	0.8665
Benzo(e)pyrene	132	-0.2892	123.32	112.28	87.87	21.7	0.8318
Benzo(a)pyrene	132	-0.0058	180.84	180.83	140.32	22.4	1.0511
Indeno[1,2,3-cd]pyrene	132	0.4698	166.79	137.66	107.92	21.6	0.9218
Benzo(ghi)perylene	132	0.2418	132.75	125.03	97.73	21.8	0.8772
Coronene	132	-0.4194	177.09	153.87	121.82	20.8	0.9794
ROSEVILLE:							
Acenaphthylene	134	2.4078	888.16	111.30	77.15	30.7	0.7733
Phenanthrene	135	2.8862	1174.60	50.06	39.00	22.1	0.5477
Anthracene	135	0.4027	97.94	76.04	56.21	26.1	0.6575
Fluoranthene	139	1.0551	204.07	49.32	37.66	23.6	0.5302
Pyrene	139	0.9925	190.18	53.27	38.91	26.9	0.5389
Benzo(a)anthracene	139	-0.8281	223.86	128.55	84.63	34.2	0.7947
Chrysene	139	-0.3832	115.48	95.07	61.68	35.1	0.6784
Benzo(k)fluoranthene	139	0.1239	164.49	162.36	120.19	26.0	0.9471
Benzo(e)pyrene	139	-0.9241	222.12	103.44	72.03	30.4	0.7332
Benzo(a)pyrene	138	-0.9386	312.41	190.83	124.18	34.9	0.9663
Indeno[1,2,3-cd]pyrene	136	-0.0544	121.07	120.66	85.29	29.3	0.8069
Benzo(ghi)perylene	139	-0.1119	110.50	108.76	80.25	26.2	0.7739
Coronene	139	-0.4392	138.40	111.58	81.65	26.8	0.7806

* %Var = (1-residual sum of squares/total corrected sum of squares)x100%
= percentage of total variation of ln(outdoor concentrations) accounted for by the model.

TABLE O-2. MODEL ESTIMATION RESULTS FOR OUTDOOR CONCENTRATIONS

COMPOUND PARAMETER	ESTIMATE	SIGNIFICANCE	STD.ERROR	95% CONFIDENCE LIMITS	
Acenaphthylene					
C0	62.4306	***	8.0207	46.6370	78.2242
C1	-5.8757	***	1.2009	-8.2404	-3.5109
C2	-0.9437	***	0.1409	-1.2212	-0.6662
C3	-2.8356	***	1.0611	-4.9251	-0.7462
C4	3.7296	***	1.1770	1.4119	6.0473
Phenanthrene					
C0	81.2414	***	9.9193	61.7096	100.7731
C1	-5.8248	***	1.7165	-9.2047	-2.4450
C2	-1.1655	***	0.1773	-1.5146	-0.8165
C3	-3.1136	**	1.4887	-6.0448	-0.1823
C4	4.6834	***	1.3591	2.0074	7.3595
Anthracene					
C0	8.7387	***	1.1440	6.4862	10.9912
C1	-0.5356	***	0.1878	-0.9054	-0.1658
C2	-0.1338	***	0.0201	-0.1734	-0.0943
C3	-0.2077		0.1613	-0.5253	0.1099
C4	0.5037	***	0.1590	0.1906	0.8169
Fluoranthene					
C0	17.9646	***	2.1282	13.7742	22.1549
C1	-0.4455		0.3736	-1.1810	0.2901
C2	-0.2748	***	0.0374	-0.3484	-0.2012
C3	-0.5285	*	0.2856	-1.0907	0.0338
C4	0.7399	***	0.2602	0.2277	1.2522
Pyrene					
C0	17.9660	***	2.0465	13.9366	21.9955
C1	-0.7460	**	0.3420	-1.4195	-0.0726
C2	-0.2774	***	0.0358	-0.3480	-0.2069
C3	-0.5703	**	0.2707	-1.1033	-0.0372
C4	0.7764	***	0.2546	0.2752	1.2776
Benzo(a)anthracene					
C0	4.0913	***	0.4927	3.1211	5.0615
C1	-0.0377		0.0871	-0.2093	0.1338
C2	-0.0657	***	0.0085	-0.0823	-0.0490
C3	-0.1343	***	0.0528	-0.2383	-0.0302
C4	0.1048	**	0.0504	0.0057	0.2040

* = 0.10 level of significance; ** = 0.05 level; *** = 0.01 level

(continued)

TABLE 0.2 (Continued)

COMPOUND	PARAMETER	ESTIMATE	SIGNIFICANCE	STD.ERROR	95% CONFIDENCE LIMITS	
Chrysene						
	C0	5.7714	***	0.6383	4.5146	7.0282
	C1	-0.0239		0.1151	-0.2505	0.2027
	C2	-0.0918	***	0.0110	-0.1135	-0.0701
	C3	-0.1730	***	0.0729	-0.3165	-0.0294
	C4	0.1429	**	0.0669	0.0111	0.2747
Benzo(k)fluoranthene						
	C0	9.3937	***	1.3419	6.7516	12.0358
	C1	0.4647	*	0.2793	-0.0852	1.0146
	C2	-0.1458	***	0.0234	-0.1920	-0.0997
	C3	-0.5770	***	0.1575	-0.8871	-0.2668
	C4	0.2645	*	0.1363	-0.0038	0.5329
Benzo(e)pyrene						
	C0	2.6808	***	0.3514	1.9890	3.3726
	C1	0.0100		0.0648	-0.1177	0.1376
	C2	-0.0406	***	0.0062	-0.0528	-0.0284
	C3	-0.1735	***	0.0450	-0.2622	-0.0848
	C4	0.0875	**	0.0389	0.0110	0.1641
Benzo(a)pyrene						
	C0	4.1669	***	0.5001	3.1821	5.1516
	C1	0.0381		0.0963	-0.1516	0.2277
	C2	-0.0674	***	0.0086	-0.0842	-0.0505
	C3	-0.1685	***	0.0484	-0.2638	-0.0732
	C4	0.0883	*	0.0452	-0.0007	0.1774
Indeno[1,2,3-cd]pyrene						
	C0	6.7564	***	0.8848	5.0143	8.4986
	C1	-0.1452		0.1542	-0.4489	0.1584
	C2	-0.1041	***	0.0155	-0.1346	-0.0736
	C3	-0.3420	***	0.1125	-0.5635	-0.1205
	C4	0.1802	*	0.0969	-0.0106	0.3709
Benzo(ghi)perylene						
	C0	4.8392	***	0.7174	3.4266	6.2518
	C1	-0.2351	**	0.1171	-0.4657	-0.0046
	C2	-0.0691	***	0.0129	-0.0944	-0.0438
	C3	-0.4682	***	0.0992	-0.6636	-0.2728
	C4	0.2313	***	0.0877	0.0587	0.4040
Coronene						
	C0	2.6469	***	0.4511	1.7587	3.5350
	C1	-0.2833	***	0.0678	-0.4168	-0.1498
	C2	-0.0350	***	0.0082	-0.0511	-0.0188
	C3	-0.3195	***	0.0634	-0.4444	-0.1946
	C4	0.1751	***	0.0618	0.0534	0.2968

* = 0.10 level of significance; ** = 0.05 level; *** = 0.01 level

TABLE O-3. MODEL ESTIMATION SUMMARY FOR OUTDOOR CONCENTRATIONS

COMPOUND	n	Mean of ln(conc)	Sums of Squares: Total Uncorr.	Sums of Squares: Total Corrected	Sums of Squares: Model Residual	%Var*	Residual Standard Deviation
Acenaphthylene	266	2.4106	1855.07	309.31	237.89	23.1	0.9547
Phenanthrene	267	2.9563	2476.51	142.97	112.21	21.5	0.6544
Anthracene	267	0.5262	322.95	249.01	197.41	20.7	0.8680
Fluoranthene	271	1.2925	645.02	192.28	139.69	27.3	0.7247
Pyrene	271	1.2099	611.37	214.67	154.22	28.2	0.7614
Benzo(a)anthracene	271	-0.4531	412.23	356.60	242.37	32.0	0.9545
Chrysene	271	-0.0331	270.41	270.12	175.35	35.1	0.8119
Benzo(k)fluoranthene	270	0.5966	450.51	354.40	227.34	35.9	0.9262
Benzo(e)pyrene	271	-0.6148	345.44	243.01	166.60	31.4	0.7914
Benzo(a)pyrene	270	-0.4826	493.25	430.37	275.89	35.9	1.0203
Indeno[1,2,3-cd]pyrene	268	0.2038	287.86	276.73	202.58	26.8	0.8777
Benzo(ghi)perylene	271	0.0604	243.26	242.27	181.04	25.3	0.8250
Coronene	271	-0.4296	315.49	265.48	208.44	21.5	0.8852

* %Var = (1-residual sum of squares/total corrected sum of squares)x100%
= percentage of total variation of ln(outdoor concentrations) accounted for by the model.

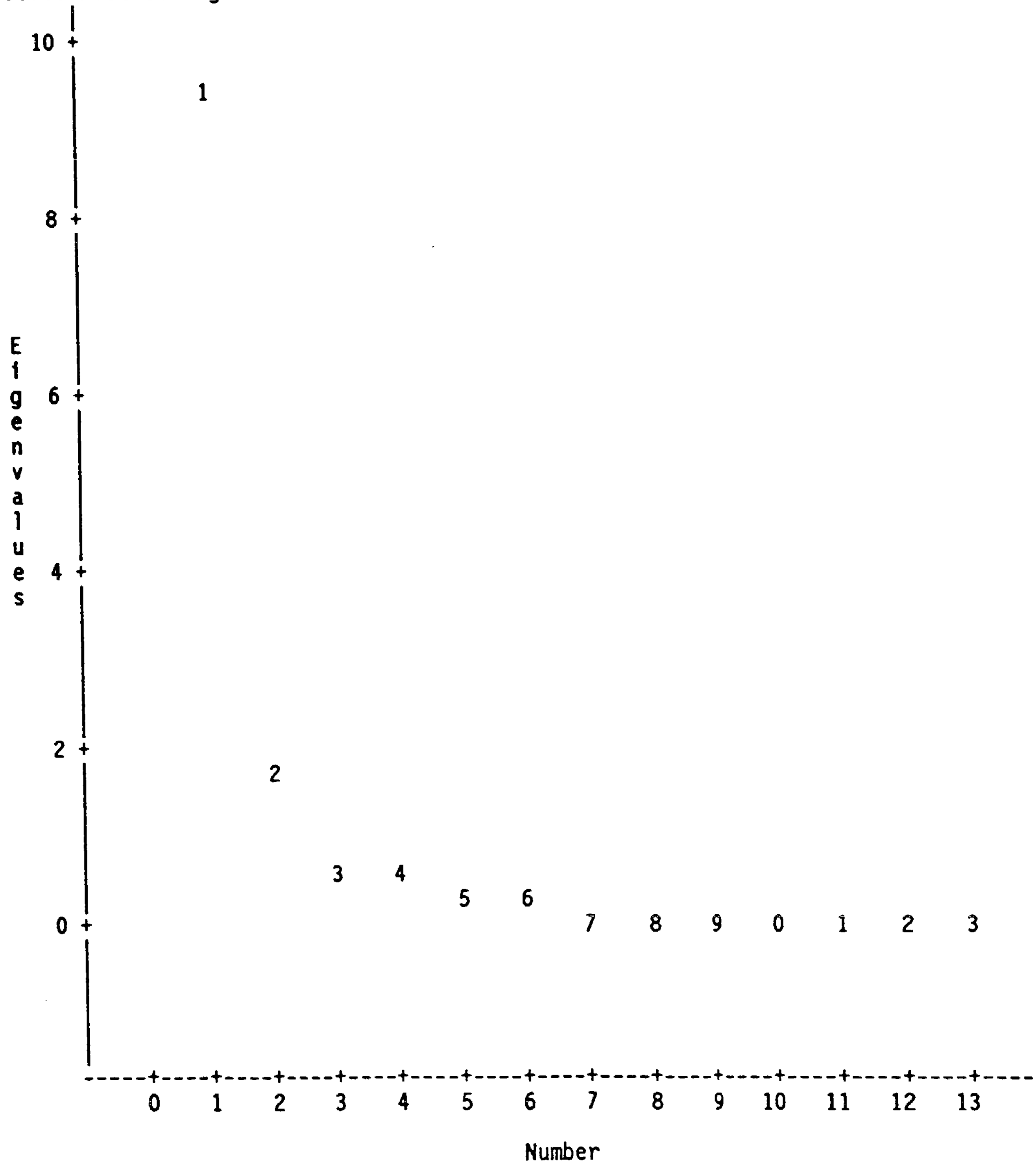
APPENDIX P
FACTOR ANALYSIS RESULTS

FACTOR ANALYSIS FOR LOG INDOOR CONCENTRATIONS

Eigenvalues of the Correlation Matrix: Total = 13 Average = 1

	1	2	3	4	5
Eigenvalue	9.437631	1.689980	0.713339	0.438343	0.293025
Proportion	0.7260	0.1300	0.0549	0.0337	0.0225
Cumulative	0.7260	0.8560	0.9108	0.9446	0.9671

Scree Plot of Eigenvalues



FACTOR ANALYSIS FOR LOG INDOOR CONCENTRATIONS

Initial Factor Method: Principal Components

Eigenvectors

	1	2
LIC1	0.21856	0.14065
LIC2	0.20928	0.49063
LIC3	0.21742	0.45956
LIC4	0.27105	0.35354
LIC5	0.26833	0.31640
LIC6	0.30936	-0.06365
LIC7	0.30816	-0.02170
LIC8	0.30455	-0.16955
LIC9	0.31107	-0.19190
LIC10	0.30744	-0.20605
LIC11	0.29568	-0.23420
LIC12	0.29438	-0.25253
LIC13	0.25866	-0.26839

Factor Pattern

	FACTOR1	FACTOR2
LIC1	0.67143	0.18285
LIC2	0.64294	0.63781
LIC3	0.66793	0.59743
LIC4	0.83268	0.45961
LIC5	0.82433	0.41131
LIC6	0.95038	-0.08274
LIC7	0.94668	-0.02821
LIC8	0.93561	-0.22041
LIC9	0.95561	-0.24947
LIC10	0.94449	-0.26786
LIC11	0.90835	-0.30445
LIC12	0.90436	-0.32829
LIC13	0.79463	-0.34891

FACTOR ANALYSIS FOR LOG INDOOR CONCENTRATIONS

Initial Factor Method: Principal Components

Plot of Factor Pattern for FACTOR1 and FACTOR2

```
                             FACTOR1
                                1
                       JIH    F G
                      K        .9
                                             D
                     M         .8           E

                               .7
                                     A            C B
                               .6

                               .5

                               .4

                               .3

                               .2
                                                                 F
                               .1                                A
                                                                 C
-1 -.9-.8-.7-.6-.5-.4-.3-.2-.1  0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0T
                                                                 O
                              -.1                                R
                                                                 2
                              -.2

                              -.3

                              -.4

                              -.5

                              -.6

                              -.7

                              -.8

                              -.9

                               -1
```

FACTOR ANALYSIS FOR LOG INDOOR CONCENTRATIONS

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.81656	0.57726
2	-0.57726	0.81656

Rotated Factor Pattern

	FACTOR1	FACTOR2
LIC1	0.44271	0.53690
LIC2	0.15681	0.89195
LIC3	0.20053	0.87341
LIC4	0.41462	0.85597
LIC5	0.43567	0.81172
LIC6	0.82380	0.48106
LIC7	0.78930	0.52345
LIC8	0.89121	0.36011
LIC9	0.92433	0.34793
LIC10	0.92585	0.32649
LIC11	0.91747	0.27575
LIC12	0.92797	0.25399
LIC13	0.85027	0.17381

Variance explained by each factor

FACTOR1	FACTOR2
6.855848	4.271763

Standardized Scoring Coefficients

	FACTOR1	FACTOR2
LIC1	-0.00436	0.12942
LIC2	-0.16224	0.34750
LIC3	-0.14628	0.32952
LIC4	-0.08495	0.27300
LIC5	-0.06917	0.24916
LIC6	0.11049	0.01815
LIC7	0.09154	0.04427
LIC8	0.15624	-0.04927
LIC9	0.16790	-0.06209
LIC10	0.17321	-0.07165
LIC11	0.18259	-0.09154
LIC12	0.19038	-0.10331
LIC13	0.18793	-0.11998

FACTOR ANALYSIS FOR LOG INDOOR CONCENTRATIONS

Rotation Method: Varimax

Plot of Factor Pattern for FACTOR1 and FACTOR2

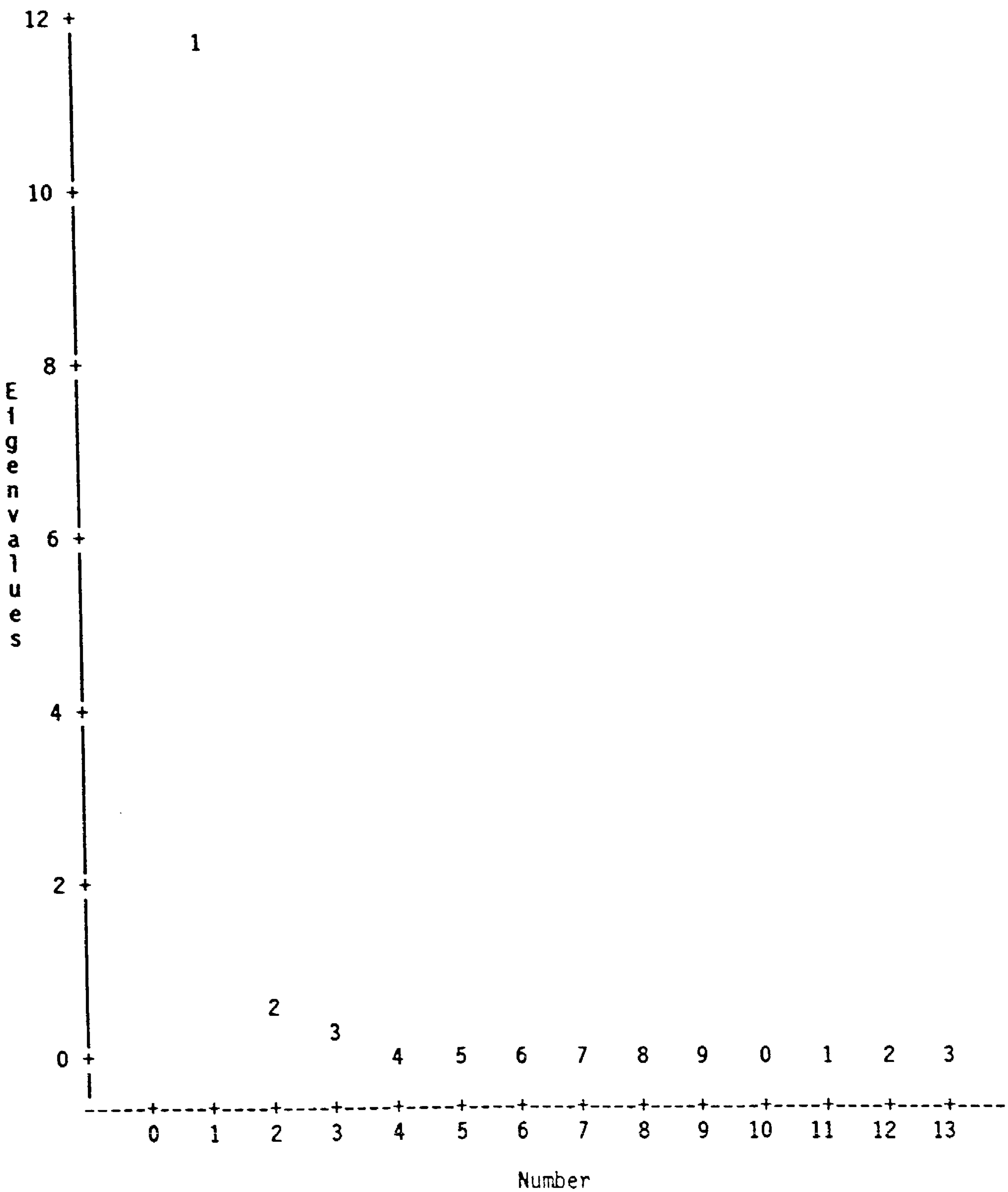
```
                             FACTOR1
                                1
                                       L J
                               .9       K H
                                     M
                               .8             FG

                               .7

                               .6

                               .5
                                                A       E
                               .4                        D

                               .3

                               .2                         C
                                                          B     F
                               .1                               A
                                                                C
-1 -.9-.8-.7-.6-.5-.4-.3-.2-.1  0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0T
                                                                O
                              -.1                               R
                                                                2
                              -.2

                              -.3

                              -.4

                              -.5

                              -.6

                              -.7

                              -.8

                              -.9

                               -1
```

FACTOR ANALYSIS FOR LOG OUTDOOR CONCENTRATIONS

Eigenvalues of the Correlation Matrix: Total = 13 Average = 1

	1	2	3	4	5
Eigenvalue	11.693727	0.481307	0.384942	0.139680	0.105367
Proportion	0.8995	0.0370	0.0296	0.0107	0.0081
Cumulative	0.8995	0.9365	0.9662	0.9769	0.9850

Scree Plot of Eigenvalues



FACTOR ANALYSIS FOR LOG OUTDOOR CONCENTRATIONS

Initial Factor Method: Principal Components

Eigenvectors

	1	2
LOC1	0.27787	-0.01596
LOC2	0.27706	-0.27254
LOC3	0.27771	-0.34177
LOC4	0.27412	-0.43515
LOC5	0.27569	-0.40511
LOC6	0.28740	-0.04628
LOC7	0.28542	-0.07435
LOC8	0.25765	0.22362
LOC9	0.28516	0.22837
LOC10	0.28115	0.21163
LOC11	0.28099	0.28747
LOC12	0.28144	0.28696
LOC13	0.26228	0.36822

Factor Pattern

	FACTOR1	FACTOR2
LOC1	0.95022	-0.01107
LOC2	0.94742	-0.18908
LOC3	0.94967	-0.23711
LOC4	0.93739	-0.30189
LOC5	0.94274	-0.28105
LOC6	0.98278	-0.03211
LOC7	0.97603	-0.05158
LOC8	0.88107	0.15514
LOC9	0.97514	0.15843
LOC10	0.96142	0.14682
LOC11	0.96087	0.19944
LOC12	0.96240	0.19908
LOC13	0.89688	0.25546

FACTOR ANALYSIS FOR LOG OUTDOOR CONCENTRATIONS

Initial Factor Method: Principal Components

Plot of Factor Pattern for FACTOR1 and FACTOR2

```
                              FACTOR1
                               GF1   I
                        DEC B   A    JK
                                .9   H  M

                                .8

                                .7

                                .6

                                .5

                                .4

                                .3

                                .2
                                                          F
                                .1                        A
                                                          C
-1 -.9-.8-.7-.6-.5-.4-.3-.2-.1  0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0T
                                                          O
                               -.1                        R
                                                          2
                               -.2

                               -.3

                               -.4

                               -.5

                               -.6

                               -.7

                               -.8

                               -.9

                                -1
```

FACTOR ANALYSIS FOR LOG OUTDOOR CONCENTRATIONS

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.72511	0.68863
2	0.68863	-0.72511

Rotated Factor Pattern

	FACTOR1	FACTOR2
LOC1	0.68139	0.66238
LOC2	0.55678	0.78953
LOC3	0.52534	0.82590
LOC4	0.47182	0.86442
LOC5	0.49005	0.85299
LOC6	0.69051	0.70005
LOC7	0.67221	0.70952
LOC8	0.74571	0.49424
LOC9	0.81619	0.55663
LOC10	0.79825	0.55560
LOC11	0.83408	0.51707
LOC12	0.83494	0.51838
LOC13	0.82626	0.43238

Variance explained by each factor

FACTOR1	FACTOR2
6.376680	5.798354

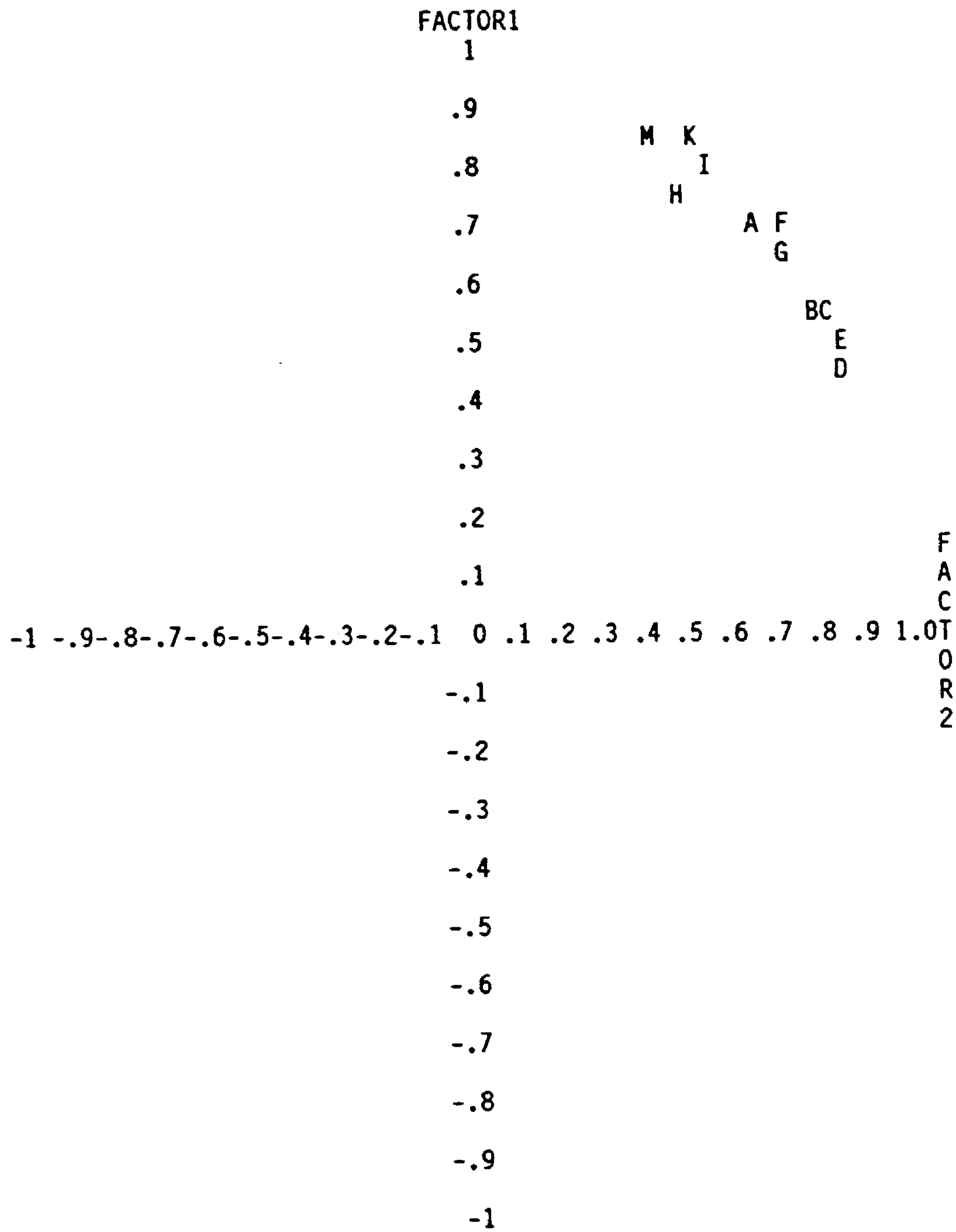
Standardized Scoring Coefficients

	FACTOR1	FACTOR2
LOC1	0.04308	0.07264
LOC2	-0.21178	0.34065
LOC3	-0.28035	0.41314
LOC4	-0.37381	0.51002
LOC5	-0.34366	0.47894
LOC6	0.01500	0.10625
LOC7	-0.01327	0.13518
LOC8	0.27660	-0.18184
LOC9	0.28715	-0.18126
LOC10	0.26968	-0.16458
LOC11	0.34493	-0.24388
LOC12	0.34451	-0.24325
LOC13	0.42111	-0.33204

FACTOR ANALYSIS FOR LOG OUTDOOR CONCENTRATIONS

Rotation Method: Varimax

Plot of Factor Pattern for FACTOR1 and FACTOR2

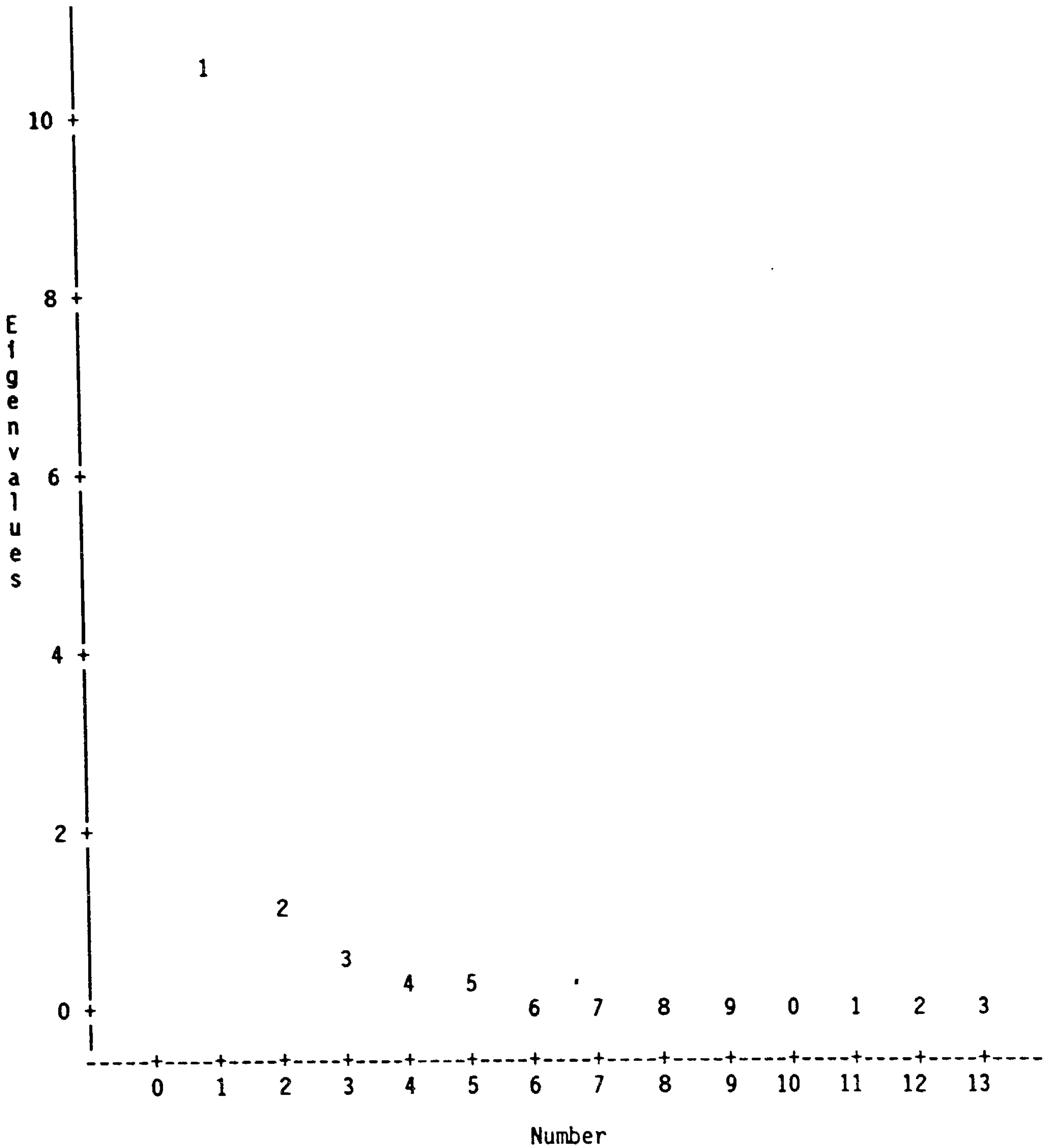


FACTOR ANALYSIS FOR SOURCE STRENGTHS

Eigenvalues of the Correlation Matrix: Total = 13 Average = 1

	1	2	3	4	5
Eigenvalue	10.543347	1.140965	0.648001	0.229369	0.170465
Proportion	0.8110	0.0878	0.0498	0.0176	0.0131
Cumulative	0.8110	0.8988	0.9486	0.9663	0.9794

Scree Plot of Eigenvalues



FACTOR ANALYSIS FOR SOURCE STRENGTHS

Initial Factor Method: Principal Components

Eigenvectors

	1	2
SS1	0.27301	-0.15738
SS2	0.25632	-0.24173
SS3	0.28165	-0.24631
SS4	0.28953	-0.24974
SS5	0.28442	-0.23128
SS6	0.29540	-0.10241
SS7	0.29194	-0.15316
SS8	0.29585	0.03316
SS9	0.29782	0.07144
SS10	0.28671	0.16522
SS11	0.27994	0.30427
SS12	0.27429	0.39712
SS13	0.17659	0.65003

Factor Pattern

	FACTOR1	FACTOR2
SS1	0.88649	-0.16811
SS2	0.83229	-0.25820
SS3	0.91453	-0.26309
SS4	0.94013	-0.26676
SS5	0.92354	-0.24704
SS6	0.95918	-0.10939
SS7	0.94795	-0.16360
SS8	0.96065	0.03542
SS9	0.96703	0.07631
SS10	0.93097	0.17649
SS11	0.90898	0.32501
SS12	0.89065	0.42419
SS13	0.57341	0.69433

FACTOR ANALYSIS FOR SOURCE STRENGTHS

Initial Factor Method: Principal Components

Plot of Factor Pattern for FACTOR1 and FACTOR2

```
                             FACTOR1
                                1
                       D   GF    HI   J
                        C A    .9        K  L
                        B
                               .8

                               .7

                               .6
                                                    M
                               .5

                               .4

                               .3

                               .2
                                                                F
                               .1                               A
                                                                C
 -1 -.9-.8-.7-.6-.5-.4-.3-.2-.1  0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0T
                                                                O
                              -.1                               R
                                                                2
                              -.2

                              -.3

                              -.4

                              -.5

                              -.6

                              -.7

                              -.8

                              -.9

                               -1
```

FACTOR ANALYSIS FOR SOURCE STRENGTHS

Rotation Method: Varimax

Orthogonal Transformation Matrix

	1	2
1	0.83548	0.54952
2	-0.54952	0.83548

Rotated Factor Pattern

	FACTOR1	FACTOR2
SS1	0.83302	0.34669
SS2	0.83725	0.24164
SS3	0.90865	0.28275
SS4	0.93205	0.29375
SS5	0.90735	0.30111
SS6	0.86149	0.43570
SS7	0.88190	0.38424
SS8	0.78313	0.55749
SS9	0.76599	0.59516
SS10	0.68082	0.65904
SS11	0.58084	0.77104
SS12	0.51101	0.84384
SS13	0.09752	0.89521

Variance explained by each factor

FACTOR1	FACTOR2
7.704038	3.980274

Standardized Scoring Coefficients

	FACTOR1	FACTOR2
SS1	0.15122	-0.07690
SS2	0.19031	-0.14569
SS3	0.19918	-0.14499
SS4	0.20298	-0.14634
SS5	0.19217	-0.13276
SS6	0.12869	-0.03011
SS7	0.15391	-0.07039
SS8	0.05906	0.07601
SS9	0.03988	0.10628
SS10	-0.01123	0.17775
SS11	-0.08450	0.28536
SS12	-0.13373	0.35704
SS13	-0.28898	0.53832

FACTOR ANALYSIS FOR SOURCE STRENGTHS

Rotation Method: Varimax

Plot of Factor Pattern for FACTOR1 and FACTOR2

```
                            FACTOR1
                               1
                                        D
                              .9       CE G
                                      B  A  F
                              .8               H
                                                I
                              .7                  J

                              .6                      K

                              .5                         L

                              .4

                              .3

                              .2
                                                                F
                               .1                        M      A
                                                                C
-1 -.9-.8-.7-.6-.5-.4-.3-.2-.1  0 .1 .2 .3 .4 .5 .6 .7 .8 .9 1.0T
                                                                O
                              -.1                               R
                                                                2
                              -.2

                              -.3

                              -.4

                              -.5

                              -.6

                              -.7

                              -.8

                              -.9

                                -1
```

APPENDIX Q
INTERIM REPORT

APPENDIX R
PTEAM PAH MODELING RESULTS
REPORTED BY XUE ET AL. (1993)

Table 5 Physical Model for Estimating Indoor PAH and Phthalate Source Strengths and Decay Rates

$$C_i = BC_o + \frac{n_{cig} S_{smoke}}{(\alpha + k) V t} + \frac{Q_{other}}{(\alpha + k) V}$$

C_i : indoor PAH or phthalate concentration (ng/m^3)

B : penetration coefficient of outdoor PAH or phthalate concentrations on the indoors

C_o : outdoor PAH or phthalate concentration (ng/m^3)

k : decay rate of PAH or phthalate (1/hr)

α : air exchange rate (1/hr)

V : house volume (m^3)

t : time (hr)

n_{cig} : number of cigarettes

S_{smoke} : PAH or phthalate emission rate from smoking

Q_{other} : flux of unknown indoor sources

Table 6 Results from Physical Modelling of Indoor Source Strengths and Removal Rates of Phthalates and PAHs

units: ng/h

Indoor Compound	r*	decay rate(per hour)			Source strength of smoking			Flux from other indoor source		
		mean	l90%	u90%	mean	l90%	u90%	mean	l90%	u90%
Acenaphthylene	0.23	4.29	-3.06	11.65	11692	-15280	38664	6026	-4833	16885
Phenanthrene	0.42	0.43	0.05	0.81	10	-2220	2240	2854	1119	4588
Antracene		failed to converge								
Fluoranthene	0.39	1.29	0.25	2.33	310	-295	915	430	13	847
Pyrene	0.20	1.49	0.03	2.95	156	-544	856	608	-6	1222
Benzo(a)anthracene	0.64	1.65	0.58	2.71	122	19	226	32	2	62
Chrysene	0.80	0.76	0.33	1.20	192	82	301	13	-14	40
Benzo(e)pyrene	0.72	0.87	0.41	1.34	86	13	158	17	-5	38
Benzo(a)pyrene	0.74	1.29	0.64	1.94	264	101	426	48	9	87
Indeno[1,2,3-cd]pyrene	0.44	0.68	-0.17	1.53	143	-156	441	65	-39	168
Benzo(ghi)perylene	0.71	0.82	0.39	1.24	244	-14	502	91	8	175
Coronene	0.71	0.80	0.37	1.23	297	48	545	88	11	165
Diethyl phthalate	0.20	2.05	0.12	3.98	10	-243507	243527	291222	77981	504463
Di-n-butyl phthalate	0.22	0.69	-0.11	1.48	10	-165791	165811	209893	72628	347158
Benzyl butyl phthalate		failed to converge								
Di-2-ethylhexyl phthalate		failed to converge								

* r: correlation coefficients between predicted and observed concentrations.

** l90% and u90%: low 90 and upper 90 percentile

Table 7 Estimated Percent Contributions from Different Indoor Sources of PAHs and Phthalates

Indoor Compound	All homes			just smoking homes			r*
	outdoor	smoke	other	outdoor	smoke	other	
Phenanthrene	34	0	66	42	0	58	0.42
Fluoranthene	56	0	44	63	0	37	0.39
Benzo(a)anthracene	45	7	49	41	35	24	0.64
Chrysene	71	8	21	51	40	8	0.80
Benzo(e)pyrene	69	5	27	64	24	12	0.72
Benzo(a)pyrene	46	8	46	41	39	19	0.74
Indeno[1,2,3-cd]pyrene	54	0	46	70	0	30	0.44
Benzo(ghi)perylene	61	4	35	62	20	18	0.71
Coronene	58	5	37	58	24	18	0.71

* r: correlation cofficients between predicted and observed concentrations

APPENDIX S
QUALITY ASSURANCE PROJECT PLAN

5.0 QUALITY ASSURANCE PROJECT PLAN

5.1 Project Description

A residential indoor/outdoor air study will be conducted in California to generate indoor air and exposure data for making exposure assessments for pollutants. Two objectives of the study are 1) to obtain information on indoor and outdoor air concentrations of benzo[a]pyrene (BaP), other polynuclear aromatic hydrocarbons (PAH) and carbon monoxide (CO) in California residences to allow reasonable exposure predictions to be made for California residents, and 2) to explore the relationships among the compounds and to investigate their relationship to different types of indoor combustion sources.

The study population will be selected California homes representing selected combustion sources. Homes will not be selected to provide population estimates on air concentrations for any population in the State of California. Monitoring will be performed in 280 homes from two study areas in northern California in winter, 1992.

5.2 Project Organization and Responsibility

The proposed program is a joint effort between three research units at RTI and several subcontractors. An overview of project organization is shown in Figure 9. Dr. Linda Sheldon is proposed as the Project Leader for this program. She will be responsible for the overall conduct of the program and will serve as the primary contact with the Air Resources Board. Her responsibilities include:

- overall supervision of the technical program,
- maintaining technical quality, and
- interpretation, documentation and reporting of results.

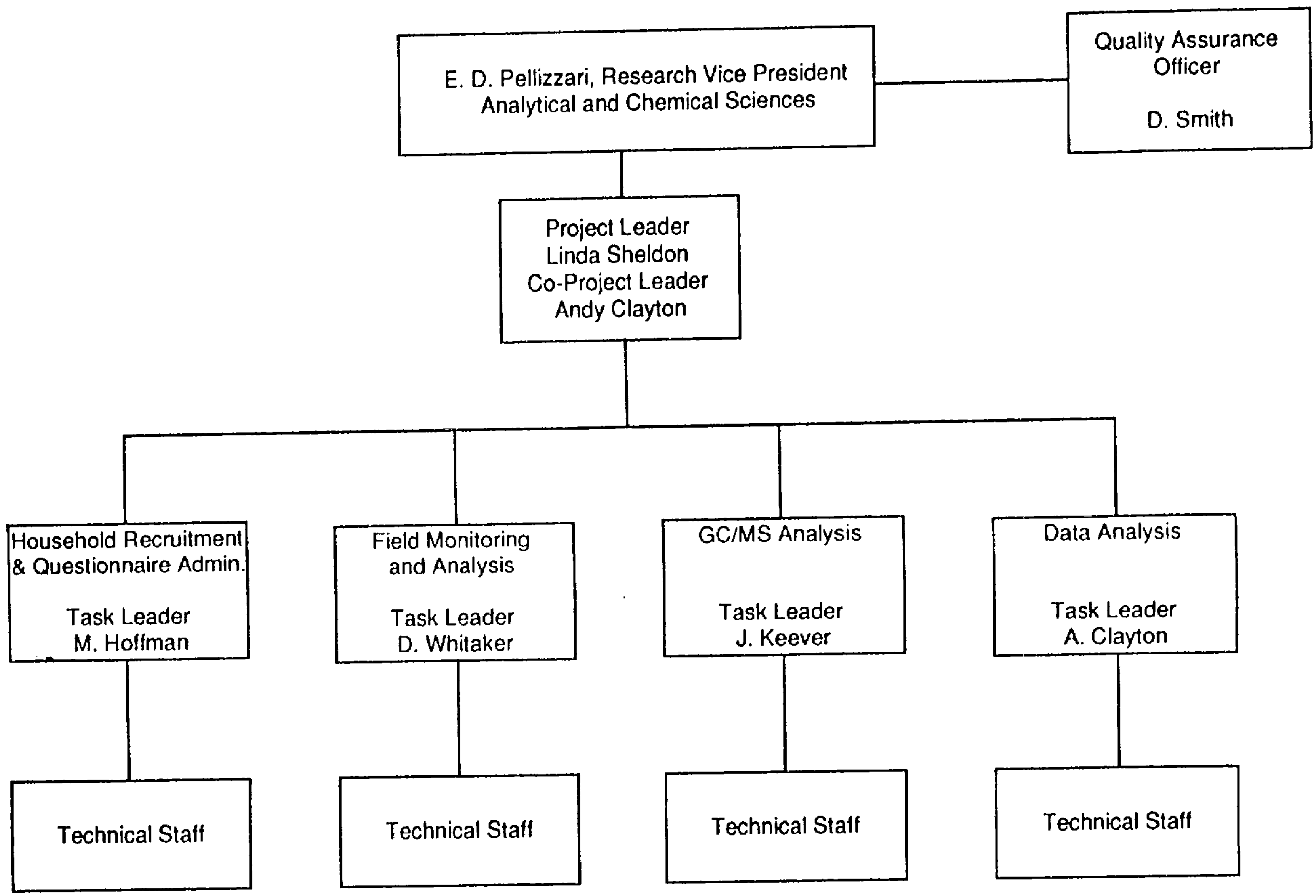


Figure 9. Project Organization

Mr. Andy Clayton is proposed as Co-project Leader and will be responsible for all statistical analyses and survey components of the study.

The program has been divided into four tasks, each associated with a specific technical activity. Each Task Leader will be responsible for budget tracking and for implementing of day-to-day technical efforts.

Ms. D. J. Smith will function as the RTI Quality Assurance (QA) Officer. She will be in a position to provide an independent and objective assessment of project data quality. She will be responsible to the ACS Vice President for performing the duties of the RTI QA officer. However, she will have independent authority to implement the QA plan in a manner necessary to insure and maintain the highest level of data quality. She will have the authority to review and assess all aspects of project performance; any inadequacies will receive Corrective Action (see Section 5.12). In the event that no effort is made to rectify the situation and that the problem is compromising the quality of project data, the QA Officer will be required to terminate the study activity in question. Specific responsibilities of the QA Officer will include:

- conducting periodic audits of data collection and measurement systems (Section 5.9),
- monitoring situations requiring corrective action (Section 5.12), and
- submitting QA reports (Section 5.13).

5.3 Quality Assurance Objectives in Terms of Precision, Accuracy, Completeness, Representativeness, and Comparability

A set of environmental samples will be collected at the performance site for subsequent chemical analysis at RTI or by one of its subcontractors. Indoor and outdoor samples will be collected at each of 280 homes. The target compounds of interest are selected polynuclear aromatic hydrocarbons (PAHs), including benzo[a]pyrene (BaP), and carbon monoxide (CO) monitored at selected homes. In addition, air exchange rate measurements will be performed in the homes.

Table 34 shows the target compounds by category, the sample types, and analytical methodology.

Data quality objectives (DQO) will not be prepared for the study. The QA objectives presented here are based on previous studies and are considered to represent acceptable performance.

5.3.1 Accuracy and Precision

Table 34 shows the analytical precision and accuracy objectives for each target compound collected. The precision measure is expressed as the percent relative standard deviation (%RSD) between duplicates and the accuracy parameter as the analyte recovery from spiked control samples. The percent recovery values reflect analyte losses during field sampling, shipping, and storage.

5.3.2 Completeness

Table 34 shows the estimated amount of valid data expected relative to the amount of data proposed. These values take into account the inability to collect the sample in the field, breakage and loss, and the likely number of invalid analytical results due to contamination or chemical interferences during analysis, etc.

TABLE 34. SUMMARY OF QUALITY ASSURANCE OBJECTIVES

Target Analyte	Method of Analysis	QA Objectives for Precision[a] % RSD	Accuracy[b] % Recovery	Completeness[c] %
PAHs[d]				
quinoline	GC/MS[f]	<25	≥70	90
acenaphthylene	GC/MS	<25	≥70	90
phenanthrene	GC/MS	<25	≥70	90
anthracene	GC/MS	<25	≥70	90
chrysene	GC/MS	<25	≥70	90
fluoranthene	GC/MS	<25	≥70	90
pyrene	GC/MS	<25	≥70	90
benzo[a]anthracene	GC/MS	<25	≥70	90
benzo[a]pyrene	GC/MS	<25	≥70	90
benzo[e]pyrene	GC/MS	<25	≥70	90
benzo[k]fluoranthene	GC/MS	<25	≥70	90
indeno [1,2,3-cd]pyrene	GC/MS	<25	≥70	90
benzo[ghi]perylene	GC/MS	<25	≥70	90
coronene	GC/MS	<25	≥70	90
Carbon Monoxide (CO)	real time monitor	≤25	-[h]	90
Air Exchange[e]	GC/ECD[g]	≤10	≥90	95

[a] % relative standard deviation between collocated (duplicate) samples

[b] % recovery from spiked control samples

[c] % valid data relative to that proposed

[d] PAHs chosen to represent 2, 3, 4, 5, 6, and 7 ring structures

[e] All analyses carried out at Brookhaven National Laboratory (BNL); QA objectives based on data provided by BNL

[f] Capillary gas chromatography/mass spectrometry

[g] Gas chromatography with electron capture detection

[h] Accuracy (bias) will be estimated based on analysis of certified zero and span gases

5.3.3 Representativeness

The study is not designed to be representative of the general population in the study area, but will represent homes selected for each combustion source category.

5.3.4 Comparability

The chemical concentration data will be reported in units most often used in previous studies to allow direct comparison of databases:

- PAHs	ng/m^3
- Air Exchange	ach (air changes per hour)
- CO	ppm

5.4 Sampling Procedures

The overall sampling protocol for this project consists of two activities: the sampling design used to select the study population and the acquisition of environmental samples.

5.4.1 Selection of the Study Population

The study population will be selected as groups of homes that are representative of homes in selected combustion source categories - fireplaces, woodstoves, gas heating, and environmental tobacco smoke (ETS). A random digit dialing procedure will be used to contact potential participants in each of two study areas (northern or central California). A screening interview will be administered to obtain information on combustion sources and their use in the home. Homes will be selected and participation enlisted based upon these interviews.

TABLE 35. NUMBER OF SAMPLES AND TYPES PROPOSED FOR PILOT STUDY[a]

Category Sample Type	Indoor Air	Outdoor Air	Total
PAH			
field samples	7	7	14
collocated (duplicate) samples			3[b]
field blanks			3[b]
field controls			3[b]
			23
CO			
field samples	4	4	8
collocated (duplicate) samples			3[b]
LOD samples			3
			14
Air Exchange			
field samples	7	0	7
collocated (duplicate) samples	3	0	3
field blanks	3	0	3
			13

[a] Based on 7 homes; 6-8 may be selected for pilot study monitoring

[b] Total indoor and outdoor

TABLE 36. NUMBER AND TYPES OF SAMPLES PROPOSED FOR MAIN STUDY

Category/Sample Type	Indoor Air	Outdoor Air	Total
PAH			
field samples	280	280	560
collocated (duplicate) samples	14	14	28
field blanks			28
XAD field controls			14
NIST field controls			14
MQL samples			7
QA samples			8
		Total	659
CO			
field samples	210	210	420
collocated (duplicate) samples	11	10	21
field blanks[a]	0	0	0
field controls[a]	0	0	0
LOD samples			7
		Total	330
Air Exchange			
field samples	280	0	280
collocated (duplicate samples)	14	0	14
field blanks	14	0	14
field controls	5	0	5
		Total	313

[a] A zero and span measurement will be performed at each house

5.4.2 Sample Collection

Collection of field samples will be conducted after the three month monitoring period by several sampling teams made up of technicians from RTI and our subcontractor, Dynamac. Each team will be made up of three technicians who will conduct all field monitoring activities. Two of the technicians will be responsible for setting up air monitoring equipment, collecting samples, and administering the study questionnaire. The third technician will be present during all initial visits to place PFT emitters. He will also serve as a field supervisor and will be responsible for maintaining equipment, communicating with staff at RTI and ARB, shipping and receiving samples and materials, and overseeing all field activities. The third technician will also be available to accompany the other two chemists to study homes during any of the additional field monitoring visits. At a minimum, the field supervisor will be present at least 10 percent of the visits.

Mr. D. Whitaker, will be task leader for field monitoring. He will be responsible for pre-sampling activities, coordination of sampling assignments, sample shipment to RTI, and overall performance at the sampling site.

The acquisition of samples will be conducted according to the procedures in Section 2.4.2 of the technical proposal.

A summary of sample types to be collected is shown in Table 35 (Pilot Study) and Table 36 (Main Study).

5.4.2.1 <u>PAH Samples</u>

The sampling method is based on methods used previously by RTI on indoor air studies. A detailed method description is found in Section 2.4.2.1 of this proposal. Briefly, particulate and vapor phase PAHs are collected on a sampling cartridge consisting of a quartz fiber filter and XAD-2 cartridge. Twenty-four hour samples will be collected by pumping ~20 m^3 air through the cartridge assembly at a constant flow of 12-15 L/min.

5.4.2.2 <u>Air Exchange Measurements</u>

The sampling method is described in detail in Section 2.4.2.2 of the technical proposal. Briefly, permeation devices containing a perfluorocarbon tracer (PFT) are placed in each home, and the PFT compound is collected using capillary adsorbent tube samplers (CATS) placed in the home during the 24-hour monitoring period.

5.4.2.3 <u>Carbon Monoxide</u>

Carbon monoxide will be monitored using Drager Model 190 Toxic Gas Monitors and Dalaloggers. The monitors use a three-electrode electrochemical cell for measurement. The dalaloggers record sensor measurement 120 times per minute. One minute average values are downloaded at the end of the period to a portable computer.

5.4.3 <u>Sampling Schedule</u>

A detailed sampling schedule will be developed prior to sampling; it will indicate when blank, control and collocated (duplicate) samples are to be collected (or deployed). The schedule for each of the three visits to each home is shown in Table 11 of this proposal.

5.4.4 Preparation of Sampling Materials/Supplies

All materials and supplies for PAH sampling will be prepared at RTI for use in the field. The procedures are detailed in Section 2.4.2.1 of this proposal. Where appropriate, standard operating procedures (SOP) in use during previous studies will be followed. The operations include:

- XAD-2 cleanup,
- Quartz fiber filter cleanup,
- Cartridge materials cleanup,
- Pump calibration,
- Preparation of field blank and control samples, and
- Preparation of sampling protocol and chain-of-custody forms.

All materials for air exchange measurements will be prepared at BNL.

5.4.5 Sample Management

A sampling protocol form will be used to document the conditions under which each sample is collected. An example is shown in Figure 10. The chain-of-custody record for the sample will be printed on the same sheet (see Section 5.5). The individuals assigned to collect specific samples will receive a computer-generated form containing all of the appropriate sampling information and will maintain this record in a field notebook set aside for this purpose.

A series of computer-generated study code labels will be prepared for sample identification. A portion of the code will be numbered in sequence for tracking purposes. Copies of the labels will be placed on the samples and the corresponding protocol/chain-of-custody form.

All sampling materials and supplies will be transported to the field by a carrier selected by the Project Leader. The Field Monitoring Task

Field Sampling Protocol Sheet
Polynuclear Aromatic Hydrocarbons

SAMPLE CODE:

BATCH NO.: ______
PUMP NO: ______

DATE START	DATE FINISH	TIME INITIAL	TIME FINAL	SAMPLING TIME(MIN)	SAMPLED VOLUME(L)
__/__/___	__/__/___	___:___	___:___		

FLOW(L/MIN) INITIAL	FLOW(L/MIN) FINAL	FLOW(L/MIN) AVERAGE	AMBIENT TEMP.(F) MAX.	AMBIENT TEMP.(F) MIN.	AMBIENT TEMP.(F) AVERAGE
______	______	___	___		

P=PERSONAL(1,2); I=INDOOR(A..K); O=OUTDOOR(R..Z); B=BREATH/ CN=CANISTER; TX=TENAX; XD=XAD/ S=SAMPLE(1,2,3); D=DUP.(1,2,3); Q=QA(1,2,3)
A=LIVING RM; B=KITCHEN; C=DINING RM; D=FAMILY RM; E=BATH; F=BEDROOM; G=STUDY; H=SHOP; I=UTILITY RM; J=BASEMENT; K=GARAGE
R=FRONT YARD; S=BACKYARD; T=RIGHT SIDE YARD; U=LEFT SIDE YARD; V=ELEVATED(BALCONY); *=UNSPECIFIED

COMMENTS:

CUSTODY RECORD

CUSTODY OF INITIALS	CUSTODY OF I.D. NO.	DATE	OPERATION PERFORMED
		__/__/___	___XAD EXPOSED______
		__/__/___	___SAMPLE COLLECTED______
		__/__/___	___SP/COC DATA QA______
		__/__/___	___SHIPPED TO RTI______
		__/__/___	___INSPECTED AND LOGGED AT RTI____
		__/__/___	___SAMPLE EXTRACT.; FINAL VOL:____
		__/__/___	___EXT. STDS. LOADED___ A: B:______
		__/__/___	___RECEIVED IN GC/MS LAB______
		__/__/___	___ANALYZED BY GC/MS; FILE:______
		__/__/___	___GC/MS FILE CONVERTED ______
		__/__/___	___DATA QUANTITATED______
		__/__/___	___DATA TRANSFERRED TO VAX______

RESEARCH TRIANGLE INSTITUTE, ANALYTICAL AND CHEMICAL SCIENCES
P.O. BOX 12194, RESEARCH TRIANGLE PARK, NC 27709

Figure 10. Example of a Sampling Protocol/Chain-of-Custody Form.

Leader will be responsible for acknowledging receipt of that shipment and noting any missing or damaged items.

Samples may be shipped back periodically to RTI by the Field Monitoring Task Leader. The carrier selected must offer 24 hour delivery service to insure the in-transit stability of the samples.

5.5 Sample Custody

5.5.1 Custody of Environmental Samples

A chain-of-custody form will be generated for each collected sample. The proper implementation of the sample custody protocol is an important component in the documentation and sample tracking phases of this project. The form should contain an exact history of the sample, including not only custody transfers but also sample source, storage, shipping, and any processing information (RTI/ACS-SOP-410-001, RTI/ACS-SOP-410-002).

The original chain-of-custody form for a given sample must accompany that sample from the time of collection to arrival at RTI. On arrival at RTI, the samples will be logged in by a staff member assigned to that task (RTI/ACS-SOP-470-001). He or she will acknowledge receipt on the appropriate custody form. Container breakage, sample leakage, obvious contamination, or other remarks should be noted at this time and made known to the RTI QA Officer in a report or memo.

At this time, all samples including blanks and controls will be assigned for analysis. The appropriate transfer of custody will be recorded. The storage period, the date of sample preparation and subsequent custody transfers will be noted on a copy of the custody form. The custody form will be returned to the Project Leader after all collection, analysis, and data processing steps have been completed.

For purposes of effective record keeping and sample tracking, a master file will be created which will contain the original custody form of each sample received at RTI. These forms will be arranged according to the label sequence number and will be bound by matrix and site. They will provide information on the number of missing samples and the RTI lab or subcontractor to which the sample was relinquished. Any problem involving a lost or misplaced sample or custody form will be directed to the RTI QA Officer in writing for resolution.

5.5.2 Custody of Survey Instruments

Custody of completed survey instruments during collection, processing, and storage will be strictly controlled. (See Section 5.7.5.)

5.6 Analytical Procedures

The analytical procedures which will be used during the course of this study are described in the proposal. The methods include capillary column GC/MS (PAHs) and GC/ECD (air exchange measurements). Carbon monoxide will be measured with a real time monitor. The calibration procedures which will be employed for analyte quantitation are described below for each methodology.

5.6.1 Calibration for PAH Analysis (GC/MS)

Quantitation of PAHs collected on glass fiber filters/XAD-2 cartridges is accomplished by GC/MS, using extracted ion current profiles. A multi-point calibration is prepared from standard mixtures prior to the analysis of samples. Quantitation is accomplished using analyte peak areas and mean relative response factors.

Results of each analysis (calibration standards) will be used to generate relative response factors (RRF) as:

$$RRF = \frac{A_t/C_t}{A_{std}/C_{std}} \tag{1}$$

where

A = integrated peak area

C = concentration (ng/mL)

t = analyte

std = quantitation standard

Mean RRFs for each analyte will be calculated for each analyte using results from each calibration standard. The data must meet criteria for precision, accuracy and linearity before being used for quantitation of sample amounts.

A mid-point standard will be run each analysis day to verify the calibration curve. Each analyte is in control if the daily RRF is within $\pm$ 25% of the mean RRF for the mid-point standard. Criteria for acceptable performance for the analytical system are:

- tuning criteria must be met,
- benzo[a]pyrene must be in control, and
- no more than 2 other analytes may be out of control.

New calibration standards will be analyzed and mean RRFs calculated if the daily standard is out of range.

5.6.2 Calibration for Air Exchange Measurements (GC/ECD)

All analysis will be carried out at BNL. Calibration procedures are described in detail elsewhere (18).

5.6.3 Calibration for Carbon Monoxide (Real-time Monitors)

Calibration of the carbon monoxide monitors will be accomplished by measurement of certified gas mixtures containing CO at known concentrations. Concentrations of CO in the mixtures will range from 0 ppm to 20 ppm. During deployment at a house, each monitor will be exposed to zero gas (0 ppm CO and span gas (10 ppm CO) and the readings will be recorded. The monitor will be adjusted to obtain the correct response if the span measurement is less than 7 or greater than 11 ppm. At the end of the 24-h monitoring period, each monitor will again be exposed to zero and span gas; the final response at each concentration will be recorded.

In addition to daily calibrations, a multipoint calibration will be performed weekly to assess the linearity of the calibration curve. This will be accomplished by exposure to a minimum of three different concentrations of CO.

5.7 Data Reduction, Validation, and Reporting

5.7.1 Chemical Analysis Data

The data flow is initiated by the chemist who either manually calculates the analyte concentration values or recovers the same from a computerized output. The concentration values for each analyte are recorded or generated on a Data Summary Form. If the analysis did not meet acceptable performance standards, corrective action is indicated (Section 5.12).

The criteria for "in-control" conditions will be based on a maximum acceptable variation in the measurement system. See Section 5.11 for a discussion of routine procedures which will be used to access accuracy and precision. When the analyses have been completed, the criteria for "in-control" conditions will be re-assessed. A summary will be made of concentration data generated under analytical conditions judged to be "out-of-control".

All reported analytical values will contain two significant figures. Final report data will contain two significant figures.

5.7.2 Rounding-Off Rules

If the figure following those to be retained is less than 5, the figure is dropped. Example, 32.4 is rounded off to 32.

If the figure following those to be retained is greater than 5, the last digit retained is increased by 1. Example, 21.7 is rounded off to 22.

If the figure following those to be retained is 5, the last digit retained is increased by 1 if odd; unchanged, if even. Examples, 13.5 is rounded off to 14, 16.5 is rounded off to 16.

In general, all arithmetic operations should be performed with all decimal places intact and the final result rounded off to correspond to the value with the fewer(est) significant figures.

5.7.3 Detection/Quantification Limits

The Data Summary Sheet (Figure 11) requires that the method quantifiable limit (MQL) be recorded in certain cases.

The MQL will be estimated using procedures based on EPA recommendations (19).

EPA has defined the MQL as the minimum concentration of a substance that can be measured and reported with 99% confidence that the true value, corresponding to a single measurement, is above zero (19). The MQL will be calculated for each target PAH as described below.

A minimum of 7 sampling cartridges will be fortified with low levels of the target analytes. They will be transported to the field site, returned and analyzed along with sample cartridges.

The MQL will be calculated as

$$MQL = SD(t_{0.99}) \tag{2}$$

where $t_{0.99}$ = student's t for a one-tailed test at the 99% confidence level and a Standard Deviation (SD) with n-1 degrees of freedom.

The MQL for CO will be estimated based on replicate measurements of a low concentration CO gas standard in the field. Equation (2) above will be used to calculate the estimated MDL.

The MQL for air exchange measurements will be provided by BNL.

5.7.4 Data Validation

Data validation will begin after samples have been analyzed and will continue during the period of data reduction. The following checks on data quality will be made by the QA Officer:

- In-control analytical conditions will be verified and data generated under conditions judged to be out-of-control will be noted.
- The mechanism used to transmit data from analytical system to the data reduction system will be reviewed.
- All quality control data (blanks, controls, daily calibration checks, LOD data) will be reviewed before data processing of samples begins.

- The concentration calculations of a random subset (5-10%) of the raw data will be re-calculated. This will consist of re-entering the input data on computer programs used originally for this purpose, or verifying the calculation manually.

Computer printouts containing all the entered analytical data will be generated periodically and reviewed. The cause for missing data will be investigated and reported detection limits will be verified.

5.7.5 Survey Instruments

5.7.5.1 Receipt Control

A survey assistant will be responsible for receipt and check-in of all materials received from the study site. Logs and document inventory sheets will be developed for use during this phase of data receipt. Each completed data collection instrument will be checked in by identification (ID) number by project personnel on the day received.

5.7.5.2 Visual Scan-Edit

Following check-in and receipt acknowledgement, each document will be reviewed to detect omissions, inconsistencies, and/or illogical or incompatible entries. Specifically, this review is designed to verify:

- That the interviewer understood and followed a question sequence and intent correctly and that entries seem reasonable and consistent,
- That any sampling or skip sequences were correctly followed and that no applicable items were omitted, and
- that each instrument is properly identified and that all items required for verification of the individual's work were completed.

All editing will be performed electronically.

5.7.5.3 Confidentiality of Project Data

RTI recognizes the need to maintain these project documents under strict controls to ensure confidentiality and record integrity. Storage for electronic source documents is in a secure room on the RTI campus at Research Triangle Park, North Carolina. When processing has been completed, all source documents will be filed in an ordered, accessible manner. During all stages of processing and storage, project personnel will control access to, removal of, and replacement of survey instruments from specified working and storage areas.

5.7.6 Statistical Analysis

For this study, it is anticipated that the statistical analyses will be similar to the analyses undertaken for the previous studies. The purposes of data analysis for the Pilot study are to compute summary statistics for the data collected and to use the results of the analyses in the design of a full scale study. Statistical analyses will be performed on the 280-home study monitoring and questionnaire data. This will include the following categories of analysis:

1. creating the analysis data files,
2. summaries of quantifiable limits,
3. summaries of percent measurable,
4. summary statistics, and
5. development and estimation of models relating pollutant concentrations to household characteristics and questionnaire data, and
6. comparison with data generated in Riverside, California.

The following paragraphs briefly describe these proposed analyses.

5.7.6.1 Analysis Data File

Before statistical analysis may proceed, it is necessary to create the data analysis files for the data collected in this study. This involves several steps after the data has been keyed, including:

1. determining if any outliers should be discarded:
   examine largest chemical values by medium and compound; examine range of quantifiable limits by medium and compound; and compare duplicate measurements.
2. deciding what values to give to measurements below the limit of detection (MQL).
3. combining duplicate measurements; duplicate readings will be averaged.

5.7.6.2 Summaries of Quantifiable Limits

The quantifiable limits for the various media and compounds will be examined to indicate how these limits vary for each compound. The minimum MQL, maximum MQL, percentages of concentrations above the maximum MQL, and ratio of percent above the maximum MQL to percent quantifiable may be calculated.

5.7.6.3 Summaries of Percent Quantifiable

Once the analysis data files are created, percent quantifiable statistics (e.g., above MQL) will be computed for all media and compounds. Tests of significance between categories of interest may be performed (e.g., indoor versus outdoor).

5.7.6.4 Summary Statistics

After examining the percent quantifiable statistics, summary statistics (e.g., sample means, medians, standard deviations, percentiles and ranges) will be computed by compound and media for each combustion source category. These statistics will only be computed for compounds and media that have a sufficient percentage of observations greater than the quantifiable limit.

5.7.6.5 Development of Models

Within each combustion source category, distribution estimates will be developed for indoor air concentrations, source strength, and emission rate.

5.8 Internal Quality Control Checks

5.8.1 Quality Control for Survey Operations

Technicians will be responsible for administering the questionnaire. Before data collection begins, training sessions will be conducted for the field staff to address study objectives, rationale and detailed procedures for collecting environmental samples, instructions for administration, coordination, quality control of all field operations, coding and editing instructions for all survey instruments, and discussion of anticipated problems.

5.8.2 Quality Control for PAH Sample Collection and Analysis

Internal quality control procedures to monitor each measurement parameter will be implemented during the sample collection in the field and during the sample analysis in the laboratory.

5.8.2.1 Control and Blank Samples

A set of control samples will be prepared by adding known amounts of selected target compounds to the sample matrix or the sampling device. The number of such controls will be equivalent to approximately 5% of the scheduled field sample collections. Additional control samples will be stored in the laboratory (laboratory controls). The field control samples will be shipped to the collection site and handled, stored, and shipped back to RTI in the same manner as field samples.

An equal number of analyte-free matrix blanks will also be prepared (approximately 5% of the scheduled field sample collections). As with the control samples, additional blanks will be stored in the laboratory (laboratory blanks) and the others (field blanks) shipped to the collection site and treated in the same manner as field samples.

The QA Officer will review the results of the controls and blanks after the analyses have been completed.

5.8.2.2 <u>Collocated Sample Collections (Duplicates)</u>

Approximately 5% of all samples will be collected in duplicate. Comparison of the analytical results of the replicates will provide a measure of the random (uncontrolled) contamination/losses during sample collection, storage and shipment; the homogeneity of the sample matrix; and the precision associated with sample preparation and analysis. Extracts from 25% of the duplicate samples will be sent to an external reference laboratory in order to evaluate differences in analysis technique between the two laboratories.

The results of the analyses described above will be evaluated by the RTI QA Officer after the analyses have been completed.

5.8.2.3 <u>Instrument Performance</u>

<u>Mass and Intensity Calibration</u>

Mass conversion of spectral peak times to peak masses will be accomplished with a mass calibration table based on perfluorotributylamine

(FC-43). The mass calibration data (characteristic ion fragments present in correct relative abundance) will be checked daily.

Assessment of Chromatographic Performance

The quality of the chromatography is important since the accuracy and precision of qualitative and quantitative analysis are directly affected. The most important criteria for evaluating fused silica capillary columns for PAH analysis are resolution (R) and percent peak asymmetry factor (%PAF). Appropriate compounds may be target analytes or standards added to the daily check standard. The evaluation criteria are:

Resolution (R)

$$R = \frac{2\,d}{W_1 + W_2} \qquad (3)$$

where d = distance between the peaks

W = peak width at base.

and percent peak asymmetry factor (PAF) (4)

$$\%PAF = \frac{B}{F} \times 100$$

where B = the area of the back half of a chromatographic peak

F = area of the front half of the chromatographic peak, both measured 10% above baseline

Resolution will be evaluated using benzo[a]pyrene and benzo[e]pyrene; peak asymmetry will be evaluated using benzo[a]pyrene.

5.8.2.4 Sequence of Sample Analysis

A strict step-sequence of analysis is followed. Upon mass and intensity calibration of the MS system, a mid-point calibration standard mixture is first analyzed. If acceptance criteria are met, then samples (including blanks and controls) are analyzed.

5.8.2.5 QA/QC for GC/MS Analysis

The analyst is responsible for logging samples into the MS lab, checking sample numbers and custody sheets, and properly storing samples. The analyst is responsible for recording all sample information and data in laboratory notebooks and maintaining records of maintenance, calibrations and results of QC checks. All custody records must be filled out and all samples must match their respective custody record. The analyst is also responsible for documenting problems or unusual occurrences and notifying the mass spectrometry laboratory manager of problems.

The mass spectrometry laboratory manager is responsible for reviewing laboratory records and procedures daily, resolving problems, and reporting losses and problems requiring corrective action to the Project Leader and QA Officer.

5.8.2.6 Procedural (Method) Blank Samples

Procedural blanks for PAH analysis will be run periodically to determine the contribution to analytical response made by the reagents, solvents, glassware, and equipment used in sampling or analysis. Any contamination observed in the chromatogram will be noted and corrective measures taken to eliminate the cause of the background peaks.

5.8.2.7 Estimate of Analytical Accuracy

Analysis of standard reference materials (SRM) provides the best estimate of analytical accuracy. Analysis of SRM or certified reference materials (CRM) will be used, where available, to evaluate accuracy.

A further measure of GC analytical bias for PAH samples will be carried out by comparing the daily mid-point calibration checks with the calibration curve used for sample quantitation.

5.8.2.8 Estimate of Analytical Precision

The variation of instrument response with time will be measured routinely with mid-point calibration checks. Analytical precision will be assessed by comparing the results of analysis of duplicate sample splits sent to the reference lab.

5.8.3 Quality Control for Air Exchange Measurements

Air exchange measurements (tracer gases collected on CATS) will be carried out by Brookhaven National Laboratory; the quality control program for analysis of CATS is detailed elsewhere (18).

Multiple air exchange measurements will be made at 5% of the homes to assess method precision. No samples will be sent to an independent reference laboratory.

5.8.4 Quality Control for CO Measurements

The accuracy of measurements with the CO monitor will be assessed on a daily basis by performance of zero and span gas measurements with each monitor, as described previously. Certified gas mixtures will be used. Instrument response to the mixtures will be recorded on daily calibration record forms.

At approximately 5% of the homes with CO measurements, CO will be measured in duplicate by use of two monitors placed side-by-side throughout the monitoring period. The duplicate measurements will assess measurement precision under field conditions of varying temperature, relative humidity, air movement, and CO concentrations.

The minimum detection limit (MDL) will also be assessed under field conditions by measurements of a certified gas mixture containing a low level (2 ppm) of CO. The measurements, to be performed at seven homes, will assess the MDL under field conditions that may result in zero and span drift during the measurement period.

5.9 System and Performance Audits

5.9.1 System Audits

Five major study components will be periodically audited by the RTI QA Officer:

- Survey operations,
- Preparation of sampling materials/supplies,
- Sample collection activities in the field,
- Analytical measurement systems, and
- Data entry and processing.

A Quality Assurance Audit Checklist will be developed to aid in the evaluation of the different work areas. The results will be made available to Task Leaders and the Project Leader in a timely fashion.

It will be the policy of this Quality Assurance Plan to avoid potential problems before they develop by disseminating QA information to and communicating with Task Leaders.

5.9.1.1 Survey Operations

The systems audit will be based, in part, on discussions with the survey operations Task Leader. The following procedures will be audited:

- Receipt of survey instruments,
- Completeness and quality of returned survey instruments,
- Visual scan-edit checks, and
- Custody of survey instruments.

Written audit reports will be submitted to the Task Leader and the Project Leader.

5.9.1.2 Preparation of Sampling Materials/Supplies

The preparation of field sampling materials and supplies at RTI will be reviewed. The following system components will be assessed:

- XAD and quartz filter cleanup,
- Cartridge assembly cleanup,
- Preparation of controls and blanks for sampling systems,
- Preparation of sampling protocol and chain-of-custody forms,
- Sampling pump calibration,
- Shipment to the field, and
- Specific problem areas.

The results of the system audits will be submitted in writing to the appropriate Task Leader and the Project Leader.

5.9.1.3 Sample Collection Analyis in the Field

The adherence to established protocols will be determined and an objective assessment of the field collection methodologies will be performed during the sample acquisition phase of this study by the Quality Assurance Officer (or designee).

5.9.1.4 Analytical Measurement Systems

The RTI analytical measurement systems will be audited twice, once shortly after analysis has begun, and again after sample analysis is complete. The laboratories in which PAH samples are extracted and analyzed will be evaluated for adherence to established protocols and general work performance. These audits will assess the following system components:

- Instrument(s) used and performance criteria,
- Chain-of-custody forms,
- Sample storage,
- Sample preparation methods,
- Internal QC protocols and records,
- Preventative maintenance,
- Mechanism for detecting and resolving analytical out-of-control situations,
- Data flow procedures,
- Status of problems requiring corrective action, and
- Other problem areas.

The results of the systems audits will be submitted in writing to the appropriate Task Leader and the Project Leader. The air exchange measurement analyses at BNL will not be audited.

5.9.1.5 Data Entry and Processing

Periodic systems audits will be conducted on the data entry and processing aspects of this study. An evaluation of document storage and quality control procedures will be performed in part by conversations with Mr. A. Clayton, Task Leader for data analysis.

5.9.2 Performance Audits

Performance evaluation samples are not scheduled for this program.

5.10 Preventative Maintenance

Preventative maintenance will be performed on each GC/MS system on a routine basis. Pump oil for each mass spectrometer will be changed a minimum of every six months. The source of each mass spectrometer will be cleaned and filaments replaced as needed. The interval can be as long as several months if all test parameters are satisfactorily met or as short as two days if necessary.

5.10.1 Documentation

In addition to the laboratory notebooks for technical personnel use, a bound notebook will be maintained for each instrument in this study. When applicable, the following information will be recorded:

- Results of performance test,
- Instrument calibration information, preparation of calibration solutions, standard calibration curve, calibration checks,
- Dates on which routine maintenance is performed and a detailed account of what was done,
- Comments concerning the analyses as they are performed,
- Instrument failure,
- Record of all instrument repairs, changes, and modification, which directly affects instrument performance, and
- Description of any problems and steps taken to rectify them.

5.11 Specific Routine Procedures Used to Assess Data Precision, Accuracy and Completeness

The procedures described below will be used to judge the condition of the analytical systems (in-control or out-of-control) and the quality of the data generated on a day-to-day basis. These quality assurance procedures require that appropriate criteria for accuracy and precision be met on each analytical system each day before sample analysis may begin.

5.11.1 Precision

The main objective of this quality control check is to obtain a quantitative estimate of analytical precision for judging the condition (in or out-of-control) of the measurement system. This is accomplished by analyzing a mid-range calibration standard (check standard) each analysis day and comparing the results for each analyte with calibration data.

The primary ion is used to assess system performance. The analytical system is in control when the daily values do not vary more than 25% from the calibration values. Benzo[a]pyrene must be in control daily. For the remainder of the analytes, if more than 2 analytes are not in control, corrective action must be taken.

5.11.2 Accuracy

The best methods for evaluating accuracy are based upon measurement of samples of known properties such as NIST Standard Reference Materials (SRMs). Assessment of accuracy will be based on analysis of SRMs or CRMs if suitable materials are available. Alternately, results of field control sample analysis will be monitored and cases of recovery values not meeting objectives (Section 5.3) will be investigated.

5.11.3 Completeness

A running record will be maintained of all samples not collected, lost, broken/destroyed or rejected because of unacceptable analytical performance. This information will be reported to the Quality Assurance Officer in writing. A staff member will be responsible for updating completeness charts monthly and reporting problems to the Project Leader and Quality Assurance Officer.

5.12 Corrective Action

Every effort will be made in each phase of this study to anticipate and resolve potential problems before the quality of performance is compromised. One of the major objectives of this QA plan is to establish the mechanisms necessary to achieve this end.

There will be two different mechanisms which will provide a check on the quality of the data and overall work performance. The internal quality control measures implemented in each work area by the respective supervisors will give information on data quality on a day-to-day basis. The responsibility for interpreting the results of these checks and resolving any potential problems resides with the respective Task Leaders.

The systems audits will provide another check on data quality but will be performed less frequently. The audits will be much more comprehensive and will yield more data quality information than the quality control regime described above. The RTI QA Officer will be responsible for performing these assessments and initiating appropriate corrective action.

Ideally the quality control measures regulating the operation of each work area will be sufficient to maintain acceptable performance and data quality. However, in the event that a study component is not operating within the limits of acceptability or is implementing methodologies not consistent with study objectives, a formal account of the matter must be submitted by the RTI QA Officer to the appropriate Task Leader and the Project Leader (see Figure 11). The report should contain the following information:

TEAM CALIFORNIA DATA SHEET

Sample Code:	Matrix:
Date Collected (m/d/y):	Collector I.D.:
Date Analyzed (m/d/y):	Analyst I.D.:
Date Processed (m/d/y):	Processor I.D.:
Temperature (deg. F):	Sample Vol. (L):
Tenax Batch:	Instrument Code:
Collection Time (initial):	M.S. Filename:

Backgnd./Recovery Filename:
LOD Filename:

I.D. NO.	COMPOUND	AMOUNT (NG/CART.	BKG	REC	BTV (L)	LOD (NG)	QL (NG)	CORR. AMT.(NG)	CONC. (UG/M3)	REPORT. VALUE
2	Chloroform									
3	1,2-Dichloroethane									
4	1,1,1-Trichloroethane									
5	Benzene									
6	Carbon Tetrachloride									
7	Trichloroethylene									
11	Tetrachloroethylene									
15	Styrene									
16	m-Dichlorobenzene									
17	p-Dichlorobenzene									
18	o-Dichlorobenzene									
19	Ethylbenzene									
20	o-Xylene									
21	m-Xylene									
22	p-Xylene									
23	n-Decane									
24	n-Dodecane									
25	1,4-Dioxane									
28	n-Octane									
29	n-Undecane									
31	a-Pinene									

Figure 11. Example of a Data Summary Sheet.

- Description and duration of problem
- Probable cause and resolution of problem
- Statement describing study data affected by problem
- Feasibility of repeating work activity and/or generating revised data.

No further work may be performed until the problem has been satisfactorily resolved and the RTI QA Officer has acknowledged approval.

5.13 Data Quality Report

Data quality reports will be issued as required. These reports may contain the following information:

- The quality of data being generated or used in the project (summary of system audits),
- A reliability summary for the measurement systems (internal QC),
- Delineate problem areas and corrective action taken.

A separate section will be included in the final report which discusses project data quality and describes the overall quality assurance program implemented during the study.

APPENDIX T
QUALITY ASSURANCE STATEMENT

QA Statement

Quality Assurance activities undertaken by the Analytical and Chemical Sciences (ACS) Quality Assurance Office in support of this program (ARB Contract No. A033-132, RTI Project 5038) included:

-meetings with the Project Leader on matters affecting data quality,
-conducting periodic reviews and audits of the data measurement systems, and
-monitoring situations requiring corrective action.

The ACS QA Office conducted systems audits of this study to ascertain that data were recorded properly, SOPs were implemented, and that the results reported reflect the raw data of the study. Written reports of all reviews and audits are maintained by the ACS QA Officer, and results have been reported to the Project Leader.

Inspection/Audit	Conducted	Reported
Audit of PAH QC Data	July 21, 1922	July 22, 1992
Audit of Air Exchange Data	Aug. 12, 1992	Aug. 13, 1992
Audit of Surrogate Recovery Data	Aug. 31, 1992	Sept. 1, 1992
Data Validation (PAH)	Sept. 8, 1992	Sept. 8, 1992
Document Review (ACS-SOP-130-003)	May 14, 1992	May 17, 1992
Final Data Review	May 13-14, 1992	May 17, 1992

In addition, regularly scheduled Inspections were conducted during the course of this study:

Inspection/Audit	Conducted	Reported
Analytical Measurement System (Instrument Log Notebook Inspection, ACS-SOP-815-003)	June, 1992	June 26, 1992
Preparation of Sampling Materials and Supplies (Laboratory Systems Audit, ACS-SOP-815-001)	June 1992	July 7, 1992
Notebook Inspection (ACS-SOP-815-002)	June 1992	July 7, 1992

Doris Smith

5/25/93

Doris Smith
ACS QA Officer

Date