SECTION 4
SUMMARY AND CONCLUSIONS

SURVEY OPERATIONS

For the follow-up study the same residences were contacted that were involved in the 1984 California TEAM study. Where possible, the same person was recruited to participate in the follow-up study. If that person no longer lived at that address then any household member seven years of age or older who lived at the address was eligible to participate in the study. Field interviewers made a personal visit to the homes, fully explained the study, obtained signed consent, administered the study questionnaire, entered the data into a lap-top personal computer and arranged for chemists to visit the residence four times during a 48-hour period to collect the environmental samples.

Table 4-1 summarizes our accuracy in determining the current resident for the 51 respondents that participated in the California Follow-up during the winter season. Of the 112 cases there were assigned to the interviewers, 51 participants completed the study questionnaire and participated in air monitoring activities. One participant who completed the study questionnaire cancelled the monitoring appointments due to illness. Another participant completed the study questionnaire but no convenient times for the air monitoring could be scheduled. There were 112 cases from the 1984 California TEAM Study from which the required 55 participants were to be obtained according to previously-defined criteria as given in the original Work Plan for this study (4,6,14). Of these, 48 were measured as having a high level of exposure in the previous study, 53 had a medium level of exposure and 11 had a low level of exposure. Of the 48 high-level exposure cases, 43 were attempted in the field and 26 were completed. None of these were included in the canister air sampling. Of the 53 medium-level exposure cases, 43 were attempted and 17 were completed. Finally, of the 11 low-level exposure cases all were attempted and 8 were completed. The results of the field data collection by final field status codes are given in Table 4-2.

Field collection began on January 29, 1987 and was concluded on February 15, 1987.

In preparation for the winter field activities, training was conducted by survey operations personnel with assistance from the field supervisor. Interviewers were trained on all aspects of field survey data collection including contacting the residents, obtaining cooperation, administering the study questionnaire using both the hard copy instrument and the programmed instrument on the computer, setting-up appointments for the 24-hour monitoring, reporting progress of work and administrative responsibilities. In addition, interviewers participated in mock-interviews and training exercises which involved practice in administering the study questionnaire and in transmitting the data using an automated telecommunications system. In addition to making four appointments for the chemists to collect environmental samples, the interviewers administered the study questionnaires.

For the Summer Season, two versions of the Study Questionnaire were designed and implemented. The exposure activity questionnaire from the Winter Season was again used in the Summer Season and was administered by the chemist at the last visit of the 24-hour monitoring period. Which version of the Study Questionnaire that was administered depended on whether the person recruited for the Summer Season participated in the prior Winter Season study. Version one was administered if the person recruited was the previous participant, otherwise version two was administered.

Forty of the participants were the original participants from the Winter Season, five were different participants, but from the same family. As in the Winter Season, an incentive was also provided to the participant.

Field data collection for the Summer Season began on June 29, 1987 and ended on July 12, 1987.

The results of the field data collection by final field status code are given in Table 4-3. The study questionnaire and environmental sampling was completed on 43 participants.

CHEMICAL SAMPLING AND ANALYSIS

Personal air, fixed-site air, and canister air samples were collected during the Winter and Summer seasons. Personal and fixed-site air (indoor

and outdoor) samples were collected from each participant and their home using Tenax GC sampling cartridges. Canister air samples were also collected indoors and outdoors but in only a subset of homes. Tracer gas emitters were deployed and air exchange samples were collected at all of the homes. Real-time monitoring using a portable gas chromatograph was performed at selected homes (homes which had canister sampling also) during the Winter trip to assist in the placement of indoor fixed-site samplers.

Field controls and blanks equal to 7 percent of the number of field samples were maintained. Similarly, duplicate samples equal to 10 percent of the total number of samples were collected for each matrix, except for canister samples in the Winter Season when no duplicates were collected. Prior to actual field work, a schedule for preparing, exposing, and shipping of field blank, control, and duplicate samples was prepared. This schedule was followed during the field sampling. Table 4-4 summarizes the samples collected from each participant in both the Winter and Summer Season studies. Table 4-5 presents the total samples collected and analyzed from the Winter and Summer Seasons.

As in the 1984 TEAM study, the volatile organic compounds in personal and fixed-site air samples were collected by pulling air, using a constant flow pump, through a bed of Tenax GC contained in a glass tube. Approximately 18 L of air was collected over the monitoring period. Glass fiber filters were attached to the inlet end of the Tenax cartridge to remove particulates from the sampled air. For personal air sampling, the pump and cartridge were carried by the participant with the inlet of the sampling cartridge located in proximity to the subject's breathing zone. For fixed-site air sampling, the pump and cartridge were placed inside a metal box for protection with only the inlet end of the sampling cartridge protruding.

In addition, fixed-site air samples were also collected in evacuated, Summa-polished, stainless steel canisters (6 L nominal volume) using mass flow controllers to provide a fixed flow over the collection period during the Summer Season and flow controlling orifices during the Winter Season.

Exposed Tenax GC cartridges were analyzed by thermal desorption, capillary GC/MS/COMP. Canister samples were analyzed by GC/ECD/FID for the Winter Season samples and by GC/ECD/FID and GC/MS/COMP in the Summer Season samples.

Air exchange measurements were conducted during the Winter Season with each house considered as a single zone with an overall air infiltration rate except for the subset of ten homes which were treated as a three-zone model. A three-zone model was used during the Summer Season. In each residence, permeation devices [different perfluorotracer compounds in different zones] were placed in each zone. Tracer concentrations were passively monitored using capillary adsorbent tube samplers concurrent with volatile organic sampling. Analysis of the tube samplers by GC/ECD/FID was followed by application of a multicompartment mass balance model for determining the infiltration rate in each zone and the mixing rate between zones, as well as the overall infiltration rate for the home.

During the Winter Season, a portable gas chromatograph was used to locate sources of emissions in selected residences to aid in placement of indoor canister samples. This real-time monitoring was performed prior to actual monitoring on a subset of ten homes in the Winter Season.

Cooperative fixed-site sampling at a central location between RTI and the California Air Resources Board was planned as part of the study. The simultaneous sampling was intended to address two monitoring questions: (1) how well do the time integrated Tenax, Summa-polished canister and Tedlar bag sampling methods agree quantitatively; and (2) how well does a centrally-located fixed sampling location reflect the chemical microenvironment of a study participant's backyard? The centrally-located fixed-site collection station was operated during the same time as the monitoring at the participant's home. The fixed-site monitoring location was at the Madronna Middle School in Torrance.

All laboratory and field activities were performed under the standard operating procedures that have been previously drafted for the TEAM program. Peer-reviewed sampling and analysis protocols were employed for canister sample collection and analysis and air exchange measurements in lieu of standard operating procedures, as these procedures had not been executed during earlier TEAM studies.

QUALITY ASSURANCE

A quality control/quality assurance (QC/QA) program was carried out during the Winter and Summer sampling. The results of these procedures are

presented here and will address the following areas:

1. Sample and data collection during field operations
2. Monitoring chemical analysis
3. Precision estimates based on duplicate sample analysis and
4. Accuracy assessment based on target compound measurement controls and performance audit samples.

This information was evaluated and summary statements are presented on (1) field operations, (2) completeness, (3) precision, and (4) accuracy for each of the Winter and Summer sampling trips to the Los Angeles County area.

Field Operations

The sample and data collection activities at the study sites during the Winter and Summer Seasons proceeded without serious problems. Standard operating procedures that had been developed were utilized during this sampling. During the Winter sampling, environmental sample collection was accomplished by four two-person teams. Two teams were at the site simultaneously. Three teams included one individual experienced in team sampling techniques. The fourth team did not. During the Summer sampling two, two-person teams were at the field site simultaneously. In addition, an individual portable GC operator was at the field site during the Winter Season. Site administrators were also in the field during the sampling. The site administrator was responsible for the successful execution of the day-to-day sampling efforts and the overall adherence to the study protocol.

Completeness

Completeness was defined as a percent of samples collected for which analytical results were reported (either not detected, trace or measurable). The completeness of field samples for all sampling trips was approximately 90 percent. The comparable completeness figure for the duplicate and quality assurance samples was approximately 75 percent.

Precision

Precision estimates were based on the analytical results for duplicate sample pairs although the observed variability included contributions from

both collection and analysis. The agreement between duplicate concentration values for target compounds was expressed as a percent relative standard deviation (%RSD). These data were evaluated and compared with respect to sample matrix and target compound.

Winter Season--

In general, the agreement between duplicate sample pairs was excellent. For most target compounds collected on Tenax across all media the median %RSD was less than 20 percent. One deviant exception was 1,4-dioxane (74 %RSD). The median %RSD between the primary and quality assurance laboratories was under 40 percent for most chemicals on Tenax samples across all media. The %RSD for duplicate air-exchange measurements was less than 33 percent.

Summer Season--

For the summer season, the median %RSD was less than 20 percent for most chemicals collected on indoor and outdoor Tenax samples while the median %RSD was less than 35 percent for most chemicals on personal air. The median %RSD between the primary and QA laboratories was under 25 percent across all Tenax sample types, considerably better than for the Winter study. The %RSD for duplicate air-exchange measurements ranged from 0 to 2.7 and 2.2 to 68.4 for two-zone and three-zone homes, respectively.

Accuracy

Two criteria were used in assessing method accuracy: (1) the blank-corrected recovery of target compounds from field control samples and (2) results from performance audit samples.

Winter Season--

The mean recovery of analytes from control samples on Tenax ranged from 75 to 129 percent with the relative standard deviation between 15 to 49 across all samples and compounds. The recovery of analytes from control samples in canisters, as measured by electron capture detection was 53 to 109 percent with a %RSD range of 14 to 41 for the winter sampling. Recovery data for control samples for air exchange measurements indicate a bias ranging from 4 to 48 percent.

The performance evaluation results for the Winter Season indicated a range of 87 to 152 mean percent recovery with a percent relative standard deviation of 8 to 61.

Summer Season--

For the Tenax control samples employed in the Summer Season, the mean recovery of analytes ranged from 85 to 100 percent with a %RSD between 2 and 65 percent. The mean % recovery of analytes in canister controls, as measured by ECD was 32 to 64 with a %RSD of 1-86, whereas, with MS the % recoveries were 75 to 102 percent. And finally, recovery data for air-exchange indicated a potential bias of 13, 12, and 5.8 percent for PFT2, PFT3, and PFT8, respectively.

The performance evaluation results for Tenax sampling cartridges indicated a mean % recovery of 54 to 130 and %RSD of 8 to 55 across all chemicals.

A comparison of the accuracy, as based on these two criteria for the 1987 study versus 1984 study, indicates a lower degree of bias in the 1987 study.

STATISTICAL ANALYSIS OF DATA

Winter Season

For Tenax samples, benzene, 1,1,1-trichloroethane, tetrachloroethylene, and m,p-xylene were measurable in over 90 percent of the samples in all media (Table 4-6). Ethylbenzene, p-dichlorobenzene, o-xylene, and n-octane were measurable in at least 50 percent of the samples in all media. Carbon tetrachloride, styrene, n-decane, n-undecane, and n-nonane showed higher percentages in the personal, indoor, and outdoor air samples than in breath samples. Chloroform, 1,2-dichloroethane, trichloroethylene, and n-dodecane showed higher percentages in personal and indoor air samples than outdoor air samples. Limonene and α-pinene showed higher breath, personal air, and indoor air percentages than outdoor air percentages. 1,4-Dioxane, m-dichlorobenzene, and 1,2-dibromoethane showed low percentages in all media.

Limonene, m,p-xylene, and 1,1,1-trichloroethane showed the highest values in both overnight and daytime personal air samples. Limonene, m,p-xylene, and p-dichlorobenzene showed high levels in overnight and

daytime kitchen and daytime living area samples. For outdoor samples, benzene, 1,1,1-trichloroethane, and m,p-xylene showed the highest values.

For canister samples, carbon tetrachloride, 1,1,1-trichloroethane, trichloroethylene, and tetrachloroethylene had high percentages measurable (Table 4-7). Trichloroethylene and 1,1,1-trichloroethane showed the highest values indoors, while carbon tetrachloride and 1,1,1-trichloroethane showed the highest levels outdoors.

Summer Season

For the Tenax samples, benzene, tetrachloroethylene, and 1,1,1-trichloroethane were measured in over 75 percent of the samples for all media while ethylbenzene and m,p-xylene were measured in over half of the samples in all media (Table 4-8). Styrene, α-pinene, n-undecane, and n-dodecane showed lower percentages in outdoors than in personal or indoor air. Limonene showed lower percentages outdoors than in the other media. Chlorobenzene, m-dichlorobenzene, 1,4-dioxane, o-dichlorobenzene, 1,1,2,2-tetrachloroethane, and 1,2-dibromoethane showed low percentages in all media.

Relatively large concentrations were found for 1,1,1-trichloroethane, p-dichlorobenzene, and m,p-xylene in overnight personal air and for 1,1,1-trichloroethane, m,p-xylene, and limonene in daytime personal air. Indoors and outdoors, 1,1,1-trichloroethane and m,p-xylene showed the highest values.

The canister samples for the Summer Season were analyzed using two methods: (1) GC/MS/COMP and (2) GC/ECD/FID. For the GC/ECD/FID samples, chloroform, 1,1,1-trichloroethane, carbon tetrachloride, trichloroethylene, and tetrachloroethylene were most often found (Table 4-9). Methylene chloride, allyl chloride, and trans-1,2-dichloroethylene were occasionally found. Vinylidene chloride, 1,1-dichloroethane, cis-1,2-dichloroethylene, and vinyl chloride were never found. For the GC/MS/COMP samples, 1,1,1-trichloroethane, benzene, toluene, tetrachloroethylene, ethylbenzene, o-xylene, m,p-xylene, n-decane, and methylene chloride were found in most samples while chloroform, p-dichlorobenzene, and n-octane were often found (Table 4-10). Vinylidene chloride, n-dodecane, and trichloroethylene were occasionally found while carbon tetrachloride and vinyl chloride were never found.

For the GC/ECD/FID samples, methylene chloride showed the highest concentrations indoors, while 1,1,1-trichloroethane and carbon tetrachloride showed the highest levels outdoors. For the GC/MS/COMP samples, toluene showed the highest concentrations indoors while n-dodecane was highest outdoors.

Central Fixed Site - Summer Season

Three collectors (Tenax, Tedlar bags, and canisters) were used to obtain central fixed-site samples. The canisters were then processed using GC/ECD/FID and GC/MS/COMP. The four data sets yielded information on a variety of compounds. Only 1,1,1-trichloroethane was detected in sufficient quantity in all four methods to give a good comparison. However, carbon tetrachloride, tetrachloroethylene, ethylbenzene, o-xylene, m,p-xylene, n-decane, and methylene chloride were measurable in sufficient quantity in pairs of methods to allow comparisons.

The ratios for the various pairs of methods are given in Table 4-11. The ratio was included only if both observations were measurable. No large differences are apparent. However, GC/ECD/FID canister concentrations tended to be higher than GC/MS/COMP canister or Tenax concentrations.

The fixed-site levels were then compared with the outdoor levels found at the participants' homes. The outdoor levels at the homes were paired with the central fixed-site outdoor levels taken on the same date during the same 12-hour period. The ratios were computed (Table 4-12) using the same inclusion criteria as above. The ratios show that the home outdoor samples tended to be higher than the central fixed-site samples (i.e., ratios were less than 1.0).

House Source Strengths

Whole-house source strengths based on overnight and daytime, kitchen, and daytime living area concentrations were calculated using the following model:

$$S = A*V(C_n-C_o)$$

where S = whole house source strength ($\mu g/hr$),
A = air exchange rate (1/hr),
V = house volume (m^3),
C_n = indoor concentration ($\mu g/m^3$),
C_o = outdoor concentration ($\mu g/m^3$).

These calculations were done only on concentrations that were measurable. The house source strengths for the overnight kitchen (Tables 4-13 and 4-14) show wide ranges. While all means were greater than zero, there were large differences with p-dichlorobenzene showing an average winter source strength of 12,500 μg/hr while carbon tetrachloride showed an average of 0.81 μg/hr.

TABLE 4-1. SUMMARY OF RE-ENLISTMENT OF 1984 STUDY RESPONDENTS - WINTER, 1987

Final Status	Assumed Status of Resident: Original Participant	New Participant	Don't Know Participant	Total
Original Participant	11	6	14	31
Original Family, Different Participant	2	2	5	9
Different Family, Different Participant	1	1	9	11
Total	14	9	28	51

TABLE 4-2. RESULTS OF FIELD DATA COLLECTION - WINTER SEASON

Field Status Codes	Number of Participants
Study Questionnaire and Environmental Sampling Completed	51
Study Questionnaire Completed, Environmental Sampling Not Performed	2
Refusal to Participate by Household	13
No One at Home	24
Other	7
Not Worked in the Field	15
TOTAL	112

TABLE 4-3. RESULTS OF FIELD DATA COLLECTION - SUMMER SEASON

Field Status Codes	Number of Participants
Study Questionnaire and Environmental Sampling Completed	43
Study Questionnaire Completed, Environmental Sampling Not Performed	2
Refusal to Participate by Household	4
Vacant Housing Unit	1
Original Participant Moved	1
TOTAL	51

TABLE 4-4. SUMMARY OF SAMPLES COLLECTED IN WINTER AND SUMMER SEASONS

Season	Personal Air	Fixed-Site Air		Canister Air		Air Exchange	Central Fixed Site	
		Outdoor	Indoor	Outdoor	Indoor		Canister	Tenax GC
Winter	152/142[a]	150/138	215/195	22/18	22/30	298/270	-	
Summer	112/108	112/108	171/156	22/22	22/22	315/303	16/16	26/26

[a]Scheduled for collection/actual collection; includes samples, duplicates, QA samples, field blanks, and field controls; lab blanks and lab controls excluded.

TABLE 4-5. SUMMARY OF SAMPLES ANALYZED FROM THE WINTER AND SUMMER SEASONS

Season	Personal Air	Fixed-Site Air		Canister Air		Air Exchange	Central Fixed Site	
		Outdoor	Indoor	Outdoor	Indoor		Canister	Tenax GC
Winter	119	117	153	18	29	241	-	-
Summer	99	102	151	22	22	288	15	25

TABLE 4-6. TARGET COMPOUNDS SORTED BY PERCENT MEASURABLE IN TENAX SAMPLES - WINTER SEASON

Ubiquitous Compounds	Range of % Measurable
1,1,1-Trichloroethane	91-100
Benzene	92-100
Tetrachloroethylene	98-100
p-Dichlorobenzene	54-98
Ethylbenzene	65-100
o-Xylene	62-100
m,p-Xylene	94-100
n-Octane	75-100
Often Present	
Chloroform	17-69
1,2-Dichloroethane	2-82
Carbon tetrachloride	0-91
Styrene	27-100
n-Decane	44-100
n-Dodecane	22-96
n-Undecane	42-100
α-Pinene	22-100
Limonene	49-100
n-Nonane	46-100
Trichloroethylene	8-52
Occasionally Found	
m-Dichlorobenzene	0-14
1,4-Dioxane	0-22
1,2-Dibromoethane	0-2

TABLE 4-7. TARGET COMPOUNDS SORTED BY PERCENT MEASURABLE IN CANISTER SAMPLES - WINTER SEASON

Ubiquitous Compounds	Range of % Measurable
1,1,1-Trichloroethane	100
Carbon tetrachloride	86-100
Often Present	
Trichloroethylene	14-100
Tetrachloroethylene	0-75
Occasionally Found	
Chloroform	6-38
Methylene chloride	12-25
Allyl chloride	0-6
Never Found	
Vinylidene chloride	0
trans-1,2-Dichloroethylene	0
1,1-Dichloroethane	0
cis-1,2-Dichloroethylene	0

TABLE 4-8. TARGET COMPOUNDS SORTED BY PERCENT MEASURABLE IN TENAX SAMPLES - SUMMER SEASON

Ubiquitous Compounds	Range of % Measurable
1,1,1-Trichloroethane	95-100
Benzene	75-100
Tetrachloroethylene	79-100
Ethylbenzene	67-100
m,p-Xylene	67-100
Often Present	
Carbon tetrachloride	0-83
Styrene	22-90
p-Dichlorobenzene	26-77
o-Xylene	33-100
n-Decane	28-100
n-Dodecane	3-86
n-Undecane	9-100
α-Pinene	8-94
Limonene	3-100
n-Nonane	8-100
Occasionally Found	
Chloroform	22-47
1,2-Dichloroethane	0-42
Trichloroethylene	0-41
Chlorobenzene	0-10
m-Dichlorobenzene	0-10
o-Dichlorobenzene	2-15
1,4-Dioxane	0-9
1,1,2,2-Tetrachloroethane	0-3
Never Found	
1,2-Dibromoethane	0

TABLE 4-9. TARGET COMPOUNDS SORTED BY PERCENT MEASURABLE IN ECD/FID CANISTER SAMPLES - SUMMER SEASON

Ubiquitous Compounds	Range of % Measurable
1,1,1-Trichloroethane	87-100
Carbon Tetrachloride	87-100
Tetrachloroethylene	62-100
Often Present	
Chloroform	37-100
Trichloroethylene	25-63
Occasionally Found	
Methylene chloride	0-25
Allyl chloride	0-13
trans-1,2-Dichloroethylene	0-13
Never Found	
Vinyl chloride	0
Vinylidene chloride	0
1,1-Dichloroethane	0
cis-1,2-Dichloroethylene	0

TABLE 4-10. TARGET COMPOUNDS SORTED BY PERCENT MEASURABLE IN MS CANISTER SAMPLES - SUMMER SEASON

Ubiquitous Compounds	Range of % Measurable
1,1,1-Trichloroethane	100
Benzene	100
Toluene	100
Tetrachloroethylene	50-75
Ethylbenzene	62-100
o-Xylene	62-100
m,p-Xylene	100
n-Decane	62-100
Dichloromethane	100
Often Present	
Chloroform	0-63
p-Dichlorobenzene	37-63
n-Octane	25-88
Occasionally Found	
Vinylidene chloride	0-13
Trichloroethylene	0-38
n-Dodecane	12-25
Never Found	
Carbon tetrachloride	0
Vinyl chloride	0

TABLE 4-11. SUMMARY STATISTICS FOR RATIO OF CONCENTRATIONS FOUND IN CENTRAL FIXED SITE SAMPLES

Compound	Sample Size	Mean Ratio	Median Ratio	Minimum Ratio	Maximum Ratio
ECD/FID TO MS CANISTER					
1,1,1-Trichloroethane	11	1.39	1.35	0.94	2.23
Carbon Tetrachloride	1	1.18	1.18	1.18	1.18
Tetrachloroethylene	2	1.41	1.41	1.34	1.48
ECD/FID CANISTER TO TEDLAR BAG					
1,1,1-Trichloroethane	11	0.58	0.35	0.12	1.66
Carbon Tetrachloride	11	2.90	2.29	1.58	5.30
Tetrachloroethylene	10	0.41	0.22	0.04	1.22
ECD/FID CANISTER TO TENAX					
1,1,1-Trichloroethane	10	1.71	0.69	0.42	8.22
Carbon Tetrachloride	6	1.69	1.37	1.00	2.93
Tetrachloroethylene	5	2.10	1.69	1.17	3.27
MS CANISTER TO TEDLAR BAG					
1,1,1-Trichloroethane	11	0.45	0.28	0.08	1.69
Carbon Tetrachloride	1	4.48	4.48	4.48	4.48
Tetrachloroethylene	2	0.25	0.25	0.13	0.36
Methylene chloride	11	0.89	0.93	0.04	2.36
MS CANISTER TO TENAX					
1,1,1-Trichloroethane	10	1.48	0.57	0.29	8.39
Benzene	10	1.70	0.58	0.50	5.29
Ethylbenzene	9	0.88	0.98	0.32	1.27
o-Xylene	9	1.11	1.18	0.42	1.65
m,p-Xylene	10	0.77	0.72	0.31	1.25
n-Decane	3	6.43	6.55	3.67	9.09
TEDLAR BAG TO TENAX					
Chloroform	2	0.50	0.50	0.07	0.94
1,1,1-Trichloroethane	17	3.19	3.09	0.50	11.4
Carbon Tetrachloride	10	0.83	0.76	0.49	1.49
Tetrachloroethylene	9	5.02	3.95	1.54	12.9

TABLE 4-12. SUMMARY STATISTICS FOR RATIO OF CONCENTRATIONS FOUND IN CENTRAL FIXED SITE TO OUTDOOR SAMPLES

Compound	Sample Size	Mean Ratio	Median Ratio	Minimum Ratio	Maximum Ratio
ECD/FID CANISTER					
1,1,1-Trichloroethane	11	0.73	0.58	0.13	2.12
Carbon Tetrachloride	11	0.91	0.92	0.09	2.06
Tetrachloroethylene	7	0.97	1.21	0.26	1.46
MS CANISTER					
1,1,1-Trichloroethane	13	1.09	0.55	0.13	6.94
Benzene	13	1.12	0.95	0.26	2.90
Toluene	13	0.85	0.75	0.25	1.68
Tetrachloroethylene	3	0.56	0.64	0.36	0.69
p-Dichlorobenzene	2	0.70	0.70	0.67	0.74
Ethylbenzene	9	0.66	0.75	0.15	1.10
o-Xylene	11	0.92	0.85	0.10	2.44
m,p-Xylene	13	1.12	0.81	0.24	4.08
n-Decane	10	0.77	0.75	0.04	1.44
n-Octane	2	0.92	0.92	0.82	1.02
Methylene chloride	13	0.62	0.66	0.06	1.03
TENAX					
Chloroform	2	0.64	0.64	0.33	0.95
1,1,1-Trichloroethane	57	0.90	0.63	0.10	4.86
Benzene	52	0.92	0.67	0.08	4.90
Carbon Tetrachloride	30	1.23	1.17	0.70	2.51
Tetrachloroethylene	21	0.35	0.30	0.10	0.88
Ethylbenzene	65	0.86	0.54	0.15	6.63
o-Xylene	64	0.60	0.40	0.10	4.69
m,p-Xylene	65	0.98	0.61	0.16	7.59
n-Decane	12	0.21	0.16	0.05	0.46
n-Octane	5	0.72	0.73	0.44	1.06
n-Undecane	2	1.33	1.33	1.31	1.34
n-Nonane	16	0.68	0.65	0.29	1.27

TABLE 4-13. SUMMARY STATISTICS (μg/hr) FOR WHOLE HOUSE SOURCE STRENGTHS BASED ON OVERNIGHT KITCHEN CONCENTRATIONS FOR SELECTED COMPOUNDS - WINTER SEASON

Compound	Sample Size	Mean	Std. Error	Minimum	Maximum
1,1,1-Trichloroethane	32	1,310	730	-6,350	20,500
Benzene	27	984	583	-2,670	10,900
Carbon Tetrachloride	29	0.81	16.3	-269	267
Tetrachloroethylene	31	126	141	-1,210	3,230
Styrene	28	20.2	80.7	-824	1,270
p-Dichlorobenzene	26	12,500	5,160	-753	104,000
Ethylbenzene	32	314	233	-1,780	6,010
m,p-Xylene	32	1,200	1,040	-8,100	28,100
n-Octane	30	419	232	-1,080	6,750
n-Undecane	29	531	177	-703	3,790
Limonene	26	6,153	1,490	343	32,900
n-Nonane	31	814	408	-1,230	9,630

TABLE 4-14. SUMMARY STATISTICS (μg/hr) FOR WHOLE HOUSE SOURCE STRENGTHS BASED ON OVERNIGHT KITCHEN CONCENTRATIONS FOR SELECTED COMPOUNDS - SUMMER SEASON

Compound	Sample Size	Mean	Std. Error	Minimum	Maximum
1,1,1-Trichloroethane	34	2,740	1,360	-8,560	43,300
Benzene	34	630	369	-3,440	8,280
Carbon Tetrachloride	24	17.3	28.7	-456	382
Tetrachloroethylene	19	253	159	-1,580	1,990
Styrene	12	1,010	839	-147	10,200
p-Dichlorobenzene	9	3,090	1,780	-1,020	14,900
Ethylbenzene	34	449	182	-1,250	5,330
m,p-Xylene	34	1,900	795	-6,440	22,200
n-Octane	23	826	182	-36.9	3,640
n-Undecane	12	6,270	3,590	-17.2	43,400
Limonene	1				
n-Nonane	23	854	233	-183	4,580

SECTION 5
RECOMMENDATIONS

SURVEY OPERATIONS

Both the Household Questionnaire and the Exposure Activity Questionnaire continue to be resistant to uniform administration by TEAM survey and analytical staff. In particular, questions about "ceiling exhaust fans" were almost certainly inconsistently interpreted by interviewers, chemists and participants. A thorough review of the questions in both of these survey instruments is recommended.

A comparison was made for data derived from analysis of samples collected at a centrally-located fixed-site. Three sampling and analysis approaches were compared: (1) Tenax GC sampling with GC/MS/COMP (2) canister sampling with GC/MS/COMP, and (3) canister sampling with GC/ECD/FID. Based on the results obtained, sampling with a Tenax GC cartridge or a canister followed by GC/MS/COMP analysis yielded comparable data. However, of the two analysis methods, GC/ECD/FID and GC/MS/COMP for canisters, the more versatility and greater sensitivity for a wide variety of volatile chemicals was exhibited by GC/MS/COMP. Thus, it is recommended that either Tenax or canister sampling be employed in future studies requiring fixed-site monitoring in combination with GC/MS/COMP analysis.

In future studies of this nature, we strongly recommend that the activities to be performed at each of the homes be clearly delineated and the magnitude of the burden on the participant be kept to a minimum. The collection of an enormous number of samples and questionnaire information also produces a heavy burden on the field sampling team. Thus, it is recommended that in any future study, the design, types and numbers of samples collected be carefully justified to reduce the effort and cost.

STATISTICAL ANALYSIS

Although there has been extensive analysis of the California data for the 1984 and 1987 studies, additional analysis could be undertaken

including:

1. The questionnaire data collected from each participant should be more fully explored. This includes not only the household questionnaire, but also the 24-hour exposure screener which the participants completed for their activities during the monitoring period. A detailed evaluation of the relationship between various questionnaire variables and observed levels of target compounds and indoor air remains to be performed. Such an evaluation would assess whether differences in VOC levels in indoor air versus outdoor air could be explained by questionnaire data.
2. The relationship between compounds in a given medium should be further examined. In particular, Spearman correlations between compounds and principal components analysis could be performed. Principal components analysis would indicate whether a few linear combinations of compounds within a sample medium account for the observed variability in VOC concentrations.
3. Volatile organic compound levels in air collected at the various sampling sites should be compared. That is, comparison of these VOC levels in the 1987 and the 1984 study in Los Angeles County should be performed. Furthermore, a comparison should be made to other areas such as Contra Costa County, California; Bayonne/ Elizabeth, New Jersey; Devils Lake, North Dakota; and Greensboro, North Carolina.
4. Detail multivariate analysis of the TEAM database has not been undertaken. In particular, multivariate analysis to organize the VOC into groups should be done (using principal component analysis) followed by an examination of the success of prediction of the VOC group concentrations by the questionnaire data. This type of analysis potentially would be extremely useful in planning future surveys. In addition, the multivariate analysis of variance could be used to determine if VOC levels are significantly different by site and season.
5. The effects of meteorological conditions on indoor and outdoor VOC levels should be investigated. For example, the effects of wind direction and temperature on indoor levels of various compounds might be contrasted with the effects of these meteorological

variables on the outdoor fixed-site VOC levels. A more detailed comparison could be performed between the outdoor fixed-site locations at the residences and the centrally-located fixed site in terms of these meteorological variables.

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APPENDIX A

WINTER SEASON:
Study Questionnaire
Exposure Activity Questionnaire
Inventory Form

OMB NO. 2080-0027

EXPIRES: January 1988

STUDY ON TOXIC CHEMICALS IN ENVIRONMENTAL AND HUMAN SAMPLES

Conducted by:

Research Triangle Institute
P.O. Box 12194
Research Triangle Park, North Carolina 27709

STUDY QUESTIONNAIRE

THE RESEARCH TRIANGLE INSTITUTE OF RESEARCH TRIANGLE PARK, NORTH CAROLINA, IS UNDERTAKING A RESEARCH STUDY FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY AND THE CALIFORNIA AIR RESOURCES BOARD TO ASSESS LEVELS AND RELATIONSHIPS OF SELECTED TOXIC COMPOUNDS IN HUMAN AND ENVIRONMENTAL MEDIA. THE INFORMATION RECORDED IN THIS QUESTIONNAIRE WILL BE HELD IN STRICT CONFIDENCE AND WILL BE USED SOLELY FOR RESEARCH INTO THE EFFECTS OF ENVIRONMENTAL FACTORS ON PUBLIC HEALTH. ALL RESULTS WILL BE SUMMARIZED FOR GROUPS OF PEOPLE; NO INFORMATION ABOUT INDIVIDUAL PERSONS WILL BE RELEASED WITHOUT THE CONSENT OF THE INDIVIDUAL. WHILE YOU ARE NOT REQUIRED TO RESPOND, YOUR COOPERATION IS NEEDED TO MAKE THE RESULTS OF THIS SURVEY COMPREHENSIVE, ACCURATE AND TIMELY.

(PLACE PID LABEL HERE)

(PLACE CHEMISTRY LABEL HERE)

First, I would like to ask some questions about your occupation.

1. Are you presently employed in any capacity? (CIRCLE RESPONSE CODE)

   1 Yes (CONTINUE) 2 No (GO TO QUESTION 4)

2. a. What is your current occupation?

   _____

   b. Is this your usual primary occupation?

   1 Yes (GO TO QUESTION 3) 2 No

   c. What is your primary occupation?

   _____

3. What is the name and street address of the organization for which you work?

   Name: _____

   Address: _____ Room #_____ ZIP _____

   (GO TO QUESTION 6)

4. IF NOT PRESENTLY EMPLOYED: Which of the following best describes your status?

   1 Housewife
   2 Student
   } (GO TO QUESTION 6)

   3 Unemployed
   4 Retired
   5 Disabled
   } (GO TO QUESTION 5)

5. What was your main occupation?

   _____

   _____

Next, I would like to ask some questions regarding your personal habits.

6. Which of the following best describes your cigarette smoking status? (READ ANSWER CHOICES AND CIRCLE ONE)

   1 Current smoker (GO TO QUESTION 7a)

   2 Ex-smoker (CONTINUE WITH QUESTION 8a)

   3 Never smoked (GO TO QUESTION 8a)

7. a. On average, how many cigarettes do you smoke per day?

   1 Less than 1/2 pack

   2 1/2 pack or more, but less than 1 pack

   3 1 pack or more, but less than 1 1/2 packs

   4 1 1/2 packs or more, but less than 2 packs

   5 More than 2 packs

   b. What is the number that appears on the side panel of the brand of cigarettes you usually smoke?

   Number _____

   c. Do you usually inhale the smoke?

   1 Yes 2 No

8. a. Does anyone else in your household smoke cigarettes?

   1 Yes 2 No

b. Which rooms do smokers, living or visiting in the home, smoke in most often between the hours of (a) 7 a.m. and 6 p.m.? and (b) 6 p.m. and 7 a.m.? (CIRCLE ALL THAT APPLY FOR EACH TIME PERIOD)

	a. (DAYTIME) 7 a.m. - 6 p.m.	b. (EVENING/NIGHT) 6 p.m. - 7 a.m.
Living room	1	1
Dining room	2	2
Kitchen	3	3
Den	4	4
Master bedroom	5	5
Other bedroom (SPECIFY WHOSE)	6 _____	6 _____
Other room (SPECIFY)	7 _____	7 _____
NONE	8	8

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

9. a. Do you use any of the following tobacco products on a regular basis?

b. IF YES: About how many times a day or week do you use (NAME OF TOBACCO PRODUCT)?

	YES	NO	TIMES PER	DAY	WEEK
(1) Pipes	1	2	_____	1	2
(2) Cigars	1	2	_____	1	2
(3) Snuff	1	2	_____	1	2
(4) Chewing Tobacco	1	2	_____	1	2

10. Do you or any member of your household pursue any of the following hobbies? (FOR EACH YES, ASK WHO?)

Hobbies	No	You	Household Member
Painting	0	1	2
Furniture refinishing	0	1	2
Scale models	0	1	2
Gardening	0	1	2
House plants	0	1	2
Automobile or bicycle repair	0	1	2

11. Have you worked with or used pesticides or herbicides outdoors for more than 1 hour at a time in the past 6 months?

1 Yes 2 No

12. a. Did you or any member of the household use pesticides in the home in the past 6 months?

1 Yes 2 No (GO TO QUESTION 13)

b. In which rooms?

1 Living Room
2 Dining Room
3 Kitchen
4 Den
5 Master Bedroom
6 Other Bedroom (SPECIFY WHOSE) _____
7 Other Room (SPECIFY) _____
_____

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

13. a. Did you pay someone to have your home treated for pests in the past 6 months?

1 Yes 2 No (GO TO QUESTION 13d)

b. About how many times in the past 6 months?

_____ Times

13. c. When was the last time you paid someone to have your home treated for pests? (RECORD NUMBER OF TIMES AND CIRCLE APPROPRIATE CODE FOR UNIT OF TIME)

_____ 1 Days ago 2 Weeks ago 3.Months ago 4 Other (SPECIFY)

_____

d. In the past 6 months, did you have any drapes, carpeting, or furniture that you use in your home commercially cleaned?

1 Yes 2 No (GO TO QUESTION 14)

e. About how many times in the last 6 months?

_____ Times

f. When was the last time you had any drapes, carpeting, or furniture that you use in your home commercially cleaned? (RECORD NUMBER OF TIMES AND CIRCLE APPROPRIATE CODE FOR UNIT OF TIME)

_____ 1 Days ago 2 Weeks ago 3 Months ago 4 Other (SPECIFY)

_____

14. In which areas of your home do you and other household members spend most of your waking hours? (CIRCLE ALL THAT APPLY)

1 Living Room
2 Dining Room
3 Kitchen
4 Den
5 Master Bedroom
6 Other Bedroom (SPECIFY WHOSE)
_____
7 Other Room (SPECIFY)
_____
_____

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

15. Do you have any of the following in your home? (READ AND CIRCLE ALL THAT APPLY.)

1 Central air conditioning
2 Window air conditioner(s)
3 Portable circulating fan(s)
4 Ceiling exhaust fan(s)
5 None of these

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

16. a. Do you have a fireplace in your home?

1 Yes 2 No (GO TO QUESTION 17a)

b. Is the damper open now?

1 Yes 2 No

(RECORD ANSWERS ABOVE AND ON LAST PAGE)

17. a. Are you now using mothballs or moth crystals in your home?

1 Yes 2 No (GO TO QUESTION 18a)

SPECIFY BRAND NAME _____

_____

b. Specifically, where are you using them?

_____

_____

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

18. a. Do you use indoor air fresheners of any type? (e.g., sprays or liquid wick)

1 Yes 2 No (GO TO QUESTION 19)

b. In which room(s) are these fresheners used?

c. How often are they used?

	TIMES PER	DAY	WEEK	MONTH	YEAR	CONTINUOUS
_____	____/	1	2	3	4	5
_____	____/	1	2	3	4	5
_____	____/	1	2	3	4	5
_____	____/	1	2	3	4	5

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

19. Do you use bathroom deodorants attached to a wall or toilet bowl?

1 Yes 2 No

20. a. Is your water supplied by a municipality or corporation?

1 Yes 2 No (GO TO QUESTION 20f)

b. How often do you use water supplied by a municipality or corporation for drinking and drink mixes (coffee, tea, etc.) at home? (READ AND CIRCLE ONE)

1 Always 3 Sometimes

2 Usually 4 Never

c. Do you use bottled water?

1 Yes 2 No

d. Do you sometimes drink water from your sink or refrigerator tap?

1 Yes 2 No (GO TO QUESTION 20f)

e. When you drink water from the tap, do you usually run the water for a time before filling your glass or drink the first water out of the tap?

1 Usually run the water for a time

2 Usually drink the first water out of the tap

f. Do you have a filter on your water tap or any other type of filter that purifies the water?

1 Yes 2 No

21. a. Is there a residential garage attached to or contained in the same building as your home?

1 Yes 2 No (GO TO QUESTION 22)

b. About how often can you smell odors in adjacent rooms? (READ AND CIRCLE ONE)

1 Frequently 2 Sometimes 3 Never

(RECORD ANSWERS ABOVE AND ON LAST PAGE)

22. Do you store any of the following items in any structure that is attached to or part of your home, such as a garage, basement, or storage room? (READ EACH ITEM AND CIRCLE APPROPRIATE RESPONSE CODE.)

	Yes	No
Kerosene	1	2
Gasoline	1	2
Gasoline-powered lawn mower	1	2
An automobile	1	2
Motorcycle	1	2
Pesticides, insecticides, or lawn and garden chemicals	1	2

23. a. Do you store cleaning supplies (e.g., chlorine bleaches, detergents) in the following places?

b. IF YES: Does this area or room have an odor?

	Yes	No	Usually	Sometimes	Never
Kitchen	1	2	1	2	3
Utility room	1	2	1	2	3
Bathroom	1	2	1	2	3
Basement	1	2	1	2	3
Other (SPECIFY	1	2	1	2	3

_____

_____

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

24. a. Do you store paints, varnishes or paint thinners or removers in the following places?

b. IF YES: Is there an odor near these materials?

	Yes	No	NA	Yes	No
(1) Attached garage?	1	2	3	1	2
(2) Basement?	1	2	3	1	2
(3) Attic?	1	2	3	1	2
(4) Attached shop or workroom?	1	2	3	1	2
(5) Other (SPECIFY) _____	1	2	3	1	2

(RECORD ANSWER(S) ABOVE AND ON LAST PAGE)

Finally, I would like to ask some general questions about you.

25. Sex (by observation): (CIRCLE RESPONSE CODE)

1 Male 2 Female

26. Race (by observation): (CIRCLE RESPONSE CODE)

1 Hispanic
2 American Indian/Alaskan Native
3 Black, not of Hispanic origin
4 Asian/Pacific Islander
5 White, not of Hispanic origin

27. What is your birthdate? _____ (month) _____ (day) _____ (year)

28. What is your approximate weight? _____lbs. 1 Do not know

29. What is your approximate height in feet and inches? _____ ft. _____ in.

INTERVIEWER INFORMATION

Interviewer Number: [ ][ ][ ]

Date of Interview: [ ][ ] - [ ][ ] - [ ][ ]
Month Day Year

COMMENTS

TEAR OUT PAGE

FROM Q.8b → ROOMS SMOKED IN:

	a. (DAYTIME) 7 a.m. - 6 p.m.	b. (EVENING/NIGHT) 6 p.m. - 7 a.m.
Living room	1	1
Dining room	2	2
Kitchen	3	3
Den	4	4
Master bedroom	5	5
Other bedroom (SPECIFY WHOSE)	6 _____	6 _____
Other room (SPECIFY)	7 _____	7 _____
NONE	8	8

FROM Q.12 →

a. Did you or any member of the household use pesticides in the home in the past 6 months?

1 Yes 2 No

b. In which rooms?

1 Living Room
2 Dining Room
3 Kitchen
4 Den
5 Master Bedroom
6 Other Bedroom (SPECIFY WHOSE) _____
7 Other Room (SPECIFY) _____
_____

TEAR OUT PAGE

FROM Q.14 → In which areas of your home do you and other household members spend most of their waking hours?

1 Living Room
2 Dining Room
3 Kitchen
4 Den
5 Master Bedroom
6 Other Bedroom (SPECIFY WHOSE) _____
7 Other Room (SPECIFY) _____
_____

FROM Q.15 → Do you have any of the following in your home?

1 Central air conditioner
2 Window air conditioner(s)
3 Portable circulating fan(s)
4 Ceiling exhaust fan(s)
5 None of these

FROM Q.16a → Fireplace? 1 Yes 2 No

b. Damper open? 1 Yes 2 No

FROM Q.17 →

a. Are you now using mothballs or moth crystals in your home?

1 Yes 2 No

SPECIFY BRAND NAME _____

_____

b. Where?

_____

_____

TEAR OUT PAGE

FROM Q.18 →

18. a. Do you use indoor air fresheners of any type? (e.g., sprays or liquid wick)

1 Yes 2 No

b. In which room(s) are these fresheners used?

c. How often are they used?

	TIMES PER DAY	WEEK	MONTH	YEAR	CONTINUOUS
_____	____/	1	2	3	4	5
_____	____/	1	2	3	4	5
_____	____/	1	2	3	4	5
_____	____/	1	2	3	4	5

FROM Q.21b. → SMELL GAS/AUTO ODORS IN ADJACENT ROOMS?

1 Frequently 2 Sometimes 3 Never 4 Not Applicable

FROM Q.23a. →

a. Do you store cleaning supplies (e.g., chlorine bleaches, detergents) in the following places?

b. Does this area or room have an odor?

	Yes	No	Usually	Sometimes	Never
Kitchen	1	2	1	2	3
Utility room	1	2	1	2	3
Bathroom	1	2	1	2	3
Basement	1	2	1	2	3
Other (SPECIFY)	1	2	1	2	3

_____

_____

TEAR OUT PAGE

FROM Q.24a. → STORE PAINTS, ETC. IN:	Yes	No	NA	IS THERE AN ODOR? Yes	No
(1) Attached garage?	1	2	3	1	2
(2) Basement?	1	2	3	1	2
(3) Attic?	1	2	3	1	2
(4) Attached shop or workroom?	1	2	3	1	2
(5) Other (SPECIFY) _____	1	2	3	1	2

OMB NO. 2080-0027

EXPIRES: January 1988

TEAM STUDY
24-HOUR RECALL
EXPOSURE AND ACTIVITY QUESTIONNAIRE

P.I.D. _____

DATE ___/___/___

THE FOLLOWING QUESTIONS ARE FOR THE PAST 24-HOUR PERIOD.

1. a. Have you pumped your own gasoline during the past 24 hours. — 1 Yes — 2 No

   IF YES:

   b. Was a vapor lock device (nozzle protector) in use? — 1 Yes — 2 No

   c. Did you pump leaded or unleaded? — 1 Leaded — 2 Unleaded

   d. At what time? _____ a.m. / p.m.

2. a. Do you have clothes in the house that have been dry-cleaned in the past week? — 1 Yes — 2 No (GO TO QUESTION 3)

   b. Did you wear any of these clothes in the past 24 hours? — 1 Yes — 2 No

   IF YES:

   c. For how long did you wear these clothes? ____Hrs. ____Mins.

3. a. Did you smoke any cigarettes during the first monitoring period, that is, between (TIME) and (TIME)? — 1 Yes — 2 No

   IF YES:

   b. About how many cigarettes did you smoke? _____

c. Did you smoke any cigarettes during the second monitoring period, that is, between (TIME) and (TIME)? — 1 Yes — 2 No

IF YES:

d. About how many cigarettes did you smoke? _____

4. Have you used any of the following tobacco products in the past 24 hours?

	YES	NO
a. Pipes?	1	2
b. Cigars?	1	2
c. Snuff?	1	2
c. Chewing tobacco?	1	2

5. a. Were you in the same room or enclosed area with someone who was smoking in the past 24 hours? (e.g., at home, at work, at parties) — 1 Yes — 2 No

IF YES:

b. About how much time were you exposed to others' smoke? ____Hrs. ____Mins.

c. Including yourself, how many people were smoking? _____ People

6. Have you used or worked with insecticides, pesticides, or herbicides in any way, including farming or gardening in the past 24 hours? — 1 Yes — 2 No

IF YES:

(1) ENTER SPECIFIC PRODUCT NAME. _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

(2) ENTER SPECIFIC PRODUCT NAME. _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

(3) ENTER SPECIFIC PRODUCT NAME. _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

7. a. Did you go to work today in your regular occupation? 1 Yes 2 No 3 Unemployed

IF YES:

b. What time did you go to work? _____ a.m. / p.m.

c. What time did you leave work? _____ a.m. / p.m.

HAVE YOU USED OR BEEN NEAR ANY OF THE FOLLOWING IN THE PAST 24 HOURS?

8. Paints/solvents (e.g., acetone, chloroform, toluene)? 1 Yes 2 No

IF YES:

(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

9. Odorous, vaporizing glues or adhesives? 1 Yes 2 No

IF YES:
(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. p.m.

b. For how long? ____Hrs. ____Mins.

10. Moth crystals, room air freshener, or bathroom deodorizers? 1 Yes 2 No

IF YES:
(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. p.m.

b. For how long? ____Hrs. ____Mins.

11. Petroleum products (e.g., gasoline, fuel oil, motor oil, kerosene, etc., excluding pumping your own gas? 1 Yes 2 No

IF YES:
(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

12. Auto/truck/lawn mower exhausts (heavy or long exposure, e.g., attached garage, tunnel, expressway? 1 Yes 2 No

IF YES:
a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

13. Cleaning solutions (including household cleansers or chemicals)? 1 Yes 2 No

IF YES:
(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

14. Flea collars, flea powder, or pet shampoo? 1 Yes 2 No

IF YES:
(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

15. Aerosol sprays, such as cleaning, polishing, or waxing agents, or hair sprays, or deodorants? 1 Yes 2 No

IF YES:
(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

16. Any other product that involved exposure to chemicals? 1 Yes 2 No

IF YES:
(1) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. / p.m.

b. For how long? ____Hrs. ____Mins.

(2) SPECIFY THE PRODUCT NAME _____

a. Ending at what time? _____ a.m. p.m.

b. For how long? ____Hrs. ____Mins.

17. a. Did you take any showers or baths in the house or anywhere else in the past 24 hours? 1 Yes 2 No

IF YES:

b. Was the bathroom exhaust fan on while you were taking a bath or shower? 1 Yes 2 No

c. If you took a shower, how long did the water run? ____ Mins. 99 Not applicable

d. In the past 24 hours, were you in a swimming pool, sauna, spa, or hot tub? 1 Yes 2 No

IF YES:

e. For how long? _____ Hrs. _____ Mins.

18. a. Did anyone else take showers or baths <u>in the house</u> in the past 24 hours? 1 Yes 2 No

IF YES:

b. How many baths and showers were taken? _____

19. Was a dishwasher in use while you were in the house in the past 24 hours? 1 Yes 2 No

20. a. Was a clotheswasher in use while you were in the house in the past 24 hours? 1 Yes 2 No (GO TO QUESTION 21)

IF YES:

b. How many loads were washed with:

(1) hot or warm water? _____ Loads

(2) cold water? _____ Loads

c. Was bleach used? 1 Yes 2 No

IF YES:

d. What brand name? _____

21. What is your best estimate of the number of hours you spent in each of the following environments during the past 24 hours?

a. Indoors at home? (Include sleeping time) _____ Hrs.

b. Indoors, for your occupational work? _____ Hrs.

c. Indoors for other activities? _____ Hrs.

d. Outdoors, for your occupational work? _____ Hrs.

e. Outdoors for other activities? _____ Hrs.

TOTAL HOURS _____ Hrs.

(IF TOTAL FOR COLUMN IS LESS THAN 23 OR MORE THAN 25, RESOLVE DISCREPANCY WITH RESPONDENT.)

22. a. In the past 24 hours, which of the following combustion sources did you use in your home or in attached structures, such as a garage, basement,or storage room?

b. IF YES: In which room(s) or area are they located?

	YES	NO	
(1) Gas cooking range or oven?	1	2	_____
(2) Gas water heater?	1	2	_____
(3) Gas clothes dryer?	1	2	_____
(4) Gas or kerosene space heater?	1	2	_____
(5) Fireplace?	1	2	_____
(6) Wood stove?	1	2	_____
(7) Gas furnace?	1	2	_____
(8) Other combustion applicances? (SPECIFY)	1	2	
_____			_____
_____			_____

23. During the past 24 hours, how many cans, bottles, or glasses of the following beverages did you drink? (RECORD NUMBER AND CIRCLE IF CANS, BOTTLES, OR GLASSES.)

	NUMBER	CANS	BOTTLES	GLASSES
a. Cola soft drinks	_____	1	2	3
b. Non-cola soft drinks	_____	1	2	3
c. Canned juices	_____	1	2	3
d. Milk	_____	1	2	3
e. Beer	_____	1	2	3
f. Wine	_____	1	2	3
g. Coffee, tea (cooked water)	_____	1	2	3
h. Tap water and tap water drinks	_____	1	2	3
i. Bottled water	_____	1	2	3

24. a. What was the usual daytime temperature in your home during the past 24 hours? _____ °F

b. What was the usual nighttime temperature in your home during the past 24 hours? _____ °F

25. a. Did any household member use any of the following cooling appliances in the past 24 hours?

	YES	NO	IF YES: b. In which room(s) are they located?
(1) Window air conditioner?	1	2	_____
(2) Portable circulating fan?	1	2	_____
(3) Ceiling exhaust fan?	1	2	_____
(4) Central air conditioning system?	1	2	_____

26. Were windows or outside doors opened in your home at any time during the past 24 hours? 1 Yes 2 No

27. Finally, I'd like to ask you about each one-way trip you took during the past 24 hours.

	Trip #1	Trip #2	Trip #3	Trip #4
a. What mode of transportation did you use? (e.g.,auto, bus, truck, train,etc.)	_____	_____	_____	_____
b. Approximately, how long was the trip, one-way?	___Mins.	___Mins.	___Mins.	___Mins.
c. Was the traffic: Heavy or moderate, or light?	1 2	1 2	1 2	1 2

28. Please indicate any other event related to chemicals, for example, repairing your car engine or using cosmetics.

_____

_____

_____

_____

OMB NO. 2080-0027

EXPIRES: JANUARY, 1988

TEAM INVENTORY FORM

P.I.D._____

Specific Location_____ Date_____ Time_____

SECTION A

1. Has anything been sprayed or applied, such as a cleaner, in this area in the past 2 hours?

   1 Yes 2 No (GO TO QUESTION 2)

   a. May I see the container? (RECORD PRODUCT BRAND NAME AND INGREDIENTS)

   _____

   _____

   _____

2. Are there any new materials in this area, such as floor or wall coverings, drapes, or furniture?

   1 Yes 2 No (GO TO QUESTION 3)

   a. What are the new materials?

   _____

   _____

   _____

3. Has anything in this area been cleaned, either dry or wet, in the past 24 hours?

   1 Yes 2 No (Go to Question 4)

   a. What was cleaned?

   _____

   b. How was it cleaned? (Commercial dry cleaning, carpet shampoo, etc.)

   _____

   _____

4. Are any of the following kinds of items stored in this area?

(1)	Gasoline and Petroleum Products (eg, kerosene)	1	2
(2)	Paints and Paint Products (oil-based and latex)	1	2
(3)	Toiletries and cosmetics (eg, soaps, shampoos and perfumes)	1	2
(4)	Cleaners, Petroleum-based, Water-based, Solids (eg, laundry detergents, degreasing compounds)	1	2
(5)	Insecticides, Pesticides, Herbicides (eg, moth-balls)	1	2
(6)	Aerosal Sprays	1	2
(7)	Chemicals	1	2
(8)	New Materials (eg, floor or wall coverings, furniture)	1	2
(9)	Gasoline-powered Equipment	1	2
(10)	Room Deodorizers	1	2
(11)	Glues and Adhesives	1	2
(12)	New Building Materials, excluding wood, con-crete, sheetrock (eg, polyurethane insulation)	1	2
(13)	Automotive Care Products (eg, carberator cleaner wax, polishes)	1	2
(14)	Other Potential Sources of Odorous Substances	1	2

FOR EACH YES, OBTAIN THE PRODUCT BRAND NAME OF ALL SUCH PRODUCTS AND RECORD IN SECTION B.

P.I.D._____

SECTION B

Location _____

Sublocation_____

1. Category of Product (ENTER NUMBER FROM LIST IN QUESTION 4):_____
2. Product Brand Name: _____
3. Ingredients: _____

_____

_____

_____

_____

Location _____

Sublocation_____

1. Category of Product (ENTER NUMBER FROM LIST IN QUESTION 4):_____
2. Product Brand Name: _____
3. Ingredients: _____

_____

_____

_____

Location _____

Sublocation _____

1. Category of Product (ENTER NUMBER FROM LIST IN QUESTION 4):_____
2. Product Brand Name: _____
3. Ingredients: _____

_____

_____

_____

APPENDIX B

WINTER SEASON:
Control Form
Participant Consent/Incentive Receipt Form
Advance Letter for Previously Sampled Participant
Advance Letter for New Participant
Information Sheet
News Magazine Article

FOLLOW-UP CALIFORNIA TEAM STUDY

CONTROL FORM

FIELD INTERVIEWER _____
RTI ID _____

FINAL FIELD STATUS CODE _____
(SEE REVERSE SIDE)
DATE ASSIGNED _____

A. ASSIGNMENT INFORMATION (Correct Name if Necessary)

B. PARTICIPANT INFORMATION

SEX _____ TELEPHONE NUMBER _____

AGE _____

1. SAME PARTICIPANT
2. DIFFERENT PARTICIPANT, SAME FAMILY
3. DIFFERENT PARTICIPANT, DIFFERENT FAMILY

C. APPOINTMENTS FOR VISITS

INITIAL SET-UP: DATE _____ TIME _____ AM/PM

NOTES _____

_____

FIRST VISIT: DATE _____ TIME _____ AM/PM

NOTES _____

_____

SECOND VISIT: DATE _____ TIME _____ AM/PM

NOTES _____

_____

THIRD VISIT: DATE _____ TIME _____ AM/PM

NOTES _____

_____

D. FIELD STATUS CODES

01 COMPLETED SQ/VISIT APPOINTMENT(S) MADE

02 COMPLETED SQ/UNABLE TO SCHEDULE APPOINTMENT(S) (Explain in Section F)

03 REFUSAL BY ENTIRE HOUSEHOLD

04 NO ONE AT HOME

05 CALLBACK APPOINTMENT SCHEDULED (Specify in Section F)

06 NO CONTACT WITH PARTICIPANT - NO POSSIBILITY OF SCHEDULING CALLBACK

07 OTHER (Explain in Section F)

E. RECORD OF CONTACTS (Circle Contact No. If Contact Made by Telephone)

Contact Number	Day of Week	Date	Time	Status Code	Notes
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

F. COMMENTS _____

_____

Research Triangle Institute

PARTICIPANT CONSENT FORM AND INCENTIVE RECEIPT

I understand that the Research Triangle Institute, under contract from the U.S. Environmental Protection Agency (EPA), is engaged in a study of the potential exposure and absorption of certain toxic chemicals by residents of selected areas of Maryland which may have various levels of these chemicals in the environment. I understand that the study is being conducted in order to help measure the levels of exposure and body uptake of the selected toxic compounds in populations environmentally exposed, and is limited to the purpose stated. I further understand that the survey is being cosponsored by the California Air Resources Board and wit the cooperation of the South Coast Basin Air Quality Management Districts.

I do hereby freely consent to participate in this study of potential exposure and absorption of selected toxic chemical compounds and understand that my participation will consist of providing answers to questions related to environmental exposure, working and living conditions, and basic demographics, and supplying some or all of the following environmental and biological samples: (1) two four-ounce samples of cold tap water from a source commonly used for drinking and cooking, (2) three breath samples, (3) samples of air from the house and work environments, collected through the use of a personal air monitor, (4) an outdoor air sample collected through the use of a similar monitor, (5) a measurement of the air exchange rate in my residence, and (6) an indoor and outdoor air sample using a small stationary air monitor. Some measurements may be made using a small portable gas chromatograph. This procedure may take up to three hours.

I understand that a representative of the Research Triangle Institute will administer the questionnaire in my home, and at the same time will make arrangements for the collection of the environmental and biological samples. I understand I will receive an incentive of $100.00 dollars for my full participation in the study. I understand that a few households will be selected for the collection of duplicate samples (to be collected at the same time as the original samples) but that such selection would not entitle me to further compensation. I further understand that a sample of the participating households may be contacted again during a different season of the year. At that time they will be asked to repeat all the activities of the first round, and will receive a second incentive payment.

I understand that my name will not be voluntarily disclosed, and that my name will not be referred to in any way when compiling and evaluating the results of the study. I understand that participation in this study may result in no direct benefit to me, other than the results of my sample analyses which I will receive after written request. Although my request for data will be acknowledged immediately, the processing and analysis of the data will delay the release of the data for as much as a full year. I further understand that I am free to withdraw from this study at any time, and that during my participation in the study I will be free to ask questions concerning the study. If I have any further questions about the project, I know that I am free to contact the EPA Region 9 Public Affairs Office, telephone number (415) 974-7651 or Ms. Jutta Sebestik, Center for Survey Research, Research Triangle Institute, Research Triangle Park, North Carolina 27709, telephone number (800) 334-8571 (toll-free); or Dr. Dane Westerdahl, California Air Resources Board, telephone number (916) 323-1522.

Date: ☐☐-☐☐-☐☐ Participant's Name: _____ (Print)

Month Day Year

Signatures:

Participant: _____ Interviewer: _____

PID Number Interviewer Number: ☐☐☐☐☐☐

I hereby acknowledge receipt of one-hundred dollars ($100.00) from the Research Triangle Institute for my participation in this study.

PID Number: _____ _____ Participant's Signature

Date: _____ _____ RTI Representative

RESEARCH TRIANGLE INSTITUTE

January, 1987

Dear Californian,

In late 1983 and early 1984 you participated in the Total Exposure Assessment Methodology (TEAM) Study, sponsored by the U.S. Environmental Protection Agency (EPA). The results of that study, as well as similar studies conducted in other areas of the United States, have provided the EPA with important information about our exposure to certain toxic chemicals. The enclosed news magazine article is only one example of how the TEAM Studies have contributed to the knowledge on this subject.

The Research Triangle Institute (RTI) has been requested to repeat the TEAM Study in California, returning to the homes originally sampled. The U.S. EPA and the California Air Resources Board (ARB) are co-sponsoring the study in order to measure any changes in exposure. Repeating the study will help strengthen the results of the earlier studies by adding to and explaining already existing information.

Your new involvement will be similar to your previous participation. After a brief, initial visit to set up the air exchange monitoring equipment, you will be visited three times during a 24-hour period by an RTI chemistry team. You will be asked to wear an air sampling device and to provide water and breath samples. On the last visit, the chemists will be administering a questionnaire about possible sources of exposure during the monitoring period. If you participate completely, you will receive $100 at the end of the monitoring period as an expression of our thanks.

In a few days, an RTI Field Interviewer will be contacting you to request your participation in the TEAM Study, and to answer any questions you may have. The interviewer will ask you questions about your home and your activities that could affect exposure, and will plan with you convenient times for the visits by the chemists.

All of the information you provide will be confidential; your name and address will never be known to the project sponsors. The composite results of the study will be made public, but individual homes and residents will never be identified.

Your participation is voluntary, but very important to the study. We hope you will decide that it is important to you also. If you have any questions, please contact any of the following organizations involved in the planning of this study:

RTI, Ms. Jutta Sebestik, 1-800-334-8571 (toll-free);
CARB, Dr. Dane Westerdahl, 916-323-1522; or
U.S.EPA, Region 9 Public Affairs Office, 415-974-7651.

Sincerely,

Jutta Sebestik

Jutta Sebestik
Senior Survey Specialist

Post Office Box 12194 Research Triangle Park, North Carolina 27709-2194 Telephone: 919-541-6000

RESEARCH TRIANGLE INSTITUTE

January, 1987

Dear Californian,

In the winter of 1983, The Research Triangle Institute (RTI) conducted the Total Exposure Assessment Methodology (TEAM) Study in California for the U.S. Environmental Protection Agency (EPA). The results of this study, as well as similar studies conducted in other areas of the United States, have provided the EPA with important information about our exposure to certain toxic chemicals. The enclosed news magazine article is only one example of how the TEAM Studies have contributed to the knowledge on this subject.

RTI has been requested to repeat the TEAM Study in the same California homes that were included in the earlier study. The U.S. EPA and the California Air Resources Board (ARB) are co-sponsoring the study in order to monitor any changes in exposure. Repeating the study will help strengthen the results of the earlier studies by adding to and explaining already existing information.

Since you are the current resident of this home, which was monitored previously, we are now asking for your participation. The extent of your involvement and other information about the TEAM Study is explained in the accompanying Information Sheet. If you agree to participate, you will receive $100 as an expression of our thanks upon completing the study.

In a few days, an RTI Field Interviewer will be contacting you to request your participation in the TEAM Study, and to answer any questions you may have. The interviewer will ask questions about your home and your activities that could affect exposure, and will plan with you convenient times for the monitoring visits by an RTI chemistry team.

All of the information you provide will be confidential; your name and address will never be known to the project sponsors. The composite results of the study will be made public, but individual homes and residents will never be identified.

Your participation is voluntary, but very important to the study. We hope you will decide that it is important to you also.

Sincerely,

Jutta Sebestik

Jutta Sebestik
Senior Survey Specialist

Post Office Box 12194 Research Triangle Park, North Carolina 27709-2194 Telephone: 919-541-6000

TOTAL EXPOSURE ASSESSMENT METHODOLOGY (TEAM) STUDY

Sponsored by the U.S. Environmental Protection Agency
and the California Air Resources Board

Conducted by Research Triangle Institute

The California TEAM Study was first conducted by the Research Triangle Institute under the direction of the U.S. Environmental Protection Agency (EPA) in late 1983 and early 1984 with residents of the South Bay section of Los Angeles County, California. The purpose of the study was to estimate the exposures of the population in this area to about 20 hazardous chemicals encountered in the air and drinking water during normal daily activities. Similar studies have also been conducted in communities in New Jersey, North Carolina and North Dakota.

TEAM studies have provided information about exposure to hazardous chemicals to state agencies that are concerned with air quality and which are attempting to develop control strategies for such chemicals. The extent to which outdoor air concentrations affect indoor air concentrations of these chemicals is of particular interest to this current study. In this regard, the California Air Resources Board (ARB) and the U.S. EPA have joined together to sponsor this California TEAM Study.

During the month of February, 1987, return visits to previously sampled homes will be conducted to allow comparisons with data from previous studies. To encourage you to participate, we have addressed some questions you may have about this important study. Specific information on the various activities will be provided by the analytical chemists on their first visit to your home.

WHAT IS IN IT FOR ME?

If you agree to participate, you will receive $100 at the end of the monitoring period. Also, upon written request, you will receive the measurement results for your home. But, the major benefit is that you will be contributing to a vital research project, and we expect you will find the experience interesting and valuable.

WHAT WILL I HAVE TO DO?

You will be asked to participate in the study for one 24-hour period, beginning in the early evening of the first day. Analytical chemists from the Research Triangle Institute will visit your residence three times during this 24-hour monitoring period to collect various air samples, breath samples, and perhaps also drinking water samples. Subsequent visits by the analytical chemists will be made at an agreeable time the following morning and again later that afternoon or early evening. Each type of sample will be collected during each of these three visits. The length of each visit will be approximately 50 minutes to 1 hour. At least 12 hours prior to the first "monitoring" visit, the analytical chemists will come to your home to place small capsules which will enable them to determine air movements within the home and also exchange between the air inside and the air outside the home.

The personal air samples will necessitate that you wear a small, battery-powered, sampling pump attached to a belt or waistband (except during water activities such as showering or swimming) so that an accurate sample of the air that you have been exposed to throughout the day can be acquired. The sampling pump may be placed on a nearby nightstand during sleeping hours. Fixed-site air samplers will be placed at up to three locations both inside and outside your home and will be of negligible inconvenience to you. Breath sampling will require that you breathe using an apparatus much like a SCUBA system. In this device, you will be inhaling purified and humidified air and exhaling into a Teflon "bag." This process takes about 5 to 8 minutes. At the conclusion of the final visit, a questionnaire will be administered which will ask for information on your activities and on special exposure possibilities during the monitoring period.

A subsequent study is planned for later in 1987. Although your participation at this time is independent of any second study, you may be asked to participate for a second monitoring study at a later date.

WHO ARE THE ANALYTICAL CHEMISTS?

The Research Triangle Institute (RTI) in Research Triangle Park, North Carolina has been contracted by the U.S. EPA and ARB to conduct this study. The people visiting your home will be RTI analytical chemists who will be carrying appropriate identification cards. An RTI Field Interviewer, with appropriate identification as well, will be contacting you in a few days to request your participation and to plan convenient times for the visits by the chemistry team.

WHO WILL RECEIVE THE INFORMATION ON MY HOME?

Only the project sponsors and the RTI project staff will see the monitoring results for your home. The data from all the homes in the study will be combined in statistical summaries that will be presented in reports, scientific journals, books, and maybe news broadcasts. Your name or address will never be known to the project sponsor or be associated with any of the results.

WHERE CAN I GET MORE INFORMATION?

If you have any questions, please contact any of the following organizations involved in the planning of this study:

RTI, Ms. Jutta Sebestik, 1-800-334-8571 (toll-free);
CARB, Dr. Dane Westerdahl, 916-323-1522; or
U.S. EPA, Region 9 Public Affairs Office, 415-974-7651.

Now You Can Worry About Bad Air Indoors, Too

New research into air pollution finds that homes and offices are dangerous toxic dumping grounds.

You are coughing, wheezing, sneezing and your eyes are burning. You are suffering from air pollution—yet you haven't even gotten out of bed.

Today, the front line in the battle against poisoned air is far from industry smokestacks and bus exhaust pipes. It's in your house.

The Environmental Protection Agency reported on September 11 that toxic chemicals found in every home—from paint to cleaning solvents—are three times more likely to cause cancer than airborne pollutants, even in areas next to chemical plants.

EPA scientist Lance Wallace, who evaluated the data from a five-year study, said chemicals ingested indoors "make the home more of a toxic-waste dump than any chemical plants nearby. It was difficult to accept for a while, but a number of similar studies concluded the same thing."

Wallace acknowledged that researchers cannot say for sure whether toxins in the home have directly caused even a single death. He said scientists are hard-pressed to determine the role that any particular home-use substance plays in a cancer-related death.

However, these data and other studies have shown that Americans are exposed to surprisingly high levels of toxic chemicals in their houses through breathing, eating, drinking water and skin absorption.

Hazardous chemical vapors in the average American home now have become so bad, reports EPA scientist Wayne Ott, that "if you found these levels outside, you'd demand to know where they were coming from."

In your house, the polluter is you.

The nationwide drive to save energy by weatherproofing has made the air inside many homes and offices more polluted than the air outside. Sealing windows and doors and insulating walls and roofs keep heat or cold out but often trap unwanted gases inside.

Gathering data. Tests in Bayonne, N.J., and Devil's Lake, N.D., by the EPA found levels of benzene and tetrachloroethylene ranging two to five times higher than outdoor readings. Bayonne is close to chemical plants; Devil's Lake is not near heavy industry. Yet researchers found little difference in the levels of indoor contaminants between homes in the two towns.

Contact with these two cancer-causing agents is as routine as the Saturday chores: You inhale benzene and get it on your skin and clothes during a fill-up at a self-service gas station; your body slowly releases these fumes later in your home. You bring tetrachloroethylene into your house on clothes fresh from the dry cleaners.

Even taking a shower is suspected of elevating levels of chloroform—a possible causer of cancer—in nearly every home because of chlorine in the water.

Other known household sources of cancer causers are insecticide, oven fumes, air freshener, hair spray, paint thinner, fingernail polish, cosmetics and even the dirt and rock surrounding the foundations of thousands of homes.

One of the worst indoor-pollution problems of all is cigarette smoke. A Department of Health and Human Services survey of homes in six cities last year determined that roughly 60 percent of the nation's children are exposed to cigarette smoke from one or both parents. The survey found that respiratory illness among these children is 10 to 20 percent higher than in the homes of nonsmokers.

That view is countered by Tobacco Institute spokesperson Anne Browder, who says a 1983 University of Arizona study on the subject "found no relationship between children's lung function and parents' cigarette smoking."

Surprising study. The EPA is just beginning to learn the dimensions of what Americans breathe at home. Between 1980 and 1984, some 600 residents in six cities were given monitors, which they wore by day and kept beside their beds at night, that registered minute amounts of 11 of the most volatile synthetic chemicals. The profile that emerged from this study showed traces of substances ranging from industrial solvents in air fresheners to nitrogen oxides released from gas stoves during cooking. Some toxic chemicals were found to be 70 times more prevalent in houses than outdoors.

The results don't surprise building-ventilation experts. "There are 45 aerosol canisters, each containing 15 different compounds, in the average home today," says James Woods, senior scientist at Honeywell Corporation. The total of chemicals found in common household products tops 50,000.

At work, employes face widespread

Leaks of toxic coolants at Smithsonian museum forced refit of electrical equipment.

exposure through recycled air to a witches' brew of poisonous fumes from photocopying solvents, typewriter correction fluid and carpet cleansers.

For many people, indoor contaminants produce headaches, dizziness and flulike symptoms. Now, when more than 30 percent of workers complain of such ailments that disappear within 8 hours after leaving their jobs, engineers characterize the problem as the "sick-building syndrome."

Solving mysteries. Scores of office buildings around the country have been closed while toxicologists cope with this problem. In Knoxville, a Tennessee Valley Authority building remains closed four years after nearly 200 workers suffered chest pains, shortness of breath and muscle aches that abated on weekends and vacations.

Similar complaints surfaced in June at a state Department of Labor office in Toms River, N.J., where 20 of the 30 employes complained of respiratory problems. The microbiologist-engineer hired to study the building and organize the decontamination says he found a fungus in the ventilation system.

In Boston, a faulty furnace caused carbon-monoxide poisoning at a downtown motel last February during a convention of lawyers who specialize in prosecuting toxic-liability cases. More than 50 were treated for poisoning.

Sometimes, sick buildings are responsible for death. Legionnaires' disease led to three deaths in June in a hotel at the Detroit airport; Legionella bacteria were discovered on the building's air-conditioning coils.

"Including transportation, people are spending 85 to 90 percent of their time indoors," worries Dr. Joel Nobel, who tracks indoor pollutants for the National Indoor Environmental Institute near Philadelphia.

Nobel and his wife found that their own house in Montgomery County, Pa., was filling up with an odorless, colorless gas called radon. The naturally occurring radioactive product that causes an estimated 5,000 to 15,000 lung-cancer deaths each year among nonsmokers was seeping into their subterranean house from the earth and rocks.

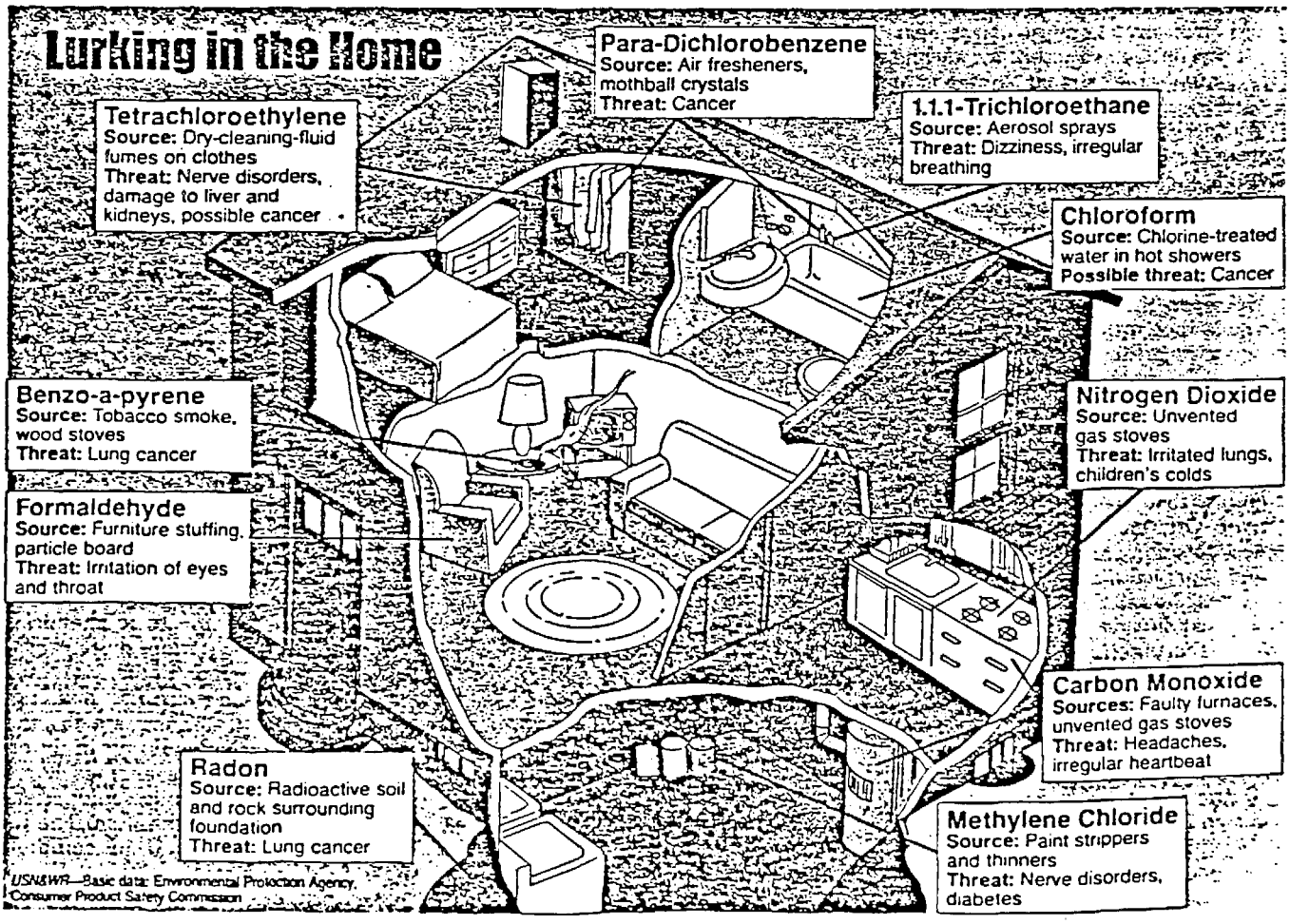
The problem was fixed by adding suction blowers to direct the radon gas away from the house. Nobel recommends that all would-be home buyers invest $400 to $500 in a radon test. He and other building-pollution experts also recommend the use of heat exchangers to maintain a flow of fresh air into homes. These devices range in price from $500 to $1,500 and conserve up to 80 percent of conditioned air.

Greenery, too. Nearly as efficient and a lot cheaper, however, are $8 spider plants. National Aeronautics and Space Administration scientists found that these house plants, with long tendrils, will remove formaldehyde and other toxic gases from the average home.

The advice most often offered by experts is to use more care in handling toxic products inside the home. Follow labels carefully, use products sparingly and open windows to insure adequate ventilation, they recommend.

"A frightening number of things are being introduced into our homes without thought. We have wonder products, and they do nice work. But they are dangerous," explains Ralph Goldman, a Natick, Mass., environmental scientist. The quality of human health is at stake, adds John Spengler, Harvard professor of environmental health, who says, "The end points range from irritation to illness to death." □

By RONALD A. TAYLOR



APPENDIX C

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Field Interviewer Manual
Winter Season

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APPENDIX D

Study Questionnaire - Summer Season:

Version 1
Version 2

OMB NO. 2080-0027

EXPIRES: January 1988

STUDY ON TOXIC CHEMICALS IN ENVIRONMENTAL AND HUMAN SAMPLES
SEASON 2 (FORM I)

Conducted by:

Research Triangle Institute
P.O. Box 12194
Research Triangle Park, North Carolina 27709

STUDY QUESTIONNAIRE

THE RESEARCH TRIANGLE INSTITUTE OF RESEARCH TRIANGLE PARK, NORTH CAROLINA, IS UNDERTAKING A RESEARCH STUDY FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY AND THE CALIFORNIA AIR RESOURCES BOARD TO ASSESS LEVELS AND RELATIONSHIPS OF SELECTED TOXIC COMPOUNDS IN HUMAN AND ENVIRONMENTAL MEDIA. THE INFORMATION RECORDED IN THIS QUESTIONNAIRE WILL BE HELD IN STRICT CONFIDENCE AND WILL BE USED SOLELY FOR RESEARCH INTO THE EFFECTS OF ENVIRONMENTAL FACTORS ON PUBLIC HEALTH. ALL RESULTS WILL BE SUMMARIZED FOR GROUPS OF PEOPLE; NO INFORMATION ABOUT INDIVIDUAL PERSONS WILL BE RELEASED WITHOUT THE CONSENT OF THE INDIVIDUAL. WHILE YOU ARE NOT REQUIRED TO RESPOND, YOUR COOPERATION IS NEEDED TO MAKE THE RESULTS OF THIS SURVEY COMPREHENSIVE, ACCURATE AND TIMELY.

(PLACE PID LABEL HERE)

USE FORM 2

(IF NOT ORIGINAL PARTICIPANT, ~~GO TO Q2~~; OTHERWISE, CONTINUE WITH LEAD-IN STATEMENT AND Q1.)

I would like to ask you just a few questions about any changes that may have occurred since we saw you in February.

1. Has your employment status changed since February?

   1 Yes (CONTINUE) 2 No (GO TO QUESTION 6)

2. a. Are you presently employed in any capacity? (CIRCLE RESPONSE CODE)

   1 Yes (CONTINUE) 2 No (GO TO QUESTION 4)

   b. What is your job title? What are your main duties on the job?

   _____

   _____

   c. What kind of business or industry is that in--what do they make or do at the place where you work?

   _____

   _____

   d. Is this your usual primary occupation?

   1 Yes (GO TO QUESTION 3) 2 No (CONTINUE)

   e. What is your job title in your primary occupation? What are your main duties on the job?

   _____

   _____

   f. What kind of business or industry is that in--what do they make or do at this place?

   _____

   _____

3. What is the name and street address of the organization for which you work?

   Name: _____

   Address: _____ Room #_____ ZIP _____

   (GO TO QUESTION 6)

4. IF NOT PRESENTLY EMPLOYED: Which of the following best describes your status? (READ AND CIRCLE ONE RESPONSE CODE)

1 Housewife 2 Student	(GO TO QUESTION 6)	3 Unemployed 4 Retired 5 Disabled	(GO TO QUESTION 5)

5. a. What <u>was</u> your job title? What were your main duties on the job?

_____

_____

b. What kind of business or industry was this--what did they make or do at this place?

_____

_____

6. Which of the following best describes your current cigarette smoking status? (READ ANSWER CHOICES AND CIRCLE ONE)

1 Current smoker (CONTINUE)

2 Ex-smoker (GO TO QUESTION 8a)

3 Never smoked (GO TO QUESTION 8a)

7. a. On average, how many cigarettes do you currently smoke per day?

1 Less than 1/2 pack

2 1/2 pack or more, but less than 1 pack

3 1 pack or more, but less than 1 1/2 packs

4 1 1/2 packs or more, but less than 2 packs

5 More than 2 packs

b. What is the number that appears on the side panel of the brand of cigarettes you currently smoke?

Number _____

c. Do you usually inhale the smoke?

1 Yes 2 No

8. a. Does anyone else in your household currently smoke cigarettes?

1 Yes (CONTINUE) 2 No (GO TO QUESTION 9a)

b. How many people in your household smoke cigarettes?

_____ People

9. a. Since February 1987, have you or someone else done any of the following inside your home?

		Yes	No	DK
1.	Painted?	01	02	94
2.	Obtained new furniture?	01	02	94
3.	Obtained new carpeting or other floor covering?	01	02	94
4.	Drycleaned drapes or curtains?	01	02	94
5.	Shampooed a wool or wool-based carpet?	01	02	94
6.	Refinished furniture?	01	02	94
7.	Reupholstered furniture?	01	02	94
8.	Paneled walls?	01	02	94
9.	Plastered walls?	01	02	94
10.	Remodeled any rooms?	01	02	94
11.	Caulked bathtubs, sinks, or shower stalls?	01	02	94
12.	Installed new insulation?	01	02	94

b. Have you done anything else inside your home since February?

1 Yes (CONTINUE) 2 No (END OF INTERVIEW)

c. What have you done?

_____

_____

_____

10. INTERVIEWER: Which one of the following best describes the Season 2 participant?

    1 Same participant as Season 1 (END INTERVIEW)

    2 Different participant, same family as Season 1 (CONTINUE)

    3 Different participant, different family (CONTINUE)

11. INTERVIEWER: What is the sex of the participant?

    1 Male 2 Female

12. What is your birthdate? _____ _____ _____
    (Month) (Day) (Year)

OMB NO. 2080-0027

EXPIRES: January 1988

STUDY ON TOXIC CHEMICALS IN ENVIRONMENTAL AND HUMAN SAMPLES SEASON 2 (FORM 2)

Conducted by:

Research Triangle Institute
P.O. Box 12194
Research Triangle Park, North Carolina 27709

STUDY QUESTIONNAIRE

THE RESEARCH TRIANGLE INSTITUTE OF RESEARCH TRIANGLE PARK, NORTH CAROLINA, IS UNDERTAKING A RESEARCH STUDY FOR THE U.S. ENVIRONMENTAL PROTECTION AGENCY AND THE CALIFORNIA AIR RESOURCES BOARD TO ASSESS LEVELS AND RELATIONSHIPS OF SELECTED TOXIC COMPOUNDS IN HUMAN AND ENVIRONMENTAL MEDIA. THE INFORMATION RECORDED IN THIS QUESTIONNAIRE WILL BE HELD IN STRICT CONFIDENCE AND WILL BE USED SOLELY FOR RESEARCH INTO THE EFFECTS OF ENVIRONMENTAL FACTORS ON PUBLIC HEALTH. ALL RESULTS WILL BE SUMMARIZED FOR GROUPS OF PEOPLE; NO INFORMATION ABOUT INDIVIDUAL PERSONS WILL BE RELEASED WITHOUT THE CONSENT OF THE INDIVIDUAL. WHILE YOU ARE NOT REQUIRED TO RESPOND, YOUR COOPERATION IS NEEDED TO MAKE THE RESULTS OF THIS SURVEY COMPREHENSIVE, ACCURATE AND TIMELY.

(PLACE PID LABEL HERE)

(USE FORM 1 IF ORIGINAL PARTICIPANT; OTHERWISE, CONTINUE WITH LEAD-IN STATEMENT AND Q1.)

First, I would like to ask some questions about your occupation.

1. a. Are you presently employed in any capacity? (CIRCLE RESPONSE CODE)

   1 Yes (CONTINUE) 2 No (GO TO QUESTION 3)

   b. What is your job title? What are your main duties on the job?

   _____

   _____

   c. What kind of business or industry is that in--what do they make or do at the place where you work?

   _____

   _____

   d. Is this your usual primary occupation?

   1 Yes (GO TO QUESTION 2) 2 No (CONTINUE)

   e. What is your job title in your primary occupation? What are your main duties on the job?

   _____

   _____

   f. What kind of business or industry is that in--what do they make or do at this place?

   _____

   _____

2. What is the name and street address of the organization for which you work?

   Name: _____

   Address: _____ Room #_____ ZIP _____

   (GO TO QUESTION 5)

3. IF NOT PRESENTLY EMPLOYED: Which of the following best describes your status? (READ AND CIRCLE ONE RESPONSE CODE)

1 Housewife 2 Student	(GO TO QUESTION 5)	3 Unemployed 4 Retired 5 Disabled	(GO TO QUESTION 4)

4. a. What <u>was</u> your job title? What were your main duties on the job?

_____

_____

b. What kind of business or industry was this--what did they make or do at this place?

_____

_____

5. Which of the following best describes your current cigarette smoking status? (READ ANSWER CHOICES AND CIRCLE ONE)

1 Current smoker (CONTINUE)

2 Ex-smoker (GO TO QUESTION 7a)

3 Never smoked (GO TO QUESTION 7a)

6. a. On average, how many cigarettes do you currently smoke per day?

1 Less than 1/2 pack

2 1/2 pack or more, but less than 1 pack

3 1 pack or more, but less than 1 1/2 packs

4 1 1/2 packs or more, but less than 2 packs

5 More than 2 packs

b. What is the number that appears on the side panel of the brand of cigarettes you currently smoke?

Number _____

c. Do you usually inhale the smoke?

1 Yes 2 No

7. a. Does anyone else in your household currently smoke cigarettes?

1 Yes (CONTINUE) 2 No (GO TO QUESTION 8a)

b. How many people in your household smoke cigarettes?

_____ People

8. Which rooms do smokers, living or visiting in the home, smoke in most often between the hours of (a) 7 a.m. and 6 p.m.? and (b) 6 p.m. and 7 a.m.? (CIRCLE ALL THAT APPLY FOR EACH TIME PERIOD)

	a. (DAYTIME) 7 a.m. - 6 p.m.	b. (EVENING/NIGHT) 6 p.m. - 7 a.m.
Living room	1	1
Dining room	2	2
Kitchen	3	3
Den	4	4
Master bedroom	5	5
Other bedroom (SPECIFY WHOSE)	6 _____	6 _____
Other room (SPECIFY)	7 _____	7 _____
NONE	8	8

9. a. Do you use any of the following tobacco products on a regular basis?

b. IF YES: About how many times a day or week do you use (NAME OF TOBACCO PRODUCT)?

	YES	NO	TIMES PER	DAY	WEEK
(1) Pipes	1	2	_____	1	2
(2) Cigars	1	2	_____	1	2
(3) Snuff	1	2	_____	1	2
(4) Chewing Tobacco	1	2	_____	1	2

10. Do you or any member of your household pursue any of the following hobbies? (FOR EACH YES, ASK WHO?)

Hobbies	No	You	Household Member
Painting	0	1	2
Furniture refinishing	0	1	2
Scale models	0	1	2
Gardening	0	1	2
House plants	0	1	2
Automobile or bicycle repair	0	1	2

11. Have you worked with or used pesticides or herbicides outdoors for more than 1 hour at a time in the past 6 months?

1 Yes 2 No

12. a. Did you or any member of the household use pesticides in the home in the past 6 months?

1 Yes 2 No (GO TO QUESTION 13)

b. In which rooms?

1 Living Room
2 Dining Room
3 Kitchen
4 Den
5 Master Bedroom
6 Other Bedroom (SPECIFY WHOSE) _____
7 Other Room (SPECIFY) _____
_____

13. a. Did you pay someone to have your home treated for pests in the past 6 months?

1 Yes 2 No (GO TO QUESTION 13d)

b. About how many times in the past 6 months?

_____ Times

c. When was the last time you paid someone to have your home treated for pests? (RECORD NUMBER OF TIMES AND CIRCLE APPROPRIATE CODE FOR UNIT OF TIME)

_____ 1 Days ago 2 Weeks ago 3 Months ago 4 Other (SPECIFY)

_____

d. In the past 6 months, did you have any drapes, carpeting, or furniture that you use in your home commercially cleaned?

1 Yes 2 No (GO TO QUESTION 14)

e. About how many times in the last 6 months?

_____ Times

f. When was the last time you had any drapes, carpeting, or furniture that you use in your home commercially cleaned? (RECORD NUMBER OF TIMES AND CIRCLE APPROPRIATE CODE FOR UNIT OF TIME)

_____ 1 Days ago 2 Weeks ago 3 Months ago 4 Other (SPECIFY)

_____

14. a. In the past 6 months, have you or someone else done any of the following inside your home?

		Yes	No	DK
1.	Painted?	01	02	94
2.	Obtained new furniture?	01	02	94
3.	Obtained new carpeting or other floor covering?	01	02	94
4.	Shampooed a wool or wool-based carpet?	01	02	94
5.	Refinished furniture?	01	02	94
6.	Reupholstered furniture?	01	02	94
7.	Paneled walls?	01	02	94
8.	Plastered walls?	01	02	94
9.	Remodeled any rooms?	01	02	94
10.	Caulked bathtubs, sinks, or shower stalls?	01	02	94
11.	Installed new insulation?	01	02	94

b. Have you done anything else inside your home in the past 6 months?

1 Yes (CONTINUE) 2 No (END OF INTERVIEW)

c. What have you done?

_____

_____

_____

15. In which areas of your home do you and other household members spend most of your waking hours? (CIRCLE ALL THAT APPLY)

1 Living Room
2 Dining Room
3 Kitchen
4 Den
5 Master Bedroom
6 Other Bedroom (SPECIFY WHOSE) _____
7 Other Room (SPECIFY) _____
_____

16. a. Are you now using mothballs or moth crystals in your home?

1 Yes 2 No (GO TO QUESTION 17a)

SPECIFY BRAND NAME _____

_____

b. Specifically, where are you using them?

_____

_____

17. a. Do you use indoor air fresheners of any type? (e.g., sprays or liquid wick)

1 Yes 2 No (GO TO QUESTION 18)

b. In which room(s) are these fresheners used?

c. How often are they used?

	TIMES PER	DAY	WEEK	MONTH	YEAR	CONTINUOUS
_____	_____/	1	2	3	4	5
_____	_____/	1	2	3	4	5
_____	_____/	1	2	3	4	5
_____	_____/	1	2	3	4	5

18. Do you use bathroom deodorants attached to a wall or toilet bowl?

1 Yes 2 No

19. a. Is your water supplied by a municipality or corporation?

1 Yes 2 No (GO TO QUESTION 19f)

b. How often do you use water supplied by a municipality or corporation for drinking and drink mixes (coffee, tea, etc.) at home? (READ AND CIRCLE ONE)

1 Always 3 Sometimes

2 Usually 4 Never

c. Do you use bottled water?

1 Yes 2 No

d. Do you sometimes drink water from your sink or refrigerator tap?

1 Yes 2 No (GO TO QUESTION 19f)

e. When you drink water from the tap, do you usually run the water for a time before filling your glass or drink the first water out of the tap?

1 Usually run the water for a time

2 Usually drink the first water out of the tap

f. Do you have a filter on your water tap or any other type of filter that purifies the water?

1 Yes 2 No

20. a. Is there a residential garage attached to or contained in the same building as your home?

1 Yes 2 No (GO TO QUESTION 21)

b. About how often can you smell odors in adjacent rooms? (READ AND CIRCLE ONE)

1 Frequently 2 Sometimes 3 Never

21. Do you store any of the following items in any structure that is attached to or part of your home, such as a garage, basement, or storage room? (READ EACH ITEM AND CIRCLE APPROPRIATE RESPONSE CODE.)

	Yes	No
Kerosene	1	2
Gasoline	1	2
Gasoline-powered lawn mower	1	2
An automobile	1	2
Motorcycle	1	2
Pesticides, insecticides, or lawn and garden chemicals	1	2

22. a. Do you store cleaning supplies (e.g., chlorine bleaches, detergents) in the following places?

b. IF YES: Does this area or room have an odor?

	Yes	No	Usually	Sometimes	Never
Kitchen	1	2	1	2	3
Utility room	1	2	1	2	3
Bathroom	1	2	1	2	3
Basement	1	2	1	2	3
Other (SPECIFY	1	2	1	2	3

_____

_____

23. a. Do you store paints, varnishes or paint thinners or removers in the following places?

b. IF YES: Is there an odor near these materials?

	Yes	No	NA	Yes	No
(1) Attached garage?	1	2	3	1	2
(2) Basement?	1	2	3	1	2
(3) Attic?	1	2	3	1	2
(4) Attached shop or workroom?	1	2	3	1	2
(5) Other (SPECIFY) _____	1	2	3	1	2

Finally, I would like to ask some general questions about you.

24. Sex (DO NOT ASK): (CIRCLE RESPONSE CODE)

1 Male 2 Female

25. Which one of the following best describes you. Are you ...: (READ AND CIRCLE RESPONSE CODE)

1 Hispanic,
2 American Indian/Alaskan Native,
3 Black, not of Hispanic origin,
4 Asian/Pacific Islander, or
5 White, not of Hispanic origin?

26. What is your birthdate? _____ (month) _____ (day) _____ (year)

27. What is your approximate weight? _____lbs. 1 Do not know

28. What is your approximate height in feet and inches? _____ ft. _____ in.

(END INTERVIEW)

29. INTERVIEWER: Which one of the following best describes the Season 2 participant?

1 Same participant as Season 1

2 Different participant, same family as Season 1

3 Different participant, different family

INTERVIEWER INFORMATION

Interviewer Number: [ ][ ][ ][ ][ ][ ] Date of Interview: [ ][ ] - [ ][ ] - [ ][ ]
Month Day Year

COMMENTS

APPENDIX E

Advance Letter - Summer Season

Exhibit 1

RESEARCH TRIANGLE INSTITUTE

CENTER FOR SURVEY RESEARCH June 16, 1987

<Title> <First><Mid> <Last><Suffix>
<Address>
<City>

Dear <Title> <Last>:

In February you participated in the Total Exposure Assessment Methodology (TEAM) Study which was sponsored by the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB). We appreciate your cooperation and hope that it was an interesting experience for you.

The Research Triangle Institute (RTI) is repeating the study in July in the same homes that were monitored in February. The purpose is to measure differences in exposure to certain toxic chemicals that could be explained by the difference in seasons.

Your involvement would be similar to your previous participation. After an initial visit to set up air exchange monitoring equipment, you will be visited three times during a 24-hour period by an RTI chemistry team. You will again be asked to wear an air sampling device and to provide breath and water samples. On the last visit, the chemists will administer a questionnaire on possible sources of exposure during the 24-hour monitoring period. If you participate completely, you will receive $100 as an expression of our thanks.

I ask that you call me during the week of June 20 to June 26 to plan convenient times for the monitoring visits. RTI chemists will be monitoring four homes daily from July 8 through July 20. Therefore, the sooner I can make arrangements with you, the more likely I can accommodate your time schedule.

If you call Monday through Friday, between 8:30 a.m. and 5:00 p.m. Eastern Time (between 5:30 a.m. and 2:00 p.m. Pacific Time), you can reach me at the following toll-free number: 1-800-334-8571. In the evening or on the weekend, you can call me collect at (919) 783-8277.

All of the information you provide will be confidential; your name and address will never be known to the project sponsors. The composite results of the study will be made public, but individual homes and residents will never be identified.

Your participation is voluntary, but very important to the study. I hope you will decide that it is important to you also, and look forward to hearing from you soon.

Sincerely,

Jutta Sebestik
Senior Survey Specialist

APPENDIX F

Interviewer Instructions

CALIFORNIA TEAM FOLLOW-UP STUDY
SEASON 2

INTERVIEWER INSTRUCTIONS

The monitoring for Season 2 for the California TEAM Follow-Up Study will be conducted from July 8 through July 20, 1987 in the same homes monitored in Season 1 during February, 1987. We will attempt to set up monitoring appointments with 45 of the 51 participants from Season 1. Our responsibilities will include:

1. Contacting Season 1 participants and recruiting their participation for the study.

2. Scheduling the RTI chemists' visits with cooperating participants according to preestablished schedule plans.

3. Administering a version of the Study Questionnaire (SQ) with the participant at the time the visits are scheduled.

4. Providing the RTI chemists the appropriate information about the scheduled visits in a timely fashion.

The following discusion specifically describes each of these responsibilities.

1. Contacting and Recruiting Participants

Contact with the participants will be conducted in three stages. During the first stage, the participants were requested to call the RTI central office to schedule the monitoring visits. An "800" number was provided in a lead letter (see Exhibit 1) sent on June 16, 1987. This stage took place June 20 through June 26, 1987. The second stage will require RTI staff (the field supervisor and an interviewer) to contact the remaining Season 1 participants by telephone. This stage will take place June 29 through July 3, 1987. The third stage will be a personal visit by an interviewer to the remaining Season 1 participants with whom no contact was made by telephone. This will take place from July 4 through July 12, 1987. A schedule for all activities related to Season 2 is shown in Exhibit 2.

Participation in Season 2 will involve the same activites as in Season 1 except that the portable gas chromatograph will not be used in any of the homes during the initial visit. During the initial visit, an RTI chemist will set up the equipment that will measure the air exchange rate in the residence. This visit will not require the presence of the participant. The second visit will be approximately 24 hours after the initial visit and will commence the 24-hour monitoring period. A total of three visits will be made during the 24-hour monitoring period, at which time the chemists will take various air, breath, and water samples. Participants will be required to wear a small, battery-powered sampling pump attached to a belt or waistband at all times except during water activities and sleeping hours. The breath samples will require the participant to breathe using an apparatus similiar to a SCUBA system, inhaling purified and humidified air and exhaling into a Teflon bag. During the last visit, the RTI chemist will administer the 24-hour Exposure

Activity Questionnaire (EAQ). The participant will be asked to sign a Participant Consent and Receipt Form at the initial visit (or at the onset of the 24-monitoring period) and will receive a copy at the last visit with the $100 cash incentive. The length of each visit will be between 50 and 90 minutes.

If at all possible, we would like to recruit the same individual for Season 2 who participated in Season 1, assuming he or she still lives in the residence we monitored in February. If this is not possible, our next priority is a different person in the same family. If a different family now resides in the home that was monitored in Season 1, then any cooperating family member who resides in the home, age 7 or older qualifies.

2. Scheduling Monitoring Visits

Air monitoring will be conducted in July, 1987, with the initial or first visit for a residence beginning July 7 and the last or fourth visit for a residence ending on July 20, 1987. Four homes need to be scheduled each day. If four homes are scheduled each day, then only one home will have to be scheduled to end on July 20th to reach our goal of 45. Otherwise, there will be three "backup" spots where homes can be scheduled to end on July 20th.

Two scheduling plans have been designed for the four monitoring visits. They are:

PLAN A:	Visit 1	5:00 p.m. or 7:00 p.m.
	Visit 2	8:30 p.m.
	Visit 3	*7:15 a.m. or 9:45 a.m.
	Visit 4	5:30 p.m.
PLAN B:	Visit 1	4:00 p.m. or 6:00 p.m.
	Visit 2	7:00 p.m.
	Visit 3	6:00 a.m. or *8:30 a.m.
	Visit 4	4:00 p.m.

Each day, two homes should be scheduled using Plan A and two homes should be scheduled using Plan B. When scheduling visits, these rules should be followed:

1. Try to schedule homes located in the same area on any one day. This will facilitate travel time for the chemists when going from one residence to another.

2. For Visit 3, the time with an asterisk (*) is preferred. Whenever possible, schedule that time for Visit 3.

3. Whenever possible, try to schedule the earliest slots that are available.

4. One RTI chemist will be responsible for the Visit 1 appointments. Therefore, for Plan A, if you schedule a 5:00 p.m. Visit 1 appointment for one home on a given day, then the second home scheduled under Plan A on that day must have a 7:00 p.m. Visit 1. Likewise for Plan B. If you schedule a 4:00 p.m. Visit 1 appointment for one home on a given day, then the second home scheduled under Plan B on that day must have a 6:00 p.m. Visit 1 appointment.

Once the appointments are established with the participant, you should complete the information on the schedule calenders. The information is to be recorded in the calendar date square that corresponds to Visit 1. Record the participants PID number, name, address telephone number and city. This information will be on the Control Form. Circle the appointment times for each of the four visits. After you have administered one of the versions of the SQ, you will be completing the Control Form.

3. Administering the Study Questionnaire (SQ)

Immediately after you have established the monitoring appointments with the participant, you are to administer the SQ. There are two versions of the SQ. Which one you administer depends on whether or not the person you recruited is the same person who participated in Season 1. Version 1 is administered if the person recruited is the same person who participated in Season 1; Version 2 is administered if the person recruited is a different person, regardless of whether he or she is a member of the same family as the Season 1 participant.

After you have finished administering the SQ, be sure to record the participant's PID on the cover page of the questionnaire. Verify the appointment times with the participant and provide him or her with your telephone number to contact you if there are changes in schedules due to an emergency. After saying goodbye, complete the Control Form. If it is a new participant, record his or her name next to the original participant and draw a line through the name of the original participant in Section A. Complete Section B appropriately, calculating age from the birthdate obtained in the SQ. Complete Section C by transferring the information from the calendar schedule; record the day of the week by each visit. On the back side of the Control Form, complete Section E and, if appropriate, Section F. Then, complete the information on the top of the front side of the Control Form. Finally, staple the completed Control Form to the cover page of the SQ. Send the SQ and Control Forms to Jutta Sebestik in the postage-paid manila envelopes that are provided.

4. Contacting RTI Chemists

Information regarding appointments that you make during the week of June 29 through July 3, 1987 should be reported to Jutta Sebestik at 800-334-8571 at RTI or call at her home collect at 919-783-8277. The RTI chemists will arrive in Los Angeles on July 6, 1987, but, because of their hectic schedules to prepare for the monitoring, you should report appointments made after July 3 starting on July 8, 1987. The exception to this is if participants that are already scheduled during the first few days of the monitoring period contact you with cancellations or changes. For all usual reporting, you are to contact the chemists at the Holiday Inn, Torrance, 540-0500, Room _____ between 8:00 a.m. and 10:00 a.m., Monday through Sunday.

The information you are to provide to the chemists is below. Please report the information in the order listed.

1. PID number
2. Name
3. Adress
4. City
5. Telephone number
6. Visit 1, date and time
7. Visit 2, date and time
8. Visit 3, date and time
9. Visit 4, date and time
10. Whether original Season 1 participant or different participant
11. Age of participant
12. Sex of participant
13. Other comments

APPENDIX G

Air Exchange Data - Winter and Summer Seasons

BROOKHAVEN NATIONAL LABORATORY
ASSOCIATED UNIVERSITIES, INC.
Upton, Long Island, New York 11973

(516) 282-
FTS 666- 3059

Department of Applied Science
Building 426

June 10, 1987

Mr. Kent Thomas
Research Triangle Institute
Analytical and Chemical Sciences
P.O. Box 12194
Research Triangle Park, NC 27709

Dear Kent:

Enclosed are the results of 241 CATS samplers used in the California study which were received at BNL on 3/25/87 along with 81 CATS for rebaking ($1 each). These results are in files on a data disk in delimited format with appropriate header files--see enclosed instruction sheet. Also included is the hardcopy for the houses done as multizones. A summary of the ACH's for all the houses and a summary sheet of the results of the standard and blank controls are also included. These blanks and standards were interspersed as you indicated in your house data sheets. The control blanks have been normalized to 12 hours. The control standards are reported as picoliters of tracer found and expected with % difference.

All of the control blanks with the exception of No. 18 (the last in the table) showed negligible tracer levels compared to the concentrations generally found in this 12-h study which ranged from about 1 to 50 pL/L with a median level between 10 to 20 pL/L.

There was a problem with the analysis instrument (a gas chromatograph-GC) which has introduced an uncertainty of 25 to 30% in the tracer concentrations as shown in the control standards report. The re-concentrating trap on the GC was defective, causing variable amounts of tracer to break through. In addition, we inadvertantly failed to calibrate for the meta PDCH (PFT 3) which has caused some uncertainty in those values.

A total of 21 measurement periods for houses done with 3 zones are shown in the attached BNL-AIMS sheets and summarized in Table 1. Experience has shown us that when the standard deviation (SD) is less than about ±10%, the multizone whole house ACH is generally properly determined. Eight of 21 were less than 10% and 11 of 21 less than 15%; the former are indicated by footnote a.

Secondly, when the concentrations of one tracer in all three zones are nearly the same, then a volume-weighted average of those values can be used to calculate a 1-zone ACH for the whole house. Table 1 shows that the 1-zone calculation was done

using each of the three PFTs separately. It was generally found that when the highest concentration was less than 50% greater than the smallest, then this 1-zone ACH will be fairly accurate; such cases are indicated by footnote b.

An alternative way to calculate a better estimate of a 1-zone whole house ACH is to make use of all the PFT types simultaneously by assuming they were all one type. Then, the total concentration found in each zone is the sum of all these PFTs, the source strength is the sum of all three, and the average concentration is the volume-weighted value.

As shown by the first house in Table 1 (cf. its BNL-AIMS output sheet as well), the whole house ACH from the 3-zone model was determined to better than ± 10%. Two of the three 1-zone calculations met criteria b and those ACH values, 0.332 and 0.387 h^{-1}, were in good agreement with the 3-zone value of 0.341 ± 0.029 h^{-1}. Using the sum of the PFTs, the whole house ACH was also determined to be 0.341 ± 0.027 h^{-1}, for a ratio of 1.000 (last column in Table 1). In this example, the summed PFT concentrations in each zone are more nearly identical to each other than are the corresponding values for any individual tracer; thus, this one-zone value is quite accurate.

Item 2 is an example where none of the 3 individual PFTs have a uniform concentration in all three zones. But the summed PFT concentrations are quite uniform and its ACH value, 1.52 ± 0.06 h^{-1}, agrees within 1% of the 3-zone value, 1.53 ± 0.12 h^{-1}.

The first measurement period in the next house was done in duplicate, items 3 and 4, with good 3-zone results as well. The summed PFT concentrations had a bigger spread (±24%) and thus the ratio was not as close to unity. In the daytime period, the living zone tracer had a lower concentration in its zone than in each of the other zones, a physical impossibility, and thus the 3-zone rate had a larger error (there must have been a deployment error). Only the PMCH appears to give the right result because of its uniform presence in all three zones. The three zones, as well as the summed ACH value, agree very well (ratio = 0.984) in the daytime duplicate case; where were the duplicate CATS--in different rooms? Please send the floor plans and deployment locations for those 10 homes.

Item 7 appeared to have m PDCH contamination or it was placed in a direct path of air from one of those sources. The first floor sampler had too much PMCP, throwing off the 3-zone calculation. But the summed PFTs look okay.

House item 9 shows moderate agreement between 4 of 5 of the computed values even though the summed PFTs had a large SD. The 3-zone calculation in the next case blows up because of just a slight shift in the tracer concentrations when C_{33} was less than C_{32}. The living and kitchen zones appear to be one zone; the PMCP seems very high in the bedroom.

In the next set, PMCP is again high in the bedroom during the evening period; is it the same in the other bedrooms? Because C_{22} was less than C_{21} and none of the tracers nor summed tracers had a uniform concentration, all of the determinations have a significant error. Note the ratio of 0.777. The daytime period was accurately determined.

Items 13 and 14 should have been done as a 2-zone because the living room and bedroom concentration are essentially identical for all three PFTs; this caused large errors for the 3-zone calculations. The summed PFTs give the best estimate of overall ACH.

Items 15 and 16 were accurately determined based on the 3-zone in the nighttime case and the summed PFTs in the day case.

Item 18 needs to be recomputed as a 3-zone. The enclosed 2-zone calculation, combining the whole first floor as 1 zone, gave good results. Obviously, the daytime period should also be done as 2 zones; the summed PFTs are not uniform enough to be reliable, but the m PDCH and PMCH are quite uniform and do give reliable results. Note how the 2-zone results (item 18) agrees with the latter two one-zone results.

Item 20 was successfully done as a 3-zone and agreed well with the summed PFTs. Item 21 had a contaminated sampler. The PMCH and PMCP in zone 2 was guesstimated to determine an estimated summed PFT ACH.

When Bob returns from vacation, on/about June 22, he will compute those that should be done as 2-zones. Let me know if you have any questions and please send the deployment plans.

Sincerely,

Russell N. Dietz, Head
Robert W. Goodrich
Tracer Technology Center

RND:jgb
Encl.

NOTE: Circled values used. R.W.T. 3/88

Table 1
HOMES PERFORMED AS 3-ZONE STUDIES

Item No.	House	Whole House ACH ± Standard Deviation (SD), h^{-1} (± % SD) 3-Zone	1-Zone	1-Zone	1-Zone	ΣPFTs[d]	3-Zone ΣPFTs
				Mean	Mean		
1	712729TF1	0.341 ± 0.029 (8.5)[a]	0.332[b]	0.287	0.387[b]	0.341 ± 0.027 (8.0)	1.000
2	F2	1.534 ± 0.121 (7.9)[a]	1.36	1.67	1.82	1.518 ± 0.057 (3.7)	1.011
3	712737TD1	0.529 ± 0.046 (8.7)[a]	0.499	0.637	0.562	0.567 ± 0.136 (24.0)	0.933
4	F1	0.515 ± 0.044 (8.5)[a]	0.476	0.622	0.558	0.552 ± 0.135 (24.4)	0.933
5	F2	2.084 ± 0.561 (26.9)	4.08	2.63	2.36[b]	2.84 ± 0.76 (26.7)	0.734
6	D2	3.453 ± 0.343 (9.9)[a]	4.63	3.24	3.10[b]	3.51 ± 0.90 (25.6)	0.984
7	712745TF1	8.84 ± 1.31 (14.8)[e]	0.390	0.091	13.04	1.39 ± 0.18 (13.0)[e]	—
8	F2	3.63 ± 1.39 (38.2)	1.67	0.460	8.65	1.256 ± 0.128 (10.2)	2.890
9	712752TF1	0.213 ± 0.044 (20.6)	0.263	0.184[b] 0.188	0.191[b]	0.232 ± 0.106 (45.7)	0.918
10	F2	0.116 ± 0.838 (>100)	0.247	0.164[b] 0.170	0.177[b]	0.215 ± 0.102 (47.4)	0.540
11	712760TF1	0.480 ± 0.137 (28.5)	0.635	0.525	0.651 0.582	0.618 ± 0.287 (46.4)	0.777
12	F2	1.477 ± 0.158 (10.7)	1.045	0.884	1.80[b]	1.289 ± 0.205 (15.9)	1.146
13	712778TF1	1.138 ± 1.411 (124.1)	0.473	0.334	0.959[b]	0.535 ± 0.119 (22.2)	2.127
14	F2	1.624 ± 14.91 (918.1)	0.686	0.379[b]	0.996	0.662 ± 0.053 (7.9)	2.453
15	712786TF1	0.424 ± 0.033 (7.8)[a]	0.273	0.492	0.594	0.355 ± 0.103 (29.2)	1.194
16	F2	0.486 ± 0.092 (18.9)	0.438[b]	0.515[b]	0.578	0.484 ± 0.018 (3.7)	1.004
17	712794TF1	0.423 ± 0.038 (9.0)[a]	0.361	0.545	0.602	0.463 ± 0.097 (21.0)	0.914
18	712802TF1	0.349 ± 0.038 (10.9)[c]	0.231	0.364[b]	0.317[b]	0.256 ± 0.126 (49.5)	1.363
19	F2	0.637 ± 0.249 (39.1)	0.463	0.765[b] 0.680	0.595[b]	0.543 ± 0.215 (39.6)	1.173
20	713008TF1	1.138 ± 0.107 (9.4)[a]	1.78	0.729	1.242	1.044 ± 0.080 (7.6)	1.090
21	F2	Contaminated sampler	1.15	—	—	0.770 ± 0.160 (20.8)	—

[a] 3-zone results with a standard deviation near or less than 10% are most reliable.
[b] Indicates highest PFT concentration found was less than 50% greater than the smallest concentration in any of the other zones.
[c] House 712802TF1 needs recalculation as a 3-zone (wrong no. of sources in zone 3 and wrong volume for zone 2); result shown for 2-zone calculation.
[d] All three PFTs found in one zone are added and the average of the summed PFTs are used with the total (summed) source strengths to calculate the ACH.
[e] Contamination in zone 1 CATS; assumed 18 pL/L for sum of PFTs to calculate estimated ACH of 1.39 h^{-1}.

CONTROL STANDARDS REPORT

File	RTI TC No.	CATS ID	Quantity of Tracer, pL								
			PFT 2			PFT 3			PFT 8		
			Expected	Found	% Diff.	Expected	Found	% Diff.	Expected	Found	% Diff.
2A20	1	528	1.17	1.42	+ 21	—	—	—	—	—	—
5A16	2	1447	1.17	1.25	+ 6.8	—	—	—	—	—	—
5A3	3	7411	1.17	1.73	+ 48	—	—	—	—	—	—
5A7	4	139	1.17	1.69	+ 44	—	—	—	—	—	—
6A5	5	1022	2.92	3.38	+ 16	2.71	3.66	35	2.85	3.36	18.0
8A8	6	1321	5.83	5.58	- 4.3	5.42	6.40	18	5.70	5.65	0.9
9A20	7	4398	5.83	6.36	+ 9.1	5.42	6.45	19	5.70	5.52	3.2
10A9	8	3614	5.83	5.37	- 7.9	—	—	—	—	—	—
11A14	9	3119	2.92	3.98	- 36	—	—	—	—	—	—
11A19	10	4419	5.83	5.16	- 13	—	—	—	—	—	—
12A4	11	3170	2.92	3.73	+ 28	—	—	—	—	—	—
13A5	12	4729	2.92	4.14	+ 42	2.71	3.69	36	2.85	2.72	4.6
Avg. of absolute % Diff.:					23 ± 16			27 ± 9.8			6.7 ± 7.7

CONTROL BLANKS

RTI TB No.	File	CATS ID	Equivalent 12-h Tracer Conc., pL/L		
			PMCP	PMCH	PDCH
1	6802A5	1957	.22	0	.59
2	10	6845	.10	0	.24
3	15	3710	.03	0	.17
5	6803A13	9618	.09	0	0
6	4A17	3341	0	0	.04
7	5A4	1193	.33	0	.26
8	8A4	4830	0	0	.30
9	8A15	2338	0	0	.21
12	9A9	7178	0	0	0
13	10A4	2144	.24	0	0
14	11A11	6627	0	0	0
16	12A7	8298	0	0	0
17	12A20	6164	0	0	0
18	13A10	5618	.77	1.16	1.07

MEMORANDUM

TO: Larry Michael

FROM: Kent Thomas

DATE: 3/23/87

SUBJECT: California TEAM Air Exchange In Apartments

During the February TEAM field trip to California, air exchange samples were collected in both apartments and detached residences It was decided after returning from California that those air exchange samples collected in apartments would not be analyzed because of the uncertainty about the relative contrbutions of outdoor and other apartment air to the infiltration.

There were seven respondents identified as living in the multi-family dwellings we have defined as apartments. The criteria for being an apartment are defined as sharing a common hallway and/or having another dwelling unit above or below the sampled dwelling unit. The samples from six of these respondent's residences will be returned to Brookhaven Labs with instructions not to analyze. They are identified as follows:

71255-4	4 field samples
71266-1	4 field samples
71270-3	4 field samples
71290-1	4 field samples, 4 duplicate samples
71293-5	4 field samples
71295-0	4 field samples

Post Office Box 12194 Research Triangle Park, North Carolina 27709 Telephone: 919 541-6000

All of the above samples were collected in homes which did not have canister collectors and were therefore treated as "one zone" houses. The seventh apartment was sampled as a canister home, so the residence was treated as three zones. Furthermore, this apartment also received duplicate air exchange collectors. This apartment is identified as:

71273-7 6 field samples, 6 duplicate samples

The samples for this particular apartment will be analyzed by Brookhaven Labs. The three zone mixing data may still be useful, and it was the only three zone residence with duplicate air exchnge sample collection. The duplicate data will be particularly useful in judging the quality of the three zone measurement method. However it must be remembered that the accuracy of the air exchange measurement is uncertain in this case. It would be best to inform anyone either at RTI or EPA who uses the air exchange data for this particular residence that its value is questionable.

cc
Dr. Pellizzari

Post Office Box 12194 Research Triangle Park, North Carolina 27709 Telephone: 919 541-6000

General Description of the BNL/AIMS Output Format
June 1986

Revised: April 8, 1987

The top portion of the BNL/AIMS sheet shows the project title, the house name, the start and stop times and dates for sampling, the date analyzed, and the final date that computations were made.

The rates section gives the overall infiltration rate (m^3/h) for all zones and the air change rate (h^{-1}) by dividing by the total volume. Next is given, for each zone, the zone location, source information (gravimetric calibration rate at 25°C, quantity, and total emission rate adjusted for temperature, assuming an enthalpy of 6.8 kcal/mole), and exfiltration and infiltration rates with their standard deviations (SDs), followed by the zone to zone air flow rates and SDs. The total flow in or out of each zone, sometimes a useful quantity, is also given.

Note: All gaseous volumes, i.e., those for air flow rates and perfluorocarbon tracer (PFT) source rates, are reported at conditions of 25°C and 1 atm. When comparing results with those from other techniques, consideration must be given to the conditions under which those results are being reported. For example, tracer decay volumetric rates are reported for the conditions at the site (i.e., the indoor temperature and the prevailing barometric pressure).

The analysis section gives for each zone the volume, source type, and average tracer concentration with SDs, only for those used in the computations. Below is the individual CATS analyses by zone with the calibration correction factors. The PFT concentrations of those used in the computations are reported first, by zone, and then those for other PFTs found. Note that even though separate calibration curves are used for the mt-, mc-, and total m PDCH, the sum of mt and mc is generally very close to the m PDCH.

The notes section mentions the SDs assigned to the source rates and volumes; conditions or results that should not exist are flagged by printing in capital letters.

The current number codes of the tracers are:

PFT Code	PFT	Isomers Reported
1	PDCB	
2	PMCH	
3	m PDCH	mt PDCH and mc PDCH
4	o PDCH	oc PDCH and ot PDCH
5	p PDCH	pc PDCH and pt PDCH
6	PTCH	1 PTCH and 2 PTCH
8	PMCP	

Although these are 7 PFT source types currently available, chromatographic analysis limitations restrict certain combinations. In addition, the software is not yet available for the computation of more than 4 zones.

TEAM AIR EXCHANGE DATA

EXPLANATION OF BNL DATA FILES HEADER CODES

HOUSE ID	:RTI sample code and sampling period
START TIME	:Time air exchange measurement begins
STOP TIME	:Time air exchange measurement ends
HOURS	:Duration of air exchange measurement
ZONE ID	:Description of zones within a home being sampled
TRACER	:Type of chemical tracer used in each zone
VOLUME	:Volume of zones being measured in cubic meters or cubic feet
SOURCE	:Total rate of tracer emission in nL/hour
C12	:Concentration of the tracer compound released in Zone1 as measured in Zone2 in pL/L
ZONE INFILT	:Infiltration rate of outdoor air into a zone in cubic meters/hour
ZONE EXFILT	:Exfiltration rate of indoor air to the outdoors in cubic meters/hour
R12	:Rate of air flow from Zone1 to Zone2 in cubic meters/hour
ZONE ACH	:Air exhange rate for a particular zone
TOTAL HSE RATE	:Overall infiltration rate of outdoor air into the house in cubic meters/hour for the
TOTAL HSE ACH	:Overall air exchange rate for the whole house in air changes/hour

SINGLE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER 1987)

HOUSE ID	START TIME	START DATE	STOP TIME	STOP DATE	HOURS	TRACER	m^3 VOLUME	SOURCE RATE	AVG. CONC	TOT.RATE	ACHT	STANDARD DEVIATION --> VOLUME	SRCE RATE	CONC.	TOT.RATE	ACHT FOOTNOTES
712513TF1	20:25		08:30		12	PMCH	326	11642	31.6	368.8	1.13	5	10	10.96	135.3	0.41
712513TF2	08:45		17:45		9	PMCH	326	11896	29.2	407.4	1.25	5	10	3.52	63.8	0.21
712521TF1	19:05		08:25		13	PMCH	158	5547	34	163	1.03	5	10	6.38	34.6	0.22
712521TF2	08:45		18:15		10	PMCH	158	6899	63.6	108.5	0.68	5	10	70.47	120.6	0.76
712539TF1	21:05		07:30		10	PMCH	267	10437	46.1	226.6	0.85	5	10	3.24	27.7	0.11
712539TF2	08:40		16:45		8	PMCH	267	10437	31.6	330	1.24	5	10	17.43	184.9	0.69
712547TF1	19:00		07:25		12	PMCH	217	7931	63.5	124.9	0.57	5	10	3.07	13.9	0.07
712547TF2	07:28		16:10		9	PMCH	217	9401	20.7	454.5	2.09	5	10	6.23	144.4	0.67
712562TF1	21:20		07:06		10	PMCH	209	3479	46.2	75.3	0.36	5	10	13.57	23.4	0.11
712562TF2	07:07		16:35		9	PMCH	209	4052	53.4	75.9	0.36	5	10	11.49	18	0.09
712570TF1	18:55		09:27		15	PMCH	369	10805	27.5	392.9	1.07	5	10	6.3	98.2	0.27
712570TF2	09:25		18:08		9	PMCH	369	10127	36.7	276	0.75	5	10	1.24	29.1	0.09
712588TF1	19:00		07:25		12	PMCH	148	5287	34.7	152.5	1.03	5	10	0.88	15.7	0.12
712588TF2	07:26		16:18		9	PMCH	148	5639	39.9	141.5	0.96	5	10	0.93	14.5	0.11
712596TF1	20:10		08:43		13	PMCH	466	9484	36.3	261.1	0.56	5	10	19.75	144.4	0.31
712596TF2	08:59		17:32		9	PMCH	466	9484	30.1	315.5	0.68	5	10	1.85	37	0.09
712604TF1	21:15		09:05		12	PMCH	296	8670	24.3	357.2	1.21	5	10	3.66	64.6	0.23
712604TF2	09:10		16:24		7	PMCH	296	8670	10.5	827.7	2.79	5	10	0.23	84.8	0.32
712612TF1	21:10		06:53		10	PMCH	453	5174	46.9	110.4	0.24	5	10	16.58	40.6	0.09
712612TF2	06:55		16:43		10	PMCH	453	5174	43.6	118.8	0.26	5	10	17.42	48.9	0.11
712620TF1	20:15		07:38		11	acPDCH	374	4191	22.9	183.2	0.49	5	10	0.06	18.3	0.05
712620TF2	07:45		17:33		10	acPDCH	374	3923	12	325.9	0.87	5	10	5.55	153.9	0.41
712638TF1	19:44		07:40		12	acPDCH	195	8139	47	173.2	0.89	5	10	9.73	39.8	0.21
712638TF2	07:51		17:34		10	acPDCH	195	6853	40.4	169.7	0.87	5	10	2.02	19	0.11
712646TF1	19:30		09:23		14	PMCH	266	9253	92.4	100.1	0.38	5	10	5.96	11.9	0.05
712646TF2	09:25		16:45		7	PMCH	266	9055	84.8	106.8	0.4	5	10	8.5	15.1	0.06
712653TF1	20:30		07:05		11	PMCH	145	6329	75.2	84.1	0.58	5	10	7.52	11.9	0.09
712653TF2	07:21		18:09		11	PMCH	145	5927	96.8	61.2	0.42	5	10	4.39	6.7	0.05
712679TF1	20:17		07:22		11	PMCH	182	8825	87	101.4	0.56	5	10	36.85	44.1	0.24
712679TF2	07:24		17:48		10	PMCH	182	8104	71.2	113.8	0.63	5	10	30.51	50.1	0.28
712687TF1	20:15		07:20		11	PMCH	277	8118	80.5	100.8	0.36	5	10	19.79	26.8	0.1
712687TF2	07:22		18:31		11	PMCH	277	8670	46.9	184.8	0.67	5	10	9.39	41.3	0.15
712695TF1	21:15		08:19		11	PMCH	259	9075	44.4	204.2	0.79	5	10	7.53	40.2	0.16
712695TF2	08:21		17:23		9	PMCH	259	10349	38.3	270	1.04	5	10	1.93	30.2	0.13
712711TF1	20:23		07:23		11	PMCH	259	8482	32.2	263.7	1.02	5	10	6.27	57.8	0.23
712711TF2	07:25		16:26		9	PMCH	259	8861	27.5	322.5	1.25	5	10	1.59	37.3	0.16
712810TF1	18:19		06:32		12	PMCH	154	5063	49.8	101.6	0.66	5	10	3.64	12.6	0.09
712810TF2	06:36		16:10		10	PMCH	154	4537	34.9	130	0.85	5	10	0.78	13.3	0.1
712828TF1	19:00		08:30		14	PMCH	406	6193	20.1	308.3	0.76	5	10	5.01	82.8	0.21
712828TF2	08:32		16:15		8	PMCH	406	6468	29.1	222.4	0.55	5	10	4.96	44	0.11
712828TD1	19:00		08:30		14	PMCH	406	6193	19	325.6	0.8	5	10	4.96	90.9	0.23
712828TD2	08:32		16:15		8	PMCH	406	6468	28.6	226.2	0.56	5	10	5.37	48.1	0.12
712836TF1	19:20		08:04		13	PMCH	363	7766	27.4	282.9	0.78	5	10	2.81	40.5	0.12
712836TF2	08:10		17:42		10	PMCH	363	8118	14.4	562.2	1.55	5	10	1.44	79.5	0.23
712844TF1	20:10		06:20		10	PMCH	526	8680	61.7	140.7	0.27	5	10	40.46	93.3	0.18
712844TF2	06:22		17:15		11	PMCH	526	8300	31.4	264.3	0.5	5	10	1.94	31.1	0.06
712851TF1	19:15		08:19		13	PMCH	230	5063	32.5	155.8	0.68	5	10	8.05	41.7	0.18
712851TF2	08:40		15:59		7	PMCH	230	5063	25.3	200.1	0.87	5	10	8.11	67.2	0.3
712869TF1	19:10		05:47		11	PMCH	326	7113	19.9	357.5	1.1	5	10	1.38	43.5	0.14
712869TF2	05:47		17:47		12	PMCH	326	7113	15.9	447.8	1.37	5	10	4.09	123.6	0.38
712877TF1	21:10		09:30		12	PMCH	244	6806	25.5	267.2	1.09	5	10	8.01	88.1	0.37
712877TF2	09:30		17:20		8	PMCH	244	6958	17.4	400.1	1.64	5	10	11.72	272.6	1.12
712877TD1	21:10		09:30		12	PMCH	244	6806	40.2	169.2	0.69	5	10	14.09	61.6	0.25

SINGLE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER 1987)

712877T02	09:30	17:20	8	PMCH	244	6958	28	248.3	1.02	5	10	21.54	192.4	0.79	
712885TF1	20:25	08:56	13	PMCH	256	6468	63.6	101.7	0.4	5	10	37.78	61.3	0.24	
712885TF2	08:57	16:18	7	PMCH	256	6899	65.1	106.1	0.41	5	10	13.01	23.7	0.1	
712893TF1	19:14	08:34	13	PMCH	300	5547	13.6	407.6	1.36	5	10	7.42	225.8	0.76	
712893TF2	08:44	17:19	9	PMCH	300	5927	13.8	430.5	1.43	5	10	7.67	243.7	0.81	
712919TF1	20:15	09:15	13	PMCH	233	5187	48.3	107.3	0.46	5	10	14.22	33.3	0.15	
712919TF2	09:17	16:16	7	PMCH	233	6609	21.7	304.5	1.31	5	10	4.74	73.2	0.32	
712927TF1	20:01	09:31	14	PMCH	188	11039	32.9	335.6	1.78	5	10	8.51	93.1	0.5	
712927TF2	09:40	16:05	6	PMCH	188	11277	21.4	526.6	2.8	5	10	4.1	113.8	0.62	
712927T01	20:01	09:20	13	PMCH	188	11039	42.2	261.8	1.39	5	10	4.22	37	0.21	
712927T02	09:40	16:05	6	PMCH	188	11277	28.9	389.7	2.07	5	10	8.76	124.3	0.67	
712943TF1	20:50	10:28	14	PMCH	326	9075	69.6	130.3	0.4	5	10	33.19	63.5	0.2	
712943TF2	10:30	16:20	6	PMCH	326	9484	71.9	132	0.41	5	10	13.12	27.5	0.09	
712968TF1	19:46	10:20	15	PMCH	201	6657	67.8	98.2	0.49	5	10	52.63	76.9	0.38	
712968TF2	10:20	17:30	7	PMCH	201	6657	41	162.4	0.81	5	10	8.3	36.7	0.19	
712976TF1	19:10	08:55	14	PMCH	231	8482	50.3	168.7	0.73	5	10	5.1	24	0.11	
712976TF2	08:55	15:56	7	PMCH	231	8482	87.8	96.6	0.42	5	10	28.42	32.7	0.14	
712984TF1	20:24	10:30	14	PMCH	519	6657	34.2	194.4	0.37	5	10	7.13	44.9	0.09	
712984TF2	10:39	17:39	7	PMCH	519	7431	29.5	251.5	0.48	5	10	1.15	27	0.06	
712992TF2	21:10	07:50	11	PMCH	191	8118	135	60.1	0.31	5	10	5.18	6.4	0.04	
712992TF2	07:50	17:10	9	PMCH	191	8670	115.3	75.2	0.39	5	10	2.27	7.7	0.04	
713016TF1	13:20	08:00	19	PMCH	204	7931	79.6	99.6	0.49	5	10	12.33	18.4	0.09	
713016TF2	08:00	13:25	5	PMCH	204	6806	64.1	106.2	0.52	5	10	1.04	10.8	0.06	
712554TF1									NC					NC	?
712554TF2									NC					NC	?
712661TF1									NC					NC	?
712661TF2									NC					NC	?
712703TF1									NC					NC	?
712703TF2									NC					NC	?
712901TF1									NC					NC	?
712901T01									NC					NC	?
712901TF2									NC					NC	?
712901T02									NC					NC	?
712935TF1									NC					NC	?
712935TF2									NC					NC	?
712950TF1									NC					NC	?
712950TF2									NC					NC	?

TWO ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER 1987)

HOUSE ID	TIME	DATE	TIME	DATE	HOURS	ZONE1 ID	TRACER	m^3 VOLUME	SOURCE RATE	C11	C21	ZONE 2 ID	TRACER	m^3 VOLUME	SOURCE RATE	C12	C22	INFIL1	EXFILT1	INFIL2	EXFILT2	R11
712802TF1	18:50		08:15		13	2ND FLOOR	PMCP	230	8011	123.8	20.5	LIVING	acPOCH	274	4011	34.4	23.1	9.4	21.8	166.8	154.4	86

TWO ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER 1987)

								STANDARD DEVIATIONS ----)														
ACH1	R12	R21	R22	ACH2	TOT. RATE	ACHT	VOL1	SOURCE1	C11	C21	VOL2	SOURCE2	C12	C22	INFILT1	EXFILT1	INFILT2	EXFILT2	R11	ACH1	R12	R21	R22
0.37	64.1	76.5	230.9	0.04	176.2	0.35	5	10	12.38	2.05	5	10	1.31	1.05	8.2	11.6	20.3	26.4	14.7	0.07	12	17	29.2

TWO ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER 1987)

ACH2	TOT.RATE	ACHT
0.11	18.1	0.04

THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER SEASON)

HOUSE ID	START TIME	START DATE	STOP TIME	STOP DATE	HOURS	ZONE 1 ID	TRACER	m^3 VOLUME	SOURCE	C11	C21	C31	ZONE 2 ID	TRACER	m^3 VOLUME	SOURCE	C12	C22	C32	ZONE 3 ID	TRACER	m^3 VOLUME
712729TF1	19:50		07:51		12	BEDROOM	PMCH	182	6193	74.5	14.6	27.2	LIVING	acPDCH	48	1311	49.4	22.1	29.8	KITCHEN	PMCP	59
712729TF2	07:51		16:16		8	BEDROOM	PMCH	182	6468	18.9	3.1	5.5	LIVING RM	acPDCH	48	1789	13.3	6	6.2	KITCHEN	PMCP	59
712737TF1	19:25		09:50		14	BEDROOM	acPDCH	102	2570	37.7	13.3	10.7	KITCHEN	PMCP	27	3423	16.4	56.1	29.3	LIVING	PMCH	76
712737T01	19:25		09:50		14	BEDROOM	acPDCH	102	2570	35.9	13.6	11.3	KITCHEN	PMCP	27	3423	16.1	54.3	28.9	LIVING	PMCH	76
712737TF2	09:53		18:14		8	BEDROOM	acPDCH	102	2460	4.1	5.7	5.1	KITCHEN	PMCP	27	3276	1.7	12.2	4.8	LIVING	PMCH	76
712737T02	09:54		18:14		8	BEDROOM	acPDCH	102	2460	3.6	4	3.4	KITCHEN	PMCP	27	3276	1.4	10.9	3.6	LIVING	PMCH	76
712745TF1	18:36		09:30		15	1ST FLOOR	PMCH	270	6059	55.3	91.5	0.5	BASEMENT	acPDCH	205	2514	0	13.3	0.4	2ND FLOOR	PMCP	59
712745TF2	09:35		16:50		7	1ST FLOOR	PMCH	270	6193	11.3	4.2	1	BASEMENT	acPDCH	205	2570	0	19.6	0.4	2ND FLOOR	PMCP	59
712752TF1	21:40		09:05		11	BEDROOM	PMCP	197	8556	146.8	22.3	28.3	LIVING	acPDCH	87	1713	23.4	30.8	44.7	KITCHEN	PMCH	80
712752TF2	09:06		18:15		9	BEDROOM	PMCP	197	8190	144.3	26.4	34.6	LIVING	acPDCH	87	1640	33.9	29.5	40.7	KITCHEN	PMCH	80
712760TF1	20:40		07:50		11	LIVING	acPDCH	230	3069	16.2	12.5	8.9	KITCHEN	PMCH	52	2219	7.7	9.5	9.8	BEDROOM	PMCP	127
712760TF2	07:50		18:15		10	LIVING	acPDCH	230	3138	9.5	7	7.4	KITCHEN	PMCH	52	2269	7.2	10.2	7	BEDROOM	PMCP	127
712778TF1	20:10		06:06		10	BEDROOM	PMCH	80	3556	34	22.9	15.2	LIVING	acPDCH	123	1640	34.2	21.4	12.3	KITCHEN	PMCP	37
712778TF2	06:10		16:42		11	BEDROOM	PMCH	80	3556	23.2	19.4	12.9	LIVING	acPDCH	123	1640	22.7	18.7	12.3	KITCHEN	PMCP	37
712786TF1	21:00		05:25		8	BEDROOM	PMCH	142	6193	136.6	12.9	17.4	LIVING	acPDCH	51	1713	43.6	22	38.2	KITCHEN	PMCP	28
712786TF2	05:30		16:35		11	BEDROOM	PMCH	142	6193	70	15.1	22.8	LIVING	acPDCH	51	1713	54.6	15.3	33.4	KITCHEN	PMCP	28
712794TF1	20:07		07:12		11	BEDROOM	PMCH	112	3403	54	2.8	5.7	LIVING	acPDCH	76	1569	30	23.2	38.6	KITCHEN	PMCP	38
712794TF2	07:20		16:17		9	BEDROOM	PMCH	112	3681	103.6	7.6	9.7	LIVING	acPDCH	76	1789	34.5	23.5	42.7	KITCHEN	PMCP	38
712802TF1	18:50		08:15		13	2ND FLOOR	PMCP	230	8011	123.8	20.7	12.3	LIVING	acPDCH	184	4011	33.5	22.5	12.3	KITCHEN	PMCH	90
712802TF2	08:21		16:10		8	2ND FLOOR	PMCP	230	8371	56.1	9.1	8.5	LIVING	acPDCH	184	4191	18.5	12.5	7.7	KITCHEN	PMCH	90
713008TF1	18:55		11:00		16	LIV. RM.	acPDCH	73	2406	9.8	15.5	13.5	BED ROOM	PMCH	102	3479	4.2	30.6	8.2	KITCHEN	PMCP	33
713008TF2	11:00		17:50		7	LIV. RM.	acPDCH	73	2354	12.8	18.8	14.1	BED RM.	PMCH	102	3403	7.9	954.8	171.5	KITCHEN	PMCP	33

THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER SEASON)

SOURCE	C13	C23	C33	ZONE 1 INFILT.	ZONE 1 EXFILT.	ZONE 2 INFILT.	ZONE 2 EXFILT.	ZONE 3 INFILT.	ZONE 3 EXFILT.	R11	ZONE 1 ACH	R12	R21	R13	R31	R22	ZONE 2 ACH	R23	R32	R33	ZONE 3 ACH	TOTAL HSE. RATE
3423	45.8	14.6	41.6	37	60.7	20.8	-16.6	40.7	54.5	165.6	0.91	50	71.8	54.9	56.8	134.4	2.79	79.2	63.5	174.7	2.95	98.5
3575	11.5	3.8	11.4	217.2	159.7	99.7	103.6	126.6	180.2	580.3	3.19	285.7	186.1	135	177	544.1	11.3	254.3	158.7	515.9	8.71	443.5
2477	14.5	34.6	33.7	52.6	42	7.1	30	46.4	34.1	78.4	0.77	15	7.2	21.4	18.5	132.9	4.87	95.7	110.9	163.5	2.14	106.1
2477	13.9	33.2	32.7	53.9	44.8	5.1	32.4	50	31.8	83.6	0.82	16.6	7.4	22.1	22.3	138.4	5.07	98.7	116.7	170.8	2.24	109
2371	1.8	4.4	4.6	-126.1	718.3	-16.8	58.2	571.8	-347.6	1124.9	10.99	-21.5	115.4	428.1	1135.6	424.9	15.56	251.3	463.2	1251.2	16.41	429
2371	1.7	4	4.3	218.8	687.1	72.5	58	419.6	-34.1	1123.2	10.98	-17.9	133.2	454.1	771.1	433.1	15.86	241.9	378.6	1115.5	14.63	710.9
3349	9.9	5	0.9	-258.6	-443	74.2	2065.9	4899.5	3092.3	68.4	0.25	-12.2	556.8	523.7	-229.8	130.5	0.64	-2492.2	68.5	2931	49.55	4715.1
3423	11.1	7.7	0.7	190.8	8556.6	105.5	1522.5	1640.2	-8142.6	-850.1	-3.15	150.9	379.5	-9557.6	-1420.3	103	0.5	-1798.9	-153.4	-9716.3	-164.27	1936.5
2477	19.8	28.1	43.9	26.3	56.8	-23	-51.8	74.2	72.6	67	0.34	20.3	131.1	-10	-90.4	828.2	9.54	748.9	830.9	813.1	10.12	77.6
2371	23	28.2	38.4	-3.9	26.5	265.4	368.3	-219.3	-352.5	54.5	0.28	-301.4	-153.3	329.4	211.7	-3919.7	-45.16	-4134.7	-3883.8	-4024.5	-50.09	42.2
6131	5.6	6.7	53.9	-148.4	209.2	305.6	-112.2	39.2	99.5	511.4	2.22	299.9	702.9	2.3	-43	679.2	13.13	88.6	73.7	130.1	1.02	196.4
6269	3.5	3.4	11.2	91.2	225.7	63.8	-85.5	449	463.8	744.1	3.24	337.3	443.5	181.2	209.5	482.2	9.32	124.1	81	754.3	5.93	604
3276	16	11.9	18.6	253.4	-722.4	-163	668.3	184	328.5	-1675.6	-20.86	-1349.3	-1628.1	396.2	-300.9	-1190	-9.64	-230.2	322.4	350	9.37	274.4
3276	14.4	12.9	20.2	489.7	-6031.4	-229.6	6170.3	131.4	252.5	-12024.3	-149.66	-7094.8	-12382	1101.9	-131.9	-7155.2	-57.98	-943.5	169.2	289.8	7.76	391.5
3423	37	18.8	48	25.7	25.3	35.5	31.2	32.6	37.3	55.9	0.39	31.2	48.6	-0.6	-18.5	271.1	5.31	191.3	204.5	223.2	7.94	93.8
3423	51	14.4	34.9	73.7	4.6	-27	176	60.7	-73.3	390.3	2.75	395.1	1392.4	-9.4	-1075.8	2485	48.7	916.6	2116.9	967.8	34.41	107.3
3134	28.7	21.1	43.1	58.8	25.5	11	8.1	25.9	62.1	67.7	0.61	30.9	-0.6	11.4	9.5	360.9	4.72	353.4	319	390.7	10.36	95.7
3575	56	21.7	47.6	26.7	2.9	92.3	37.6	-37.7	40.7	37.2	0.33	-65.8	28.8	100.1	-18.2	387.6	5.07	321.2	361.1	383.6	10.17	81.2
452	35.3	24	12.9	-21.7	59.3	-558.3	-9599.8	155	9115.5	87.9	0.38	19.1	541.4	9.5	-431.8	-11560	-62.8	-2501.6	-11020.8	-2337	-25.87	-425
2424	19.6	12	7.8	-1.4	95.1	93.8	1222.2	228.9	-996	283.4	1.23	-176.2	-1680.2	364.5	1964.9	7180.3	39.01	7638.3	7262.8	8231.7	91.13	321.3
3205	6.4	16	22.7	109.9	257.1	77.7	-12.4	49.4	-7.7	439	6	47.2	105.9	134.7	223.2	151.8	1.49	58.3	26.9	242.4	7.32	237
3134	9.4	31.4	28.8	149.5	158	-8.4	-0.7	52	35.9	280.2	3.83	-25.4	1.3	147.5	129.4	4.3	0.04	3.8	38.1	203.4	6.14	193.2

THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER SEASON)

STANDARD DEVIATION ---->

TOTAL HSE. ACH	ZONE 1 SOURCE	VOLUME	C11	C21	C31	ZONE 2 SOURCE	VOLUME	C12	C22	C32	ZONE 3 SOURCE	VOLUME	C13	C23	C33	ZONE 1 IN. RATE	ZONE 1 EX. RATE	ZONE 2 IN. RATE	ZONE 2 EX. RATE	ZONE 3 IN. RATE	ZONE 3 EX. RATE	R11	ACH1
0.34	5	10	7.45	1.46	2.72	5	10	4.94	2.21	2.98	5	10	4.58	1.46	4.16	11.9	23.8	9.4	23.2	12.7	25.5	41.3	0.23
1.53	5	10	1.89	0.31	0.55	5	10	1.33	0.6	0.62	5	10	1.15	0.38	1.14	47.9	77.2	40.4	73.2	37.8	67.5	123.9	0.7
0.52	5	10	3.77	1.33	1.07	5	10	1.64	5.61	2.93	5	10	1.45	3.46	3.37	8.3	9.9	11.7	19.3	14	23.3	12	0.12
0.53	5	10	3.59	1.36	1.13	5	10	1.61	5.43	2.89	5	10	1.39	3.32	3.27	8.7	10.6	12.7	20	15	24.4	13	0.13
2.84	5	10	0.41	0.57	0.51	5	10	0.17	1.22	0.48	5	10	0.18	0.44	0.46	191	197.7	71.4	88.9	162.9	315.7	293.9	2.92
3.45	5	10	0.36	0.4	0.34	5	10	0.14	1.09	0.36	5	10	0.17	0.4	0.43	99.9	170.6	42.6	69.3	102.5	196.7	242.7	2.43
1.39	5	10	5.53	9.15	0.05	5	10	0	1.33	0.04	5	10	0.99	0.5	0.09	62.2	85.7	15.8	557.4	682.3	435.5	10.8	0.04
1.26	5	10	1.13	0.42	0.1	5	10	0	1.96	0.04	5	10	1.11	0.77	0.07	104.1	3580.3	18.7	1043.8	844.2	4369.5	464.8	1.73
0.19	5	10	14.68	2.23	2.83	5	10	2.34	3.08	4.47	5	10	1.98	2.81	4.39	23.3	10.5	162.7	220.9	153.3	229.7	12.5	0.07
0.17	5	10	14.43	2.64	3.46	5	10	3.39	2.95	4.07	5	10	2.3	2.82	3.84	156.5	392.8	3277.5	5015.2	3429.1	4925.7	201.6	1.02
0.58	5	10	1.62	1.25	0.89	5	10	0.77	0.95	0.98	5	10	0.56	0.67	5.39	137.3	92.4	113.3	155.6	18.4	22.6	213.5	0.93
1.68	5	10	0.95	0.7	0.74	5	10	0.72	1.02	0.7	5	10	0.35	0.34	1.12	57.4	113	37.6	93	77.4	104.8	225.3	0.99
0.54	5	10	3.4	2.29	1.52	5	10	3.42	2.14	1.23	5	10	1.6	1.19	1.86	790.4	2445.4	611.2	2250.8	171	549.7	5708.5	71.06
0.66	5	10	2.32	1.94	1.29	5	10	2.27	1.87	1.23	5	10	1.44	1.29	2.02	7187.1	97718	4197.4	99511.9	611.2	2081.7	195398.1	2432.04
0.42	5	10	13.66	1.29	1.74	5	10	4.36	2.2	3.82	5	10	3.7	1.88	4.8	5.5	7.6	21.2	39.4	18.4	35.8	9.4	0.07
0.48	5	10	7	1.51	2.28	5	10	5.46	1.53	3.34	5	10	5.1	1.44	3.49	163.9	108.5	298	590.9	120.6	508.6	876.2	6.18
0.42	5	10	5.4	0.28	0.57	5	10	3	2.32	3.86	5	10	2.87	2.11	4.31	8.7	9.2	30.5	66.4	33.3	66.4	10	0.09
0.36	5	10	10.36	0.76	0.97	5	10	3.45	2.35	4.27	5	10	5.6	2.17	4.76	6	15.3	69.8	61.6	65.6	64.4	7.6	0.07
0.35	5	10	12.38	2.07	1.23	5	10	3.35	2.25	1.23	5	10	3.53	2.4	1.29	375.4	628	8637.4	128216.8	1850.4	120954.4	36	0.16
0.68	5	10	5.61	0.91	0.85	5	10	1.85	1.25	0.77	5	10	1.96	1.2	0.78	202.9	230.7	795.6	5225.5	875.7	5494.7	375.7	1.64
1.14	5	10	0.98	1.55	1.35	5	10	0.42	3.06	0.82	5	10	0.64	1.6	2.27	32.3	66.9	13.8	29	17.5	48.4	100	1.4
0.77	5	10	1.28	1.88	1.41	5	10	0.79	95.48	17.15	5	10	0.94	3.14	2.88	29.8	41.8	4.1	0.8	20.8	31.5	59.1	0.83

THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - WINTER SEASON)

R12	R21	R13	R31	R22	ACH2	R23	R32	R33	ACH3	HSE. RATE	HSE. ACH	FOOTNOTES
26.7	37.3	32	34.4	38.4	0.81	39.8	31.4	47	0.81	7.7	0.03	1
104.3	81.9	81.2	70	124.2	2.64	93.7	73.3	106.8	1.85	31.7	0.12	1
10.4	6.6	11.2	8.6	40.9	1.52	39.8	46.2	50.8	0.68	8.4	0.04	1,8
11.3	7.6	12	10.2	43	1.59	41.5	49.3	53.6	0.71	8.8	0.05	1,8
73.2	138	178.4	501.9	89.7	3.38	113.8	187.4	390.5	5.19	114.8	0.76	2,8
59.3	94.8	158.4	289.4	82	3.11	93.6	129.1	282.8	3.78	67	0.34	1,8
2.3	88.6	87.2	47.3	20.1	0.1	586.2	11.9	442.1	7.87	680.8	0.18	2
66.2	149	4064.8	591.2	22.8	0.11	1197.3	80.4	4983.2	84.65	737.4	0.13	2
50.2	328.4	47.1	341.7	2295.7	26.45	2158.1	2393.6	2250.7	28.02	15.9	0.01	3
4220.7	2573	4416	2527.2	53895.2	620.94	56388.7	52933.1	55382.1	689.32	305	0.01	3
159.5	370.3	23.4	38.6	290.5	5.65	45.7	32.8	20.3	0.17	55.5	0.08	3
143.3	189.7	95.2	101.5	142.5	2.79	83.2	64.2	130.6	1.07	61.6	0.16	1
4412.7	5256.5	1209.1	1274	4061.9	32.92	1110	986.9	280.4	7.52	340.1	0.54	2
114116.6	198985.2	16608.7	4161.5	116211.3	941.62	16912.8	2430.7	358.3	9.6	3594.3	0.05	2
18.8	25.9	15.1	22	141	2.78	120.6	127.7	112.7	4.03	6.4	0.03	1
1583.6	4772.9	635.6	4114.6	8674.1	170.02	3494.3	7488	3020.6	107.39	20	0.02	2
36.3	9	39.2	9.1	333.5	6.37	364.2	329.2	361.3	9.59	8	0.04	1
84	23.2	81	23.8	340.3	6.46	321.2	355.1	337	8.95	12.6	0.06	1
757.6	6722.2	162.3	6341.1	154704.8	840.5	33141.2	145942.1	31263.9	346.1	7158.5	0.04	4
1455.9	8416.7	1603.6	8855.8	33066.4	179.66	36363	34775.5	38246.6	423.42	125.4	0.12	3
17.9	45.1	47.2	76.5	26	0.27	25.6	14.5	53.9	1.67	21.1	0.11	1
9.6	1.1	46.3	43.6	0.7	0.01	1.3	11.1	48.5	1.5	20.9	0.16	2

FOOTNOTE TABLE FOR AIR EXCHANGE DATA (TEAM CALIFORNIA -WINTER)

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1. Calculated correctly using a three zone division.

2. Original three zone calculation not correct. Reported Total ACH and House ACH Standard Deviation were calculated using the summed and volume weighted PFT concentrations.

3. Original three zone calculation not correct. Reported Total ACH and House ACH Standard Deviation are mean values calculated by single PFT type determinations of the whole house ACH.

4. Original three zone calculation not correct. Recalculated as a two zone division for determining Total ACH and House ACH Standard Deviation.

7. These homes were considered apartments so the air exchange samples were not analyzed during the winter season study.

8. This home was an apartment. Remember that the air infiltrating into apartments may come from both outside and other apartments. Therefore a pollutant source may be in another home and source strength calculations may be unreliable.

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FTS 666- 3062

Department of Applied Science
Building 426

December 9, 1987

Mr. Kent Thomas
Research Triangle Institute
Analytical and Chemical Sciences
P.O. Box 12194
Research Triangle Park, NC 27709

Dear Kent:

Enclosed are the results of the 288 CATSamplers you sent us July 31, 1987, for the TEAM Los Angeles study. Included is hard copy of the whole house ACH summary, and the results of the standard and blank controls. The summary of the results are included as files on the flexible disk. There has been a revision in the information provided in these files to include the zonal temperatures, number of sources, and number of samplers. The heading files have been updated as well. Please refer to the revised instructions.

There are 30 houses that were calculated as 2 zones as well as 3 zones because the concentrations of all the tracers in 2 of the zones were close to being equal that the errors were large and many rates were negative. The 2 zone reduction was done two ways: 1) by eliminating a tracer and averaging the 2 CATSamplers for the new enlarged zone; and 2) by adding the sources together and using a zone volume weighted average. Those results which were done by adding the sources together are indicated by an "R" at the end of the file name or house code in the case of the ACH hardcopy. You may choose the results that you want, however, we have more confidence in those results obtained by adding the sources together (the "R" results).

Hard copy of the two zone results are included so that you may know which 2 zones were merged. There are 4 periods of houses done as 2 zones for other reasons. House 722900TF (both periods) were set up as two zones and house 722678TF1 was also set up as a two zone by having the CATS in the living room. House 722520TF2 was done as a 2 zone because there was a faulty sampler.

If there are any questions, please call.

Sincerely,

Robert W. Goodrich

Robert W. Goodrich
Environmental Chemistry Division

RWG/mm
Enclosures

G-19

RTI TEAM LA ACH'S AND STD.DEV.

HOUSE CODE	# ZONES	ACH	STD.DEV	PERCENT STD.DEV
722512TF1	3	2.79	0.29	10.39
722512TF2	3	2.20	0.21	9.78
722520TF1	3	1.43	0.12	8.38
722520TF2	2	1.49	0.14	9.62
722538TF1	3	0.49	0.10	20.24
722538TF1	2	0.51	0.05	10.36
722538TF1R	2	0.53	0.07	12.41
722538TF2	3	2.27	0.24	10.67
722546TF1	3	0.89	0.08	9.27
722546TF2	3	2.60	1.92	73.91
722546TF2	2	2.00	0.49	24.78
722546TF2R	2	1.32	0.18	13.80
722553TF1	3	0.94	0.10	10.37
722553TF2	3	1.15	0.12	10.56
722579TD1	3	0.65	0.35	53.56
722579TD1	2	0.53	0.06	10.68
722579TD1R	2	0.53	0.05	9.74
722579TD2	3	1.90	0.28	14.83
722579TD2	2	1.74	0.18	10.63
722579TD2R	2	1.69	0.17	9.82
722579TF1	3	0.53	0.05	9.76
722579TF1	2	0.53	0.05	9.00
722579TF1R	2	0.53	0.05	9.89
722579TF2	3	1.92	0.17	8.94
722579TF2	2	1.98	0.19	9.67
722587TF1	3	1.72	36.17	2109.03
722587TF1	2	0.84	0.08	9.29
722587TF1R	2	0.90	0.09	9.59
722587TF2	3	1.51	0.27	18.06
722587TF2	2	1.52	0.16	10.61
722587TF2R	2	1.61	0.19	11.77
722595TF1	3	1.23	0.11	8.77
722595TF1	2	1.19	0.12	10.11
722595TF2	3	4.50	0.38	8.55
722595TF2	2	5.44	1.84	33.87
722603TF1	3	2.32	0.23	9.92
722603TF1	2	2.20	0.21	9.34
722603TF1R	2	2.38	0.23	9.78
722603TF2	3	1.98	1.07	53.92
722603TF2	2	2.54	0.27	10.54
722603TF2R	2	2.76	0.28	10.07
722611TF1	3	3.81	0.50	13.14
722611TF2	3	5.94	0.68	11.37
722629TF1	3	3.12	0.44	14.12
722629TF2	3	1.95	0.20	10.17
722637TF1	3	0.98	0.18	17.93
722637TF2	3	1.02	0.17	16.45
722645TF1	3	1.30	0.14	10.63
722645TF2	3	6.14	0.65	10.63
722652TD1	3	4.04	0.33	8.13
722652TD2	3	9.99	0.97	9.72
722652TF1	3	3.90	0.32	8.18
722652TF2	3	11.15	1.00	8.98
722660TF1	3	1.32	0.14	10.99

722660TF2	3	3.57	0.39	10.81
722678TF1	2	0.73	0.08	11.07
722678TF2	3	1.43	0.22	15.68
722686TF1	3	3.14	0.66	20.94
722686TF2	3	4.94	0.77	15.49
722694TF1	3	1.12	0.09	8.03
722694TF2	3	2.73	0.27	9.88
722702TF1	3	-0.03	2.79	-8629.61
722702TF1	2	0.39	0.31	78.07
722702TF2	3	3.67	1.31	35.71
722702TF2	2	19.02	631.47	3319.59
722702TF2R	2	2.94	0.33	11.19
722710TF1	3	1.35	0.24	17.91
722710TF1	2	1.40	0.13	9.07
722710TF1R	2	1.44	0.15	10.12
722710TF2	3	1.72	0.16	9.05
722728TF1	3	1.02	0.08	8.00
722728TF2	3	4.34	0.49	11.25
722728TF2	2	4.19	0.56	13.28
722728TF2R	2	4.42	0.58	13.16
722736TF1	3	3.37	0.48	14.20
722736TF2	3	1.25	0.12	9.55
722744TF1	3	4.47	48.04	1074.12
722744TF1	2	1.10	0.12	10.95
722744TF1R	2	1.18	0.12	10.35
722744TF2	3	2.80	0.31	11.00
722744TF2	2	2.63	0.29	10.95
722744TF2R	2	2.74	0.29	10.54
722751TF1	3	0.68	0.07	9.66
722751TF1	2	0.68	0.06	9.05
722751TF1R	2	0.68	0.07	10.01
722751TF2	3	2.03	0.19	9.15
722769TF1	3	0.56	0.10	18.29
722769TF1	2	0.46	0.07	14.88
722769TF1R	2	0.51	0.07	13.00
722769TF2	3	1.05	0.15	14.59
722769TF2	2	0.96	0.13	14.00
722769TF2R	2	1.00	0.13	13.31
722777TD1	3	3.86	0.65	16.70
722777TD1	2	3.80	0.52	13.61
722777TD1R	2	3.79	0.52	13.81
722777TD2	3	5.28	0.58	11.01
722777TD2	2	5.29	0.60	11.30
722777TD2R	2	5.28	0.60	11.41
722777TF1	3	3.95	0.82	20.84
722777TF1	2	3.94	0.55	14.04
722777TF1R	2	3.93	0.56	14.29
722777TF2	3	5.20	0.54	10.48
722777TF2	2	5.22	0.58	11.08
722777TF2R	2	5.20	0.57	10.94
722785TF1	3	0.37	0.13	36.03
722785TF1	2	0.36	0.04	10.86
722785TF1R	2	0.36	0.04	9.83
722785TF2	3	0.62	2.63	423.06
722801TF1	3	-38.35	84.46	-220.23
722801TF2	3	9.16	1.33	14.55
722801TF2	2	9.16	1.37	14.93
722801TF2R	2	9.16	1.37	14.98

722819TF1	3	18.16	55.62	306.33
722819TF2	3	6.17	0.82	13.28
722827TF1	1	0.69	0.26	38.02
722827TF2	1	0.50	0.26	52.55
722835TF1	3	2.64	0.29	11.13
722835TF2	3	4.28	0.37	8.54
722843TF1	3	1.65	0.42	25.72
722843TF2	3	4.01	5.25	131.08
722843TF2	2	8.74	1.35	15.46
722843TF2R	2	12.46	1.85	14.83
722850TF1	3	3.04	0.34	11.07
722850TF1	2	2.90	0.33	11.46
722850TF1R	2	3.05	0.31	10.10
722850TF2	3	9.02	0.94	10.38
722868TF1	3	0.59	0.05	8.66
722868TF2	3	1.06	0.09	8.87
722876TD1	3	0.45	0.23	50.68
722876TD1	2	0.40	0.04	9.97
722876TD1R	2	0.39	0.04	9.56
722876TD2	3	1.13	0.11	9.76
722876TF1	3	0.43	0.08	17.73
722876TF2	3	1.08	0.10	8.83
722884TF1	3	7.08	1.28	18.12
722884TF2	3	7.85	0.79	10.04
722892TF1	3	1.56	0.14	9.23
722892TF2	3	5.31	0.48	9.11
722900TF1	2	1.70	0.17	9.77
722900TF2	2	4.41	1.22	27.62
722918TF1	3	0.74	0.10	13.64
722918TF1	2	0.77	0.07	9.52
722918TF1R	2	0.82	0.08	9.61
722918TF2	3	1.47	2.64	179.66
722918TF2	2	1.25	0.11	9.17
722918TF2R	2	1.30	0.14	10.67
722926TF1	3	2.99	0.49	16.38
722926TF2	3	2.07	0.26	12.55
722934TF1	3	2.80	0.46	16.56
722934TF1	2	2.55	0.30	11.72
722934TF1R	2	2.58	0.30	11.62
722934TF2	3	2.71	0.30	10.95
722934TF2	2	2.68	0.25	9.47
722934TF2R	2	2.54	0.25	9.83

RTI TEAM-LA STANDARD AND BLANK CONTROLS

RTI ID	CATS ID	PICOLITERS PMCH ACT.	PMCH ANAL.	PDCH ACT.	PDCH ANAL.	PMCP ACT.	PMCP ANAL.	FILE+ TUBE #
TC1	6418	4.738	5.174	4.850	4.852	4.510	4.650	6837A6
TC2	589	1.426	1.640	1.460	1.591	1.358	1.390	6839A16
TC3	455	0.477	0.554	0.488	0.549	0.454	0.441	6839A17
TC4	3371	4.738	5.107	4.850	4.007	4.510	4.958	6845A10
TC5	3204	1.426	1.629	1.460	1.372	1.358	1.396	6845A12
TC6	8282	0.477	0.405	0.488	0.253	0.454	0.401	6849A20
TC7	9846	4.738	5.455	4.850	4.426	4.510	5.042	6851A7
TC8	6185	1.426	1.598	1.460	1.312	1.358	1.396	6851A8
TC9	11016	0.477	0.521	0.488	0.489	0.454	0.472	6853A17
TB1	11388		0.000		0.000		0.000	6837A4
TB2	10690		0.052		0.204		0.571	6837A5
TB3	10429		0.000		0.001		0.002	6839A18
TB4	9021		0.007		0.006		0.002	6845A11
TB5	8204		0.000		0.002		0.003	6845A13
TB6	1615		0.000		0.001		0.034	6845A14
TB7	9691		0.003		0.003		0.003	6853A16
TB8	6099		0.004		0.000		0.002	6849A19
TB9	10056		0.001		0.000		0.003	6849A21
TB10	9602		0.004		0.002		0.002	6851A9
TB11	9575		0.001		0.000		0.002	6852A17
TB12	2085		0.000		0.000		0.001	6853A18

Controls % Diff

PMCH	PDCH	PMCP
+ 9	0	+ 3
+ 15	+ 9	+ 2
+ 16	+ 12	- 3
+ 8	- 17	+ 16
+ 14	- 6	+ 3
- 15	- 48	- 12
+ 15	- 9	+ 12
+ 12	- 10	+ 3
+ 9	0	+ 4
Mean of absolute %diff. ± s.d.	+9.2% ± 9.6	-7.7% ± 18	+2.4% ± 7.0

MEMORANDUM

TO: Doris Smith

FROM: Kent Thomas

DATE: 4/6/88

SUBJECT: TEAM California 1987 air exchange QC. QA information.

There is some information which we can use to evaluate the quality of the air exchange data for TEAM California during the winter and summer season of 1987. However. we will have to take much of the information at face value. Blank and control tubes were prepared and carried to the field during both seasons: the background contamination appears to be insignificant and the recovery from controls appears to be acceptable for the winter season and good for the summer season. A standard deviation is calculated for each air exchange calculation using assumed errors in house volume measurement. tracer emission rates. and measured tracer concentration differences when more than one collection tube is used in each house. The sample data cover letters describe possible errors in collection. analysis and explanations of why and how house zones were evaluated and treated.

I can only check BNL's calculations for one zone cases. I have done this earlier for two or three calculations and they were correct. I do not have the mathematical model information for calculating multi-compartment mass balance silmultaneous equtions which are used for the multi-zone cases. We have no test for the overall accuracy of BNL's air exchange measurements. There were no methods which were easily available for measuring the air exchange rates during this type of study and there are no other labs available for analyzing PFT tracer collection tubes.

Post Office Box 12194 Research Triangle Park, North Carolina 27709 Telephone: 919 541-6000

There are two other concerns which I have about the quality of the air exchange data. First, we sampled in several apartments during both seasons. During the winter season we analyzed samples for only one apartment and did not analyze the samples for 6 other apartments. During the summer season we analyzed samples for all of the apartments. The problem with measuring air exchange rates in apartments and then calculating source strengths based upon measured concentration indoors and outdoors is that the source of the pollutant may be in another apartment. We did not measure air exchange between apartments nor did we measure pollutant concentrations in apartments other than the respondent's. Therefore, the source strength information may be suspect and the questionnaire data does not include sources in other apartments. For the apartments which we did determine air rates multi-zone determinations were made and it was decided that the inter-zone mixing within the apartment was useful information to have. However, this inter-zone mixing data will not be used by RTI for the source strength calculations.

A second potential problem with the data should be noted for the summer season. During this season many or most of the respondents had their windows open and there were often strong breezes blowing through the homes. It is very difficult to perform accurate air exchange measurements under these conditions using any method. The data reported by BNL was actually better than I expected in terms of standard deviations for overall air exchange. There is nothing we can do about this problem but it is worth noting.

TEAM AIR EXCHANGE DATA

EXPLANATION OF BNL DATA FILES HEADER CODES

HOUSE ID	:RTI sample code and sampling period
START TIME	:Time air exchange measurement begins
STOP TIME	:Time air exchange measurement ends
HOURS	:Duration of air exchange measurement
ZONE ID	:Description of zones within a home being sampled
TRACER	:Type of chemical tracer used in each zone
VOLUME	:Volume of zones being measured in cubic meters or cubic feet
SOURCE	:Total rate of tracer emission in nL/hour
C12	:Concentration of the tracer compound released in Zone1 as measured in Zone2 in pL/L
ZONE INFILT	:Infiltration rate of outdoor air into a zone in cubic meters/hour
ZONE EXFILT	:Exfiltration rate of indoor air to the outdoors in cubic meters/hour
R12	:Rate of air flow from Zone1 to Zone2 in cubic meters/hour
ZONE ACH	:Air exhange rate for a particular zone
TOTAL HSE RATE	:Overall infiltration rate of outdoor air into the house in cubic meters/hour for the
TOTAL HSE ACH	:Overall air exchange rate for the whole house in air changes/hour

SINGLE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

HOUSE ID	START TIME	START DATE	STOP TIME	STOP DATE	HOURS	TRACER	ft^3 VOLUME	ZONE TEMP.	NO. SOURCES	SOURCE RATE	NO. CATS	AVG. CONC	TOT.RATE	ACHT	STANDARD DEVIATION --> VOLUME	SRCE RATE	CONC.	TOT.RATE	ACHT
722827TF1		07-16-1987		07-17-1987										0.69					0.26
722827TF2	07:46	07-17-1987	17:44	07-17-1987	10	PMCH	2520	73	2	2681	3	75.3	35.6	0.5	5	10	38.65	18.6	0.26

TWO ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

HOUSE ID	TIME	DATE	TIME	DATE	HOURS	ZONE 1 ID	TRACER	m^3 VOLUME	RATE	C11	C21	ZONE 2 ID	TRACER	m^3 VOLUME	RATE	C12	C22	INFIL-1	EXFILT-1	INFIL-2	EXFILT-2	R11
722520TF2	07:45	07-10-1987	17:49	07-10-1987	10	LIVING	PMCH	90	2624	14.4	9.4	BEDROOM	acPDCH	62	2684	6.3	16.6	105.1	148.4	121.5	78.2	241.9
722678TF1	19:20	07-12-1987	06:20	07-13-1987	11	LIV/BED	PMCH	184	4109	28.3	15.1	KITCHEN	PMCP	49	3732	24.1	22.5	111.8	8.1	57.1	160.8	342.2
722702TF1	19:22	07-13-1987	08:47	07-14-1987	13	LIVING	PMCH	79	3178	32.9	43.7	KIT/BED	PMCP	148	4329	23.7	27	362.1	114.2	-272.4	-24.5	-586.5
722900TF1	20:20	07-18-1987	09:40	07-19-1987	13	LIVING	PMCH	51	2859	21.9	14.3	BEDROOM	PMCP	44	3895	14.5	32.6	103.4	72.7	56.8	87.4	184.4
722900TF2	09:43	07-19-1987	17:39	07-19-1987	8	LIVING	PMCH	51	3453	12.4	14.1	BEDROOM	PMCP	44	4705	4.8	8.9	-411.3	192.8	828	223.9	711.6
722538TF1	19:16		08:25		13	LIV/BED	PMCH	144	5345	58.5	31.3	KITCHEN	PMCP	35	4329	47	102.7	84.1	76.1	11	18.9	121
722579TF1	20:55		10:20		13	LIV/KIT	acPDCH	296	8224	43.5	17.6	BEDROOM	PMCP	230	6703	7.7	34.3	100.8	169.7	177	108.2	207.8
722546TF2	07:38		17:34		10	LIV/KIT	PMCH	187	8184	23.4	6.1	BEDROOM	PMCP	75	1950	21.2	9.7	299.4	391	45.1	-46.4	814.4
722579TD1	20:55		10:20		13	LIV/KIT	acPDCH	296	8224	40.6	16.7	BEDROOM	PMCP	230	6703	8.9	38.4	126.6	181.7	150.8	95.7	223.9
722603TF1	19:26		08:27		13	LIV/BED	PMCH	124	4913	16	9.2	KITCHEN	PMCP	27	3979	9.5	14.3	175.3	229.4	184.3	130.3	494.8
722587TF1	20:45		07:40		11	LIV/KIT	PMCH	152	7510	39.2	11.1	BEDROOM	PMCP	128	3579	20.4	17.2	102.1	125.3	150.6	127.4	289
722587TF2	07:42		17:43		10	LIV/KIT	PMCH	152	7191	16.8	5.5	BEDROOM	PMCP	128	3427	11.8	17.1	373.7	370.7	77.4	80.4	553.2
722603TF2	08:28		16:11		8	LIV/BED	PMCH	124	4608	11.9	7.5	KITCHEN	PMCP	27	3732	10.2	10.3	279.5	201.9	138.2	215.8	1033.7
722702TF2	08:50		16:06		7	LIV/KIT	PMCH	98	7827	20.2	4.2	BEDROOM	PMCP	129	3389	8.1	5.4	125.6	199.4	541.2	467.4	562.2
722744TF1	19:18		08:27		13	LIV/KIT	PMCH	145	7048	28.7	7.8	BEDROOM	PMCP	192	4069	11.6	11.7	112.5	143.5	284	253.1	336.8
722744TF2	08:22		16:13		8	LIV/KIT	PMCH	255	6759	8.7	3.5	BEDROOM	PMCP	82	3895	7.3	4.3	458.6	45.9	464.7	877.4	2438.6
722769TF1	20:43		07:32		11	LIV/KIT	PMCH	322	6203	45.1	3.4	BEDROOM	acPDCH	273	5362	27.1	13.9	121.8	-111	181	413.8	161
722769TF2	07:35		17:55		10	LIV/KIT	PMCH	322	5939	41.8	4.7	BEDROOM	acPDCH	273	5362	12.7	8.7	77.2	-56.2	516.5	650	170.7
722777TF1	18:48		06:16		11	LIV/KIT	PMCH	95	6334	22.2	4.4	BEDROOM	PMCP	76	2743	6.8	4	-41.4	116.8	710.7	552.6	427.8
722777TD1	19:07		06:16		11	LIV/KIT	PMCH	95	6334	21.4	4.4	BEDROOM	PMCP	76	2743	7.2	4.2	-15.4	116.7	661.9	529.8	453.6
722777TF2	06:23		16:31		10	LIV/KIT	PMCH	95	6472	12.8	2.6	BEDROOM	PMCP	76	2802	3.7	3.5	174.5	347.8	711.1	537.8	638.4
722777TD2	06:23		16:31		10	LIV/KIT	PMCH	95	6472	12.9	2.7	BEDROOM	PMCP	76	2802	3.6	3.4	128.9	345.4	771.2	554.7	646
722843TF2	08:45		16:10		7	LIV/KIT	PMCH	249	7039	1.9	1.9	BEDROOM	acPDCH	44	3349	1.2	13.9	3555.2	3961.8	93.1	-313.5	4134.3
722918TF1	19:10		06:03		11	LIV/KIT	PMCH	112	7841	67	10.9	BEDROOM	PMCP	89	2802	24.7	24.6	77.8	89.9	85.9	73.8	140
722918TF2	06:03		16:00		10	LIV/KIT	PMCH	112	7191	35.5	2.9	BEDROOM	PMCP	89	2570	12.4	22.8	184.9	170.9	76.8	90.7	212.2
722934TF1	19:20		08:36		13	LIV/KIT	PMCH	224	7841	24	2.3	BEDROOM	PMCP	103	2802	2.4	3.8	136.1	268.4	705.8	573.5	347.9
722934TF2	08:36		16:12		8	LIV/KIT	PMCH	224	7674	12.3	1.5	BEDROOM	PMCP	103	2802	7	4.7	516.7	348.4	314.2	482.6	766.8
722561TF2																						

TWO ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

ACH1	R12	R21	R22	ACH2	TOTAL RATE	ACHT	STANDARD DEVIATION VOL1	SOURCE1	--> C11	C21	VOL2	SOURCE2	C12	C22	INFILT1	EXFILT1	INFILT2	EXFILT2	R11	ACH1	R12	R21	R22
2.68	93.5	136.9	215	3.49	226.6	1.49	5	10	1.44	0.94	5	10	0.63	1.66	23	33.5	21.9	31.8	42.4	0.69	23.6	34.6	37.7
1.86	334.1	230.4	391.2	7.94	168.9	0.73	5	10	7.53	0.28	5	10	2.41	2.25	73.1	66.3	74.6	63.1	227.2	1.24	239.7	159.5	181.2
-7.43	-700.7	-948.6	-973.1	-6.57	89.7	0.39	5	10	3.29	4.37	5	10	0.34	2.5	315.1	140.7	363	209.4	673.1	8.53	768.2	982.8	1124.9
3.62	111.7	81	168.5	3.87	160.2	1.7	5	10	2.19	1.43	5	10	1.45	3.26	19.2	26.7	16.1	23.6	34.5	0.7	29.8	21.6	31.5
13.97	518.8	1122.9	1346.8	30.9	416.7	4.41	5	10	1.24	1.41	5	10	0.48	0.89	280.6	109.7	282.2	217.4	273	5.4	248.4	537.5	516.6
0.84	44.9	36.9	55.9	1.62	95	0.53	5	10	5.85	3.13	5	10	4.7	10.27	14.3	16.8	6.1	8.4	21.2	0.15	11.3	9.3	9.8
0.7	38.1	107	215.1	0.94	277.9	0.53	5	10	4.35	1.76	5	10	0.77	3.43	20.3	28.4	26.5	30.1	31.1	0.11	8.2	23	32.2
4.36	423.5	515	468.6	6.27	344.6	1.32	5	10	2.34	0.61	5	10	2.12	0.97	87.4	140.2	53	108	279.5	1.51	185.1	225.2	160.8
0.76	42.2	97.3	193	0.84	277.4	0.53	5	10	4.06	1.67	5	10	0.89	3.84	22.3	30.6	22.8	27.1	33.6	0.12	9.1	21	29
3.99	265.4	319.5	449.7	16.55	359.6	2.38	5	10	1.6	0.92	5	10	0.95	1.43	46.1	70.9	42.6	68.5	107.8	0.89	80.5	96.9	98
1.9	163.7	186.9	314.3	2.46	252.7	0.9	5	10	3.92	1.11	5	10	2.04	1.72	27.1	41.2	30.9	45.2	58.1	0.39	46.5	53.1	63.2
3.63	182.5	179.5	259.9	2.03	451.1	1.61	5	10	1.68	0.55	5	10	1.18	1.71	62.9	77	26	40	94.8	0.65	45.1	44.4	44.5
8.34	831.9	754.3	970.1	35.71	417.7	2.76	5	10	1.19	0.75	5	10	1.02	1.03	100.9	162.9	96.5	151.1	420.2	3.42	417.6	378.7	394.3
5.76	362.9	436.7	904.1	6.98	666.8	2.94	5	10	2.02	0.42	5	10	0.81	0.54	58.4	83	100	127.1	108.5	1.15	99.6	119.9	174.5
2.32	193.3	224.2	477.3	2.48	396.5	1.18	5	10	2.87	0.78	5	10	1.16	1.17	32.4	48.1	50.8	66.4	61	0.44	50.3	58.3	86.5
9.55	2392.7	1980.1	2857.5	34.94	923.3	2.74	5	10	0.87	0.35	5	10	0.73	0.43	228.8	471.6	269.3	480.6	1202	4.73	1411.3	1167.9	1408.5
0.5	271.9	39.1	453	1.66	302.9	0.51	5	10	4.51	0.34	5	10	2.71	1.39	19.1	53.5	44.1	67	25.2	0.08	61.7	8.9	71
0.53	227	93.5	743.5	2.72	593.8	1	5	10	4.18	0.47	5	10	1.27	0.87	16.4	44.6	83.2	109.1	27.3	0.09	52.6	21.7	119
4.53	311.1	469.2	1021.8	13.47	669.3	3.93	5	10	2.22	0.44	5	10	0.68	0.4	69.7	66.5	133.2	145	85.7	0.93	88.1	132.8	204.6
4.8	336.9	469	998.8	13.17	646.5	3.79	5	10	2.14	0.44	5	10	0.72	0.42	67.5	71.1	126.4	142.4	93.2	1.01	97.4	135.6	205.1
6.75	290.6	463.9	1001.7	13.21	685.6	5.2	5	10	1.28	0.26	5	10	0.37	0.35	65.6	67.9	117.2	138.2	107.2	1.18	70.5	112.6	168.2
6.83	300.7	517.2	1071.9	14.13	900.1	5.28	5	10	1.29	0.27	5	10	0.36	0.34	71.1	89.3	128.3	148.6	110.3	1.22	74.1	127.4	183
16.62	172.5	579.1	265.7	6.02	3648.3	12.46	5	10	9.91	1.91	5	10	7.22	2.89	17.2	28.5	17.8	28.3	49.6	0.26	50.3	43.7	51.7
1.25	50.1	62.2	136	1.54	163.7	0.82	5	10	3.55	0.29	5	10	1.24	2.28	26.9	28.5	12.3	15.7	30.8	0.29	8.5	5.7	17.1
1.89	41.2	27.3	118	1.33	261.7	1.3	5	10	2.4	0.23	5	10	0.24	0.38	34.9	46.6	103.4	104.7	51	0.24	16.7	44.5	115.1
1.55	79.4	211.8	785.3	7.64	841.9	2.58	5	10	1.23	0.15	5	10	0.7	0.47	84.8	108.7	70.2	100.1	125.2	0.58	98.9	59.1	119.7
3.42	418.5	250.1	732.7	7.13	831	2.54	5	10	16.39	2.1	5	10	10.15	6.37	5.5	7.6	5.3	7.7	8.3	0.12	8.2	3.9	9.2
						1.49																	

TWO ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

ACH2	TOT.RATE	ACHT	FOOTNOTES
0.64	20.2	0.14	4
3.7	17.4	0.08	5
7.6	69.9	0.31	4
0.75	14.6	0.17	5
11.95	114.1	1.22	5
0.29	11.1	0.07	4
0.15	25.6	0.05	4
2.18	45.7	0.18	4
0.13	25.2	0.05	4
3.7	31.8	0.23	4
0.51	22.5	0.09	4
0.36	50.6	0.19	4
14.62	38.2	0.28	4
1.39	70.7	0.33	4
0.47	38.5	0.12	4
17.31	90.1	0.29	4
0.27	37.9	0.07	4
0.46	76.2	0.13	4
2.78	92.7	0.56	4
2.78	86.3	0.52	4
2.31	91.6	0.57	4
2.51	97.5	0.6	4
0.55	10	0.04	4
0.2	26.3	0.14	4
1.18	92.5	0.3	4
1.22	75.5	0.25	4
0.12	5	0.04	4
		0.14	9

THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

HOUSE ID	START TIME	START DATE	STOP TIME	STOP DATE	HOURS	ZONE 1 ID	TRACER	ft^3 VOLUME	TEMP	SOURCE NO.	RATE	NO. CATS	C11	C21	C31	ZONE 2 ID	TRACER	ft^3 VOLUME	TEMP.	SOURCE NO.	RATE	NO. CATS
722512TF1	19:10	07-08-1987	08:35	07-09-1987	13	LIVING	PHCH	6750	71	2	2567	1	7.3	5.1	2.6	KITCHEN	PHCP	1190	71	2	3498	1
722512TF2	08:38	07-09-1987	16:11	07-09-1987	8	LIVING	PHCH	6750	72	2	2624	1	5.9	4.5	4.5	KITCHEN	PHCP	1190	72	2	3575	1
722520TF1	19:20	07-09-1987	07:42	07-10-1987	12	LIVING	PHCH	3190	75	2	2799	1	12	13.1	10.8	KITCHEN	PHCP	2600	75	3	5720	1
722536TF2	08:27	07-09-1987	16:13	07-09-1987	8	LIVING	PHCH	2830	79	2	3047	1	8.2	4.5	3.4	KITCHEN	PHCP	1220	79	2	4151	1
722546TF1	20:25	07-08-1987	07:36	07-09-1987	11	LIVING	PHCH	5475	75	3	4198	1	23.8	16.2	5.4	KITCHEN	PHCP	1120	75	2	3813	1
722553TF1	19:40	07-09-1987	09:04	07-10-1987	13	LIVING	acPOCH	10717	74	5	4671	1	19.3	9.7	5.4	KITCHEN	PHCP	984	74	2	3732	1
722553TF2	09:18	07-10-1987	16:10	07-10-1987	7	LIVING	acPOCH	10717	73	5	4571	1	12.5	8.9	4.6	KITCHEN	PHCP	984	73	2	3653	1
722579TF2	10:25	07-10-1987	17:38	07-10-1987	7	LIVING	acPOCH	7278	72	5	4474	1	6.1	4.7	4.2	KITCHEN	PHCP	3200	72	2	3575	1
722579T02	10:25	07-10-1987	17:38	07-10-1987	7	LIVING	acPOCH	7278	72	5	4474	1	5.4	4.8	4.9	KITCHEN	PHCP	3200	72	2	3575	1
722595TF1	20:55	07-10-1987	07:25	07-11-1987	11	LIVING	PHCH	3670	77	2	2921	1	7.9	7.2	6.8	KITCHEN	PHCP	2520	77	2	3979	1
722595TF2	07:27	07-11-1987	17:38	07-11-1987	10	LIVING	PHCH	3670	73	2	2681	1	3	1.9	2.1	KITCHEN	PHCP	2520	73	2	3653	1
722611TF1	19:20	07-10-1987	09:03	07-11-1987	14	LIVING	PHCH	2560	70	3	3768	1	8.2	8.1	2.5	KITCHEN	PHCP	2160	70	3	5134	1
722611TF2	09:05	07-11-1987	16:12	07-11-1987	7	LIVING	PHCH	2560	71	3	3851	1	6	2.3	2.6	KITCHEN	PHCP	2160	70	3	5134	1
722629TF1	19:10	07-11-1987	08:52	07-12-1987	14	LIVING	PHCH	1260	75	2	2799	1	1005.6	28.1	8.1	KITCHEN	PHCP	1000	75	2	3813	1
722629TF2	08:52	07-12-1987	16:10	07-12-1987	7	LIVING	PHCH	1260	77	2	2921	1	67.1	13.5	5.6	KITCHEN	PHCP	1000	77	2	3979	1
722637TF1	20:55	07-11-1987	07:42	07-12-1987	11	LIVING	PHCH	2144	71	2	2567	1	12.6	16.2	14.6	KITCHEN	PHCP	2390	71	2	3498	1
722637TF2	07:43	07-12-1987	17:48	07-12-1987	10	LIVING	PHCH	2144	76	2	2859	1	8.8	12.3	13.8	KITCHEN	PHCP	2390	76	2	3895	1
722645TF1	19:16	07-11-1987	08:49	07-12-1987	14	LIVING	PHCH	1600	74	2	2739	1	822	8	7.7	KITCHEN	PHCP	1220	74	2	3732	1
722645TF2	08:52	07-12-1987	16:08	07-12-1987	7	LIVING	PHCH	1600	76	2	2859	1	1372.6	3.9	5.5	KITCHEN	PHCP	1220	76	2	3895	1
722652TF1	20:50	07-11-1987	07:45	07-12-1987	11	LIVING	PHCH	2660	79	2	3047	1	7.6	5.5	2.4	KITCHEN	PHCP	960	79	2	4151	1
722652T01	20:50	07-11-1987	07:45	07-12-1987	11	LIVING	PHCH	2660	79	2	3047	1	7.3	5.7	2.5	KITCHEN	PHCP	960	79	2	4151	1
722652TF2	07:48	07-12-1987	17:34	07-12-1987	10	LIVING	PHCH	2660	79	2	3047	1	2	1	0.6	KITCHEN	PHCP	960	78	2	4044	1
722652T02	07:48	07-12-1987	17:34	07-12-1987	10	LIVING	PHCH	2660	72	2	2624	1	2.1	1	0.6	KITCHEN	PHCP	960	78	2	4044	1
722660TF1	20:37	07-12-1987	10:13	07-13-1987	14	LIVING	PHCH	10580	72	4	5248	1	20.5	10.3	2.7	KITCHEN	PHCP	1830	72	2	3575	1
722660TF2	10:15	07-13-1987	16:48	07-13-1987	6	LIVING	PHCH	10580	75	4	5598	1	10.1	4.2	0.9	KITCHEN	PHCP	1830	75	2	3813	1
722678TF2	06:25	07-13-1987	16:25	07-13-1987	10	LIVING	PHCH	3466	76	3	4289	1	18.5	18.6	8.4	KITCHEN	PHCP	1740	76	2	3895	1
722686TF1	20:52	07-12-1987	07:20	07-13-1987	10	LIVING	PHCH	1260	77	2	2921	1	31.4	8.4	1.4	KITCHEN	PHCP	1970	77	2	3979	1
722686TF2	07:22	07-13-1987	17:49	07-13-1987	10	LIVING	PHCH	1260	73	2	2681	1	20.9	2.4	1.5	KITCHEN	PHCP	1970	73	2	3653	1
722694TF1	20:42	07-13-1987	08:50	07-14-1987	12	LIVING	PHCH	2560	72	2	2624	1	13.1	16.3	8.6	KITCHEN	PHCP	1400	72	2	3575	1
722694TF2	08:50	07-14-1987	16:05	07-14-1987	7	LIVING	PHCH	2560	72	2	2624	1	4.2	6.7	4.7	KITCHEN	PHCP	1400	72	2	3575	1
722710TF1	19:35	07-14-1987	09:16	07-15-1987	14	LIVING	PHCH	3220	78	2	2512	1	7.6	8.8	3.1	KITCHEN	PHCP	2710	78	2	3423	1
722710TF2	09:28	07-15-1987	17:00	07-15-1987	8	LIVING	PHCH	3220	72	2	2624	1	11.2	4.5	3.8	KITCHEN	PHCP	2710	72	2	3575	1
722728TF1	20:13	07-13-1987	08:51	07-14-1987	13	LIVING	PHCH	1800	80	2	3112	1	16.5	18.3	7.3	KITCHEN	PHCP	870	82	2	4421	1
722728TF2	07:54	07-14-1987	17:42	07-14-1987	10	LIVING	PHCH	1800	80	2	3112	1	3.2	2.2	2.2	KITCHEN	PHCP	870	82	2	4421	1
722736TF1	20:19	07-14-1987	07:44	07-15-1987	11	LIVING	PHCH	2540	73	2	2681	1	28.5	18.5	4.2	KITCHEN	PHCP	660	73	2	3653	1
722736TF2	07:48	07-15-1987	17:45	07-15-1987	10	LIVING	PHCH	2540	78	2	2983	1	17.3	10.5	3.7	KITCHEN	PHCP	660	78	2	4044	1
722751TF1	20:50	07-14-1987	07:34	07-15-1987	11	LIVING	PHCH	2430	78	3	4475	1	58	45.1	11.8	KITCHEN	PHCP	1330	78	2	4064	1
722751TF2	07:36	07-15-1987	17:30	07-15-1987	10	LIVING	PHCH	2430	76	3	4289	1	18.7	3.3	6.7	KITCHEN	PHCP	1330	76	2	3895	1
722785TF1	20:15	07-15-1987	06:05	07-16-1987	10	LIVING	PHCH	1470	74	2	2739	1	71.6	105.2	24.9	KITCHEN	PHCP	1060	74	2	3732	1
722835TF1	19:21	07-16-1987	08:45	07-17-1987	13	LIVING	PHCH	2497	71	2	2567	1	12.7	7.2	3.3	KITCHEN	PHCP	1660	71	2	3498	1
722835TF2	08:47	07-17-1987	16:10	07-17-1987	7	LIVING	PHCH	2497	73	2	2681	1	5.4	2.6	1.2	KITCHEN	PHCP	1660	73	2	3653	1
722843TF1	19:42	07-17-1987	08:40	07-18-1987	13	LIVING	PHCH	3550	71	3	3851	1	11.2	6.3	12.5	KITCHEN	acPOCH	5240	71	4	3502	1
722850TF1	18:30	07-17-1987	10:05	07-18-1987	16	LIVING	PHCH	1600	72	2	2624	1	6.5	5.3	4.1	KITCHEN	PHCP	1950	72	2	3575	1
722850TF2	10:05	07-18-1987	17:21	07-18-1987	7	LIVING	PHCH	1600	73	2	2681	1	3.9	2.1	1.5	KITCHEN	PHCP	1950	73	2	3653	1
722868TF1	20:25	07-17-1987	08:06	07-18-1987	12	LIVING	PHCH	3050	72	2	2624	1	37.5	22.1	14.1	KITCHEN	PHCP	1290	72	2	3575	1
722868TF2	08:08	07-18-1987	17:47	07-18-1987	10	LIVING	PHCH	3050	75	2	2799	1	12.7	12	7.3	KITCHEN	PHCP	1290	75	2	3813	1
722876TF1	19:17	07-17-1987	08:47	07-18-1987	14	LIVING	PHCH	6150	75	4	5598	1	73.8	38.3	20.3	KITCHEN	PHCP	750	75	2	3813	1
722876TF2	08:49	07-18-1987	16:16	07-18-1987	7	LIVING	PHCH	6150	76	4	5719	1	22.8	10.3	5.8	KITCHEN	PHCP	750	76	2	3895	1
722876T01	19:17	07-17-1987	08:47	07-18-1987	14	LIVING	PHCH	6150	75	4	5598	1	64.1	36.8	19.2	KITCHEN	PHCP	750	75	2	3813	1
722876T02	08:49	07-18-1987	16:16	07-18-1987	7	LIVING	PHCH	6150	76	4	5719	1	22.6	10.3	6.2	KITCHEN	PHCP	750	76	2	3895	1
722884TF1	20:35	07-18-1987	07:15	07-19-1987	11	LIVING	PHCH	3370	68	2	2405	1	1.8	0.6	0.1	KITCHEN	PHCP	2370	68	2	3276	1
722884TF2	07:15	07-19-1987	17:22	07-19-1987	10	LIVING	PHCH	3370	78	2	2512	1	2.5	0.6	0.6	KITCHEN	PHCP	2370	78	2	3423	1
722892TF1	19:21	07-18-1987	08:49	07-19-1987	13	LIVING	PHCH	1700	76	2	2859	1	10.4	7.5	4.9	KITCHEN	PHCP	2010	76	2	3895	1
722892TF2	08:51	07-19-1987	16:18	07-19-1987	7	LIVING	PHCH	1700	76	2	2859	1	2.7	1.1	1	KITCHEN	PHCP	2010	76	2	3895	1
722926TF1	20:16	07-19-1987	07:35	07-20-1987	11	LIVING	acPOCH	4720	70	4	3427	1	2.7	3.9	0.4	KITCHEN	PHCP	520	70	2	3423	1
722926TF2	07:35	07-20-1987	17:03	07-20-1987	10	LIVING	acPOCH	4720	72	4	3579	1	4.4	5.7	1.8	KITCHEN	PHCP	520	72	2	3575	1
722785TF2	06:05	07-16-1987	17:05	07-16-1987		LIVING										KITCHEN						
722801TF1	20:35	07-16-1987	07:31	07-17-1987		LIVING										KITCHEN						
722801TF2	07:31	07-17-1987	20:25	07-17-1987		LIVING										KITCHEN						
722819TF1	19:18	07-16-1987	08:54	07-17-1987		LIVING										KITCHEN						
722819TF2	08:59	07-17-1987	17:05	07-17-1987		LIVING										KITCHEN						
722561TF1																						
722793TF1																						
722793TF2																						

THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

C12	C22	C23	ZONE 3 ID	TRACER	ft^3 VOLUME	TEMP.	SOURCE NO.	RATE	NO. CATS	C13	C23	C33	ZONE 1 INFILT.	ZONE 1 EXFILT.	ZONE 2 INFILT.	ZONE 2 EXFILT.	ZONE 3 INFILT.	ZONE 3 EXFILT.	R11	ZONE 1 ACH	R12	R21	R13
5.5	9.2	1.2	BEDROOM	acPOCH	3600	71	3	2627	4	3.6	2.2	4.4	84.3	-230.6	233.2	353.3	435.9	630.7	803.9	5.98	576.4	351.9	458.1
5.7	7	3.4	BEDROOM	acPOCH	3600	72	3	2684	1	3.7	3.4	6.1	134.9	-266.7	175.8	505.5	282	353.8	1459.6	10.66	1421.9	553.7	304.3
5.1	23.8	5.2	BEDROOM	acPOCH	2160	75	3	2863	1	8.3	5.5	28.1	87.1	160.5	176.5	148.9	58.5	12.7	394.5	4.37	127.4	191.1	106.6
5.7	30.9	6.1	BEDROOM	acPOCH	2270	79	2	2078	1	7.3	5.5	11.2	337.8	239.4	42.9	85.7	25.3	80.8	533.3	6.66	75.8	51.5	218
15.8	19.1	3.7	BEDROOM	acPOCH	2640	75	2	1909	1	20.7	12	16.2	43.8	16.8	153.1	133.9	35.5	81.6	487.8	3.15	299.8	363.4	171.2
11.7	149.8	1	BEDROOM	PMCH	4650	74	3	4109	1	9.9	6.2	10.1	145.7	40.9	14.2	6.6	272.9	385.6	346.8	1.14	28	14.7	286
15.7	114.8	1.6	BEDROOM	PMCH	4650	73	3	4022	1	8.5	6.7	7.7	245.1	-1.8	1.4	18.5	285	522.8	690.5	2.28	68	37	624.4
5.3	7.8	4.6	BEDROOM	PMCH	8130	72	5	6559	1	1.8	1.3	10.2	434.6	560.9	57.8	42.9	514.6	387.2	1412	7.84	798.5	936.7	232.6
6.5	8.3	5.7	BEDROOM	PMCH	8130	72	5	6559	1	1.8	1.3	12.6	875.1	900.1	-257.4	-123	383.7	224.4	2870.2	13.95	1677.9	1598.6	292.2
4.9	14.6	11	BEDROOM	acPOCH	6500	77	4	3984	1	5	11.4	11.8	239.8	246.3	45.3	-18.6	156	205.3	562.8	5.61	68.9	91.3	287.6
8.7	2.5	2.4	BEDROOM	acPOCH	6500	73	4	3657	4	8.5	1.2	4.4	221.3	668.8	833.4	975	560.6	-28.4	1109.3	10.68	397.2	787.8	63.4
3.6	7.7	1.2	BEDROOM	acPOCH	1700	78	2	1713	1	13.7	4.2	11.1	-123.5	119	478	500.6	137.3	72.1	1249.2	17.24	494.1	1228	636.2
4.5	4.4	1.7	BEDROOM	acPOCH	1700	71	2	1751	1	2.4	1.2	3.5	82.6	-446.7	587.6	1354.4	408.7	171.2	1314.9	18.15	1515.6	503.3	244.1
12.9	53.1	4	BEDROOM	acPOCH	4420	75	3	2863	1	5.7	4.9	4.9	-2	-0.7	14.7	19.8	577.5	571.1	2.8	0.06	8.6	8.7	2.9
5	22.7	1.9	BEDROOM	acPOCH	4420	77	3	2988	1	7.6	8.8	9.2	3.7	4.1	150.5	52	213.9	311.9	47.8	1.34	10.8	18.6	32.9
16.3	23.8	12.8	BEDROOM	acPOCH	6660	71	5	4378	1	1.5	1.3	14.1	-234.6	52.4	227.8	102.3	326	142.5	2518.9	41.51	2271.8	1658.5	194.7
7.1	13.4	8	BEDROOM	acPOCH	6660	76	5	4875	1	7	9.8	17.6	-139.1	309.8	320.4	-27.3	147	45.8	2144.4	35.38	1281.9	1183.8	554.8
23.6	35.3	4.6	BEDROOM	acPOCH	4340	74	4	3737	1	2	8.7	20.4	2.1	8	80.5	102.4	180	140.2	3.3	0.07	3	8	0.3
6.8	3.9	1	BEDROOM	acPOCH	4340	74	4	3900	1	3.5	1.9	6.7	-0.8	-3	917.8	775.9	326.7	470.7	2.1	0.05	5	1.4	0.1
4.2	6.7	3.5	BEDROOM	acPOCH	3256	79	3	3117	1	1	8.5	7.8	177.6	91	214.5	535.8	365.5	132.7	744.5	10.18	604.8	635.4	68.7
3.7	6.8	3.2	BEDROOM	acPOCH	3256	79	3	3117	1	8.6	8.6	7.9	126.8	180.8	287.8	446.1	371	158.7	717.6	9.53	509.7	600.6	27.1
1.4	3.2	1.2	BEDROOM	acPOCH	3256	72	3	2684	1	8.8	1	1.8	1174.7	659.9	-24.6	844.9	1020.1	663.6	2036.5	27.08	944.5	511.7	432.1
1.4	3.2	1.5	BEDROOM	acPOCH	3256	72	3	2684	1	8.7	1	1.9	1023.4	457.9	-167.4	952.6	1087.1	532.6	1630.6	21.66	907	451.2	265.7
19.7	15.3	3.4	BEDROOM	acPOCH	4220	72	4	3579	1	2.3	1.5	7.2	198.8	68.5	-41.5	147.8	442.4	403.4	720.8	2.41	422.5	479.7	29.7
5.9	18.1	8.9	BEDROOM	acPOCH	4220	88	4	4245	1	2.6	1.3	2.8	315.7	89.1	155.6	156.9	1207.4	1432.6	774.2	2.59	273.3	301.8	411.8
14.6	11.6	6.8	BEDROOM	acPOCH	3020	76	3	2925	6	19.1	9.6	18.2	56	-254.8	257.8	492	18.7	95.3	1105.9	11.27	938.6	859.2	422.4
14.3	7	1.6	BEDROOM	acPOCH	4360	77	3	2988	1	4.7	2.3	30.9	-36.5	-360.5	644.2	974	64.5	62.7	203.4	5.7	563.6	243.1	8.3
8.2	3.2	1.6	BEDROOM	acPOCH	4360	73	3	2743	1	2.8	1.5	24.9	42.2	-453	941.3	1476.3	60.6	48.7	182.1	5.11	644.5	137.8	-9.4
18.3	34.2	5.6	BEDROOM	acPOCH	3600	72	3	2684	1	18	18.2	13.5	94.1	65.4	43.5	38.3	102.9	144.7	558.4	7.65	157	181.3	335.9
2.7	15.3	3.9	BEDROOM	acPOCH	3600	72	3	2684	1	1.8	2.5	9.5	282.1	673.6	95.4	-57.1	208.7	-30.3	1021.8	13.99	191.7	390.4	156.4
8	18.7	3	BEDROOM	acPOCH	4530	78	4	3427	1	8.5	8.2	13.9	413.7	-144.4	-165.9	434.5	227.8	185.5	3144.4	34.53	3168.1	2567.8	122.6
6.1	14.8	3.5	BEDROOM	acPOCH	4530	72	4	3579	1	8.4	8.3	8.9	104.2	157.3	107.3	189.5	394.4	261.1	247	2.93	98.1	79	11.6
13.3	23.6	6.6	BEDROOM	acPOCH	5618	82	3	3328	1	6.8	6.8	41.6	95.1	78.3	92	112.4	51.9	48.3	513	18.87	393	390.2	41.7
3.5	11.2	2.1	BEDROOM	acPOCH	5618	80	3	3184	1	2.9	2.2	3.5	851.2	58.7	-38.3	243.6	203.2	713.8	2544.3	49.95	658.5	203	1835.1
13.1	399.8	4.3	BEDROOM	acPOCH	5280	73	3	2743	1	8.5	8.5	3.3	-25.4	79.9	-1.7	4.5	837	725.4	98.2	1.37	4.2	4.4	14
3.7	177.4	3.6	BEDROOM	acPOCH	5280	78	3	3052	1	1.7	1.8	18.4	133.9	156.7	15	12.3	151.9	131.8	178.1	2.48	4.5	18.2	18.9
68	67.9	12.1	BEDROOM	acPOCH	2910	78	3	3052	1	3.3	1.9	39.8	60.1	43.9	-5.8	29.2	73.5	54.7	248.9	3.62	198.1	144.6	6.9
10.7	11.8	3	BEDROOM	acPOCH	2910	74	3	2925	1	4.4	3.3	54	179.8	41.9	171.2	309.5	31.9	31.5	279	4.06	225	68.4	12.1
55.7	90.4	15.6	BEDROOM	acPOCH	2790	74	3	2802	1	45.1	56.4	63.7	-103.8	4.9	119.2	11.1	39.9	39.4	494.6	11.89	392.7	536.6	97
3.6	6.6	1.7	BEDROOM	acPOCH	5100	71	3	2627	1	2.7	1	8.9	-69.3	30.7	485	467.6	275.5	193	301.8	4.27	195.1	319.6	75.9
1.4	4.5	1.3	BEDROOM	acPOCH	5100	73	3	2743	1	1.5	8.5	7.2	223.7	263.6	595.3	632.5	301.4	224.4	593.6	8.4	211.8	334.9	118.2
4.9	18.2	2.7	BEDROOM	PMCP	1560	71	2	3498	1	48.1	76.4	92.2	810.9	271.6	108.1	214.8	-435.9	-5.3	593.6	5.91	235.2	-304.9	66.8
6.1	5.2	3.7	BEDROOM	acPOCH	5400	72	4	3579	1	8.6	8.8	6.5	116.4	869.6	137.7	-214.8	516.7	116	-1468.8	-32.44	-2471.3	-1687.5	132.9
1	2.1	8.6	BEDROOM	acPOCH	5400	73	4	3657	1	8.3	8.5	3.3	-168.5	315.6	1558.7	1230.1	894	738.5	918.7	20.11	570.6	832.6	24.5
28.7	29	14	BEDROOM	acPOCH	6100	72	3	2684	1	16	17.7	29	21.1	-3.9	72.3	97.4	47.5	47.5	124.4	1.44	107.8	82.4	20.5
9.5	19.4	7.1	BEDROOM	acPOCH	6100	75	3	2863	4	9.9	13.4	34.2	152	118	88.9	99	12	35.9	430.6	4.99	244.9	238	45.6
44.9	32.2	16.2	BEDROOM	acPOCH	3360	75	3	2863	1	43.8	29.1	28.7	-61.1	-2.8	163.8	61	22.8	47.3	311.5	1.79	298.4	348.7	15.8
15.3	14.4	5.2	BEDROOM	acPOCH	3360	74	3	2925	1	19.4	11.3	13.1	134.1	33.4	144.8	119.6	13.6	161.6	560.3	3.22	290.8	297.5	234.1
51.8	32.1	17.9	BEDROOM	acPOCH	3360	75	3	2863	1	42.4	29.8	28.9	-193.5	-51.5	353.6	127.2	-30	54.4	1391.6	8	1778.4	1738.5	-335.3
13.1	13.1	4	BEDROOM	acPOCH	3360	74	3	2925	1	19.5	11.3	13.1	99.2	34.3	231.7	124.9	-2.1	167.5	587.9	3.38	295.3	307.1	256.4
1.5	1.2	0.7	BEDROOM	acPOCH	3780	68	3	2460	1	1.7	0.6	2.8	1139.6	-1656.4	740.2	3604.4	27.7	-42.5	2077.3	21.78	2886.6	1220.6	847.1
1.4	1.7	8.3	BEDROOM	acPOCH	3780	70	3	2570	1	1.5	8.5	4.7	732	-381.1	1158.8	2032.7	223.6	442.7	1332.7	13.97	1394.7	670.3	319.2
5.6	78.3	3.5	BEDROOM	acPOCH	6430	74	4	3900	1	2.9	3	12.6	177.4	197.3	23.8	24.8	244.4	225.4	323	6.71	30.4	29.3	95.4
1	8	8.7	BEDROOM	acPOCH	6430	76	4	3900	1	8.5	8.5	9.5	885.8	879.1	302.1	347.4	334.6	296	1146.1	23.82	196.8	153.7	70.2
1.7	12.7	8.1	BEDROOM	PMCH	4780	70	3	3768	1	3.7	3.9	4.9	1145.1	267	121.6	-45.6	-292.5	752.7	1782.5	9.37	222.3	505.2	1293.2
2.3	9.7	1.1	BEDROOM	PMCH	4780	72	3	3934	1	6.3	3.6	7	521.8	-94.4	254	222.3	-99.3	548.6	1695.4	8.91	247.5	668.5	1542.3
			BEDROOM																				
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THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

STANDARD DEVIATION --->

R31	R22	ZONE 2 ACH	R23	R32	R33	ZONE 3 ACH	TOTAL HSE. RATE	TOTAL HSE. ACH	ZONE 1 SOURCE	S	VOLUME	C11	C21	C31	ZONE 2 SOURCE	S	VOLUME	C12	C22	C32	ZONE 3 SOURCE	S	VOLUME	C13	C23
347.7	657.5	19.52	-47.7	-152.1	844.2	8.31	753.4	2.79	S	10	0.73	0.51	0.24	S	10	0.55	0.92	0.12	S	10	0.36	0.22
771.1	1233.5	36.63	174.4	-344.2	760.7	7.47	592.6	2.2	S	10	0.59	0.45	0.45	S	10	0.57	0.7	0.34	S	10	0.37	0.34
116.2	312.8	4.25	-27.2	0.9	137.8	2.23	322.1	1.43	S	10	1.2	1.31	1.08	S	10	0.51	2.38	0.52	S	10	0.83	0.55
144	151.3	4.38	14.1	32.6	257.4	4.01	405.9	2.27	S	10	0.82	0.45	0.34	S	10	0.57	3.09	0.41	S	10	0.73	0.55
80.7	455.9	14.38	-41.4	3	165.3	2.21	232.4	0.89	S	10	2.38	1.42	0.54	S	10	1.58	1.91	0.37	S	10	2.07	1.2
186.4	25.9	0.93	4.8	-8.4	563.7	4.28	432.9	0.94	S	10	1.93	0.97	0.54	S	10	1.17	16.98	0.1	S	10	0.99	0.62
408.5	35.7	1.28	-11.7	-33.7	897.6	6.82	531.5	1.15	S	10	1.25	0.89	0.46	S	10	1.57	11.48	0.16	S	10	0.85	0.67
238.7	961.6	18.62	-18	105.3	731.2	3.18	1011	1.92	S	10	0.41	0.47	0.42	S	10	0.53	0.78	0.44	S	10	0.18	0.13
394.5	1398.7	15.44	-77	-21.9	598.9	2.6	1001.5	1.9	S	10	0.54	0.48	0.49	S	10	0.65	0.83	0.57	S	10	0.18	0.13
251.8	1023.8	14.36	943.1	929.6	1386.7	7.54	441.1	1.23	S	10	0.79	0.72	0.68	S	10	0.49	1.46	1.1	S	10	0.5	0.14
100.2	2294.5	32.17	531.7	1043.8	1135.6	6.17	1615.3	4.5	S	10	0.3	0.19	0.21	S	10	0.87	0.25	0.24	S	10	0.05	0.12
152.7	1189	19.45	-531.7	16.9	241.7	5.02	691.7	3.81	S	10	0.82	0.81	0.25	S	10	0.36	0.77	0.12	S	10	1.37	0.42
729	1913.8	31.31	56.1	-189.4	710.9	14.78	1078.9	5.94	S	10	0.6	0.23	0.26	S	10	0.45	0.44	0.17	S	10	0.24	0.12
4.1	77.8	2.75	57.4	62.5	637.7	5.1	590.2	3.12	S	10	100.56	2.81	0.81	S	10	1.29	5.31	0.4	S	10	0.57	0.49
25.5	194.7	6.88	124.1	33.5	370.9	2.97	368.1	1.95	S	10	6.71	1.35	0.56	S	10	0.5	2.27	0.19	S	10	0.76	0.88
1096.9	1650.5	24.4	-118.3	-849	410.5	2.11	317.2	0.98	S	10	1.24	1.42	1.44	S	10	1.63	2.38	1.28	S	10	0.15	0.13
1181.7	1095.5	16.2	19	-506.8	720.7	3.71	328.3	1.02	S	10	0.88	1.23	1.38	S	10	0.71	1.34	0.8	S	10	0.7	0.98
1.3	104.1	3.87	3.7	22.6	184.1	1.5	262.6	1.3	S	10	82.2	0	0.77	S	10	2.36	3.53	0.44	S	10	0.2	0.87
1.5	1077.1	31.2	299.7	154.3	624.5	5.1	1243.6	6.14	S	10	137.26	0.39	0.55	S	10	0.68	0.39	0.1	S	10	0.35	0.19
-44.6	1147.4	42.24	-23.8	324.2	410.3	4.45	759.6	3.9	S	10	0.74	0.55	0.24	S	10	0.42	0.67	0.35	S	10	0.1	0.05
-9.8	1057.2	38.91	10.4	259.6	408.5	4.43	785.6	4.84	S	10	0.73	0.57	0.25	S	10	0.37	0.68	0.32	S	10	0.04	0.04
352.1	1858.4	68.41	699.8	936.3	1952	21.18	2170.4	11.15	S	10	0.2	0.1	0.04	S	10	0.14	0.32	0.12	S	10	0.08	0.1
156	1892	69.64	686.2	1152.4	1841	19.98	1943.1	9.99	S	10	0.21	0.1	0.04	S	10	0.14	0.32	0.15	S	10	0.07	0.1
42.2	656.3	12.71	30.9	77.4	523	4.38	619.8	1.32	S	10	2.05	1.03	0.27	S	10	1.97	1.53	0.34	S	10	0.23	0.15
156.8	498.3	9.62	39.6	69.4	1658.8	13.89	1678.7	3.57	S	10	1.01	0.42	0.09	S	10	0.59	1.01	0.09	S	10	0.24	0.13
190.8	1215.2	24.68	-136	19.1	305.1	3.57	332.5	1.43	S	10	1.85	1.04	0.84	S	10	1.44	1.16	0.68	S	10	1.91	0.96
-3.3	1248.6	22.4	31.5	38.9	98.3	0.79	676.2	3.14	S	10	3.14	0.84	0.14	S	10	1.43	0.7	0.14	S	10	0.47	0.23
2	1676.9	30.08	62.7	71.1	113.9	0.92	1044.1	4.94	S	10	2.09	0.24	0.15	S	10	0.82	0.32	0.16	S	10	0.28	0.15
283	178.4	6.3	-41.2	-38	397.7	3.9	240.4	1.12	S	10	1.31	1.43	0.86	S	10	1.83	3.42	0.56	S	10	1	1.02
349.2	322.9	8.15	-10.3	35.8	354.7	3.48	586.2	2.73	S	10	0.42	0.47	0.47	S	10	0.27	1.53	0.39	S	10	0.18	0.25
144.9	2925.9	38.15	-96.5	-76.4	254	1.37	475.7	1.35	S	10	0.74	0.88	0.31	S	10	0.8	1.87	0.3	S	10	0.05	0.02
81.8	272.2	3.56	3.7	66.8	489.7	2.22	607.9	1.72	S	10	1.12	0.45	0.38	S	10	0.41	1.48	0.35	S	10	0.04	0.03
27.7	494.7	20.09	-7.8	9.7	85.7	0.54	239	1.02	S	10	1.65	1.83	0.73	S	10	1.33	2.36	0.66	S	10	0.68	0.68
1498	500.3	28.32	53.7	-111.8	2092	13.18	1016	4.34	S	10	0.32	0.22	0.22	S	10	0.35	1.12	0.21	S	10	0.29	0.22
119.2	9.3	0.5	8.4	6.9	851.5	5.7	809.9	3.37	S	10	2.85	1.85	0.42	S	10	1.31	39.98	0.43	S	10	0.85	0.85
34	23.2	1.24	8.7	3.7	169.5	1.13	300.8	1.25	S	10	1.73	1.05	0.37	S	10	0.37	17.74	0.36	S	10	0.17	0.18
24.2	191.4	5.08	-2.4	-1	78	0.95	127.8	0.68	S	10	5.8	4.51	1.18	S	10	6	6.79	1.21	S	10	0.33	0.19
30.8	390.4	18.37	12.5	-5.9	56.4	0.68	382.9	2.03	S	10	1.87	0.33	0.67	S	10	1.87	1.18	0.3	S	10	0.44	0.33
61.8	474.8	15.63	-72.9	-37.1	44	0.81	55.3	0.37	S	10	7.16	10.52	2.49	S	10	5.57	9.84	1.56	S	10	4.51	5.64
51.5	751.7	16	-35.4	71.6	316	2.19	691.3	2.64	S	10	1.27	0.72	0.33	S	10	0.36	0.64	0.17	S	10	0.27	0.1
34.9	943.2	28.08	-24.2	136.1	395.4	2.74	1120.5	4.28	S	10	0.54	0.26	0.12	S	10	0.14	0.45	0.13	S	10	0.15	0.05
89.6	320.8	2.16	410.9	-22.4	61.8	1.4	483.1	1.65	S	10	1.12	0.63	1.25	S	10	0.69	1.02	0.27	S	10	4.81	7.64
-97.7	-1744.1	-31.6	-41.8	589.5	607.7	3.98	770.7	3.04	S	10	0.45	0.53	0.41	S	10	0.61	0.52	0.37	S	10	0.04	0.08
246.6	2294.1	41.57	231.4	164.7	1149.8	7.52	2284.2	9.02	S	10	0.39	0.21	0.15	S	10	0.1	0.21	0.04	S	10	0.03	0.05
20.9	244.7	6.76	67	66.6	135	1.16	161	0.59	S	10	3.75	2.21	1.41	S	10	2.87	2.9	1.4	S	10	1.4	1.77
48.6	375	10.27	38	19.2	95.6	0.82	252.9	1.04	S	10	1.27	1.2	0.73	S	10	0.95	1.94	0.71	S	10	0.99	1.34
23.9	575.3	27.11	165.7	113.1	204.3	2.14	125.4	0.43	S	10	7.38	3.83	2.03	S	10	4.69	3.22	1.62	S	10	4.38	2.91
128.7	547.4	25.79	130.3	89.7	379.9	3.97	314.5	1.08	S	10	2.28	1.03	0.58	S	10	1.53	1.44	0.52	S	10	1.94	1.13
-153.3	2502.1	117.89	636.5	370.1	271.2	2.84	130.1	0.45	S	10	6.41	3.68	1.92	S	10	5.18	3.21	1.79	S	10	4.24	2.98
181.6	560.5	24.41	128.5	33.6	382.7	4	328.7	1.13	S	10	2.24	1.03	0.62	S	10	1.31	1.31	0.4	S	10	1.95	1.13
-282.9	4875.6	72.69	48.6	1248.8	923.4	8.63	1907.5	7.08	S	10	0.18	0.06	0.81	S	10	0.15	0.12	0.07	S	10	0.17	0.06
130.3	2544.7	37.94	41.6	-8.7	584.3	5.46	2114.4	7.85	S	10	0.25	0.06	0.06	S	10	0.16	0.17	0.03	S	10	0.15	0.05
116.3	58.8	1.03	4.7	4.7	346.5	1.9	447.5	1.56	S	10	1.04	0.75	0.49	S	10	0.56	7.03	0.35	S	10	0.29	0.3
104.5	517.3	9.09	16.2	18.5	421	2.31	1522.6	5.31	S	10	0.27	0.11	0.1	S	10	0.1	0.8	0.07	S	10	0.05	0.05
132.2	333.4	22.66	-126.3	-18.5	874.4	7.22	974.2	2.99	S	10	0.27	0.39	0.04	S	10	0.17	1.27	0.01	S	10	0.37	0.39
285.1	523	35.56	-587.8	21.5	855.2	7.04	676.5	2.07	S	10	0.44	0.57	0.18	S	10	0.23	0.97	0.11	S	10	0.43	0.34
								0.62																	
								NC																	
								9.14																	
								NC																	
								6.17																	
								1.43																	
								0.37																	
								0.62																	

THREE ZONE AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER 1987)

	ZONE 1		ZONE 2		ZONE 3																	
C33	IN. RATE	EX. RATE	IN. RATE	EX. RATE	IN. RATE	EX. RATE	R11	ACH1	R12	R21	R13	R31	R22	ACH2	R23	R32	R33	ACH3	HSE. RATE	HSE. ACH	FOOTNOTES	
0.44	68.6	172.8	41.7	113.1	82.2	141.6	234.9	1.77	217.4	136.3	171.6	131.7	162.2	4.91	84.6	184.2	165.8	1.68	74.5	0.29	1	
0.61	109	327.6	116.1	207.6	63.3	181.3	447.9	4.85	770.8	352.7	239.5	385.6	461	13.81	136.7	413.6	191.1	1.91	54.8	0.21	1	
2.81	29.9	53.2	30.5	45.4	12.6	22.1	83.9	0.96	38.6	54.4	30.7	35.3	54.3	0.77	15.8	13.9	24.9	0.42	25.3	0.12	1	
1.12	60.6	70.4	13.7	19.5	29.2	35.1	99	1.28	23.6	14.3	59.4	39.8	22.9	0.7	8.2	11.9	46.6	0.75	41.5	0.24	1	
1.62	45.2	72.2	44.4	71.2	16.6	22.7	181.9	1.18	144.1	173.5	74.6	38.5	155	4.94	62.9	28.1	31.6	0.43	20.1	0.06	1	
1.01	31.6	59.9	2.7	3.7	53.6	81.3	64.8	0.22	4.8	3.9	76.7	49.5	3.7	0.14	4.1	3	103.3	0.81	42.1	0.1	1	
0.77	44	130.8	6.4	7	63.8	139.1	171.9	0.56	20	11.4	211.1	134.4	5.5	0.21	11.5	14.1	213	1.65	52.8	0.12	1	
1.02	134.4	232.6	83	171.6	80.8	95.6	489.6	2.41	325.5	377	85	116.6	285.6	3.2	56.6	77.8	111.7	0.51	84.9	0.17	1	
1.26	412.2	505.8	279.4	324.4	71.8	97.1	1523.1	7.44	1068.4	1013.2	156.9	233.8	729.7	8.09	98.2	154.7	94.1	0.43	145.3	0.28	1	
1.18	50.6	81.5	84	173.7	107.8	210.1	118.2	1.17	178.8	182	225.2	220.5	611	8.6	719.7	704.6	853.2	4.65	36.2	0.11	1	
0.44	88	149.7	195.3	310.9	107.1	195.1	180.2	1.82	115.3	224.3	35.1	127.6	453.7	6.56	153.9	305.1	205.3	1.16	126.7	0.36	1	
1.11	189.2	175.5	150.7	216.6	95	33.6	442.6	6.17	234.9	516.7	241.4	73.5	328.8	5.47	283.5	34.4	57.6	1.22	88.6	0.5	1	
0.35	112.3	355.8	172	313.2	73.6	197.2	341.4	4.8	534.1	166.9	94.6	248.8	424.7	7.12	69.7	319	133.4	2.87	118.6	0.46	1	
0.49	8.7	8.6	9	12.7	85.5	89.4	8.4	0.01	0.2	0.2	0.6	0.9	11.5	0.43	12.3	13.4	94.7	0.8	80.7	0.44	1	
0.92	6	7.8	22.8	29.9	34.4	51.7	7.1	0.21	2.7	5	7.9	5.9	29.2	1.09	28.5	7.9	56.6	0.48	35.1	0.2	1	
1.41	630	418.7	589.2	268.9	70.9	177.5	5501.4	90.69	5198.4	3795.1	406.2	2287	3587.8	53.04	279.7	2157	181.6	0.94	55.9	0.18	1	
1.76	309.1	356.4	207.8	217.5	99.7	203.5	2028.5	33.48	1316.8	1253.4	443.5	1153.4	835.7	12.36	387.3	729.1	392.3	2.03	52.9	0.17	1	
2.04	8.3	8.6	11.9	14.8	25.5	24.8	8.5	0.01	8.6	8	8.1	8.3	15	0.46	8.7	6.6	76.1	0.23	24.5	0.14	1	
0.67	8.3	8.8	135.8	143.9	61.9	83.9	8.3	0.01	1	0.4	0.3	8.3	159.1	4.84	63.5	32.9	92.4	0.79	125.5	0.65	1	
0.78	61.5	126.1	84.9	172	52.4	44	195.8	2.65	214.7	220.1	20.4	61.3	292.3	10.96	19.1	98.2	59	0.68	57.4	0.32	1	
0.79	57.5	108.5	81.4	152.2	53.4	58.2	167.7	2.28	166.6	194.6	9	50	247.8	9.33	9.6	77.1	58.8	0.68	58.9	0.33	1	
0.18	204.7	270.3	170.1	242.8	187.2	260	349.7	4.84	284.6	150.6	160	142.1	345.1	13.15	150.2	275.4	335.2	3.79	102.6	1	1	
0.19	175.1	226.9	196.6	252.3	192.2	244.4	272.3	3.78	247.8	127.5	117.1	106.1	359.1	13.67	142.4	325.2	317.1	3.58	178.8	0.97	1	
0.72	77.5	114.2	79.2	98.1	67.4	68.6	310.3	1.84	331.1	255	26.8	45.6	283.7	5.51	22.8	51.3	75.9	0.67	64.6	0.14	1	
0.26	63.2	115.4	38	70.2	183.1	229.6	139	8.48	72.5	78.7	105.4	44.6	86.9	1.74	49.1	26.9	247.3	2.18	171.9	0.39	1	
1.82	187.9	318.9	121.7	305.4	39.5	69.8	756.5	7.73	786.9	694	308.5	162.7	745	15.18	267.2	162.6	87.9	1.84	51.2	0.22	1	
3.09	48.4	174.6	177.3	304.3	18.8	15.5	44.4	1.83	232	100	6.3	3	396.8	7.2	12.1	13.6	14	0.12	139.9	0.44	1	
2.49	18	150.2	177.6	288.9	11.2	19.9	34.4	1	175.4	37.7	6.5	2	320.7	5.95	15.6	19.2	16.4	0.14	161.1	0.77	1	
1.35	41.1	81	14.7	29.8	34.4	60.4	203.2	2.81	69.7	80.5	154.9	130.5	39.7	1.02	53.8	39.3	118	1.17	17.8	0.09	1	
0.95	77	155.6	24.3	78	35.7	75.8	210.6	2.97	57.8	113.1	44.3	104.2	59.1	1.55	18.5	27	59.2	0.61	55	0.27	1	
1.39	554.2	780	590.3	681.6	39	44	5349.9	58.73	5705.3	4457.8	205.5	221.7	4971.1	64.85	178.7	234.9	37.4	0.21	83.9	0.24	1	
0.89	21.9	35.4	21.8	34.6	56.2	51.6	40.8	0.47	21.8	17.5	2.6	19.6	41.6	0.57	1.3	17.6	58.6	0.33	51.7	0.16	1	
4.16	42.6	77.6	41.8	75.9	8.4	10.9	207.8	4.11	199	196.9	18.4	15.5	198.7	8.13	15.8	14.3	12.6	0.08	17.1	0.06	1	
0.35	271.5	401	76.2	64.7	238.1	326.6	921	18.25	270.5	101	870.6	693.7	84.3	3.57	89.9	180.1	720.4	4.58	108.3	0.49	1	
0.33	17.7	13.1	1.5	1.3	119.7	114.5	14.2	0.21	0.9	0.9	2.9	24.7	1.3	0.08	0.2	2	121.8	0.84	111.5	0.48	1	
1.84	19.8	24.2	2.3	3.1	21.8	22.4	25.6	0.36	0.9	2.1	3.5	7	3.3	0.19	0.3	0.8	24.2	0.17	24.8	0.12	1	
3.98	75.9	38.7	23.3	38.7	10.5	10.1	126.6	1.85	120.2	99.8	3.5	13.5	97.2	2.59	2.6	12.2	11.1	0.14	11.7	0.07	1	
5.4	29.1	47.2	34.5	54.3	5.1	7.9	44.8	0.68	52.1	16.4	3.6	6.9	61.7	1.72	3.1	5.7	8.1	0.1	33.1	0.19	1	
6.37	288.5	77.7	241.1	87.4	52.5	12.3	1126.6	27.09	939.8	1285.3	204.9	131.3	1072.8	35.77	232.9	109.2	24.4	0.34	19.9	0.13	1,8	
0.89	45.7	44	88.6	107.8	41.7	40.7	58.5	0.86	55.5	87.9	19.2	18.7	141.5	3.12	22.1	24	44.6	0.34	73.7	0.29	1	
0.72	58.6	77	94.8	127.5	44.5	50.9	94.2	1.4	51.8	76.6	26	15.7	147.4	3.3	15.1	31.2	57.1	0.42	86.7	0.37	1	
9.22	235.6	84.1	84.2	81.7	117.7	14.9	151.6	1.54	62.2	167.8	73.4	29.2	70.1	0.49	103.7	18.6	15.5	0.36	123.3	0.42	1	
0.65	135.7	492.1	205.2	399.5	77.8	132.9	993.1	21.99	1415.5	842.9	75.9	231.6	1177.6	21.4	59.9	348.4	92.6	0.64	81.3	0.34	1	
0.33	121.9	130.3	270.5	305.1	133.4	145.8	159.9	3.67	146.3	216.9	18.5	67.3	404.9	7.63	58.8	67.2	146.7	1.15	224.7	0.94	1	
2.9	9.5	21.5	19.4	34.7	18.9	18.9	28.9	0.34	40.4	31.3	16.2	13.7	62.6	1.75	26	27	25.1	0.22	11.4	0.05	1	
3.42	39.2	60.5	33.8	52.9	7.6	12.4	112.2	1.32	98	86.3	22.2	16.4	96.4	2.69	19.3	14	15.2	0.14	21	0.09	1	
2.87	77.4	53.5	103.8	85.8	37.2	29.3	205.3	1.18	242.6	309.5	91.3	78.8	407.7	19.25	147.5	107	56	0.59	21.8	0.08	1	
1.31	47	80.8	47.4	76.1	31.6	51.1	159.2	0.93	129.9	130	110.6	63.6	143.7	6.89	92.6	55.9	81.1	0.87	25.6	0.1	1	
2.89	831.3	374.2	1139.9	507.3	274	75.7	4770.5	27.41	6535.2	6422.7	1567.2	904.3	6603.3	414.8	2116.6	1243.8	304.9	3.21	65.8	0.23	1	
1.31	52.3	85	55.3	77.9	35.8	53.2	173	1.01	124.7	138	119.1	76.9	138.5	6.66	96.2	58.3	84.9	0.91	30	0.11	1	
0.28	234.7	744.5	469.6	889.8	107.1	243.1	456.1	4.9	1028.7	381.9	238.1	104.3	1142.5	17.42	162.8	343.8	138.8	1.37	341.1	1.28	1	
0.47	130.1	291.1	237.9	349.6	49	80.7	230.3	2.51	347.6	118	79.4	31.4	425.3	6.62	34.7	35.7	86.1	0.85	203	0.79	1	
1.26	30.8	42.4	6.8	7.8	38.2	46.1	50.4	1.1	6.8	6.6	21.6	26.3	8.6	0.16	2.6	3.1	52.6	0.3	38.4	0.14	1	
0.95	131.5	151.6	50	67.9	48.6	54.5	168.6	3.7	41.6	32.6	15.1	22.6	75.5	1.4	4.6	6.2	60.2	0.35	128.5	0.48	1	
0.49	201.5	296.2	33.5	82.1	164	123.3	316.9	1.73	55.6	127.4	317.6	32	55.1	3.91	95.1	4.3	133.8	1.16	155.9	0.49	1	
0.7	157.2	323.4	51.1	164.3	150.9	126.4	447.7	2.6	94.2	292.9	520.2	107.3	102.1	7.16	293.6	21.3	161.7	1.54	81.6	0.24	1	
																				2.63	1,8	
																				NC	6,8	
																				1.33	1,8	
																				NC	6	
																				0.82	1	
																				0.12	9	
																				0.13	9	
																				2.63	9	

FOOTNOTE TABLE FOR AIR EXCHANGE DATA (TEAM CALIFORNIA - SUMMER SEASON)

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1. Calculated correctly using a three zone division.

4. Original three zone calculation not correct. Recalculated as a two zone division for determining air exchange data.

5. Calculated correctly as a two zone division.

6. Air exchange data not calculated.

8. This home was an apartment. Remember that air infiltration into aprtments may come from both outside and other apartments. Therefore, a pollutant source may be in another home and source strength calculations may be unreliable.

9. MISSING DATA ENTRY EXPLANATION

A. Respondent no. 72256-1 was sampled at the same time in the same home as respondent no. 72252-0. Only one air exchange measurement was performed at each time period. For data which applies to 72256-1 please see data for 722520TF1 and 722520TF2.

B. Respndent no. 72279-3 was sampled at the same time in the same home as respondent no. 72278-5. Only one air exchange measurement was performed at each time period. For data which applies to 72279-3 please see the data for 722785TF1 and 722785TF2.