Development of Microenvironmental Factors for the HAPEM4 in Support of the National Air Toxics Assessment (NATA)

External Review Draft Report

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BACKGROUND

The National Air Toxics Assessment (NATA) activities are a primary component of the Environmental Protection Agency's (EPA's) national air toxics program. The primary goal of the NATA activities are to set program priorities, characterize risks, and track progress toward meeting the overall national air toxics program goals, as well as specific risk-based goals, such as those of EPA's Integrated Urban Air Toxics Strategy (64 FR 38706). More specifically, our NATA activities include expanding air toxics monitoring, improving and periodically updating emissions inventories, periodically conducting national- and local-scale air quality, multi-media and exposure modeling, characterizing risks associated with air toxics exposures, and continuing research on health and environmental effects and exposures to both ambient and indoor sources.

As part of the NATA activities, EPA is currently conducting an initial screening-level assessment, which will demonstrate the approach to characterizing air toxics risks nationwide. This initial national-scale assessment (NSA), will help to characterize the potential health risks associated with inhalation exposures to thirty-three hazardous air pollutants (HAPs) identified as priority pollutants through EPA's Integrated Urban Air Toxics Strategy. It is important to note that, such a broad-scale assessment is limited in the scope of the risks that it can address quantitatively. Specifically, the assessment addresses risks associated with only inhalation exposure, and does not quantify exposures by ingestion or dermal contact, which may be important for some substances. The assessment is also limited by the uncertainties inherent in the various types of data and methods currently available. Despite these limitations, it represents an important first step in characterizing air toxics risks nationwide.

INTRODUCTION

To accomplish the inhalation exposure assessments under NATA, EPA chose the Hazardous Air Pollutant Exposure Model, Version 4 (HAPEM4). The HAPEM4 is a screening-level human inhalation exposure model designed to estimate exposures of population subgroups from concentrations of HAPs originating in the ambient (i.e., outdoor) environment. It was designed to predict the inhalation exposure for selected population groups and HAPs. Through a series of calculation routines, the model makes use of census data, information about human activity patterns, ambient air quality levels, climate data, and indoor/outdoor concentration relationships to estimate an expected range of inhalation exposure concentrations for subgroups of the population.

It is expected that for a majority of the thirty-three HAPs being examined in the initial NSA, the air medium, and hence, inhalation exposure, will be the dominant pathway in determining population risk. Furthermore, a lack of appropriate assessment tools and supporting data currently prohibits a national scale multimedia assessment. Due, in part, to these factors and limitations, the EPA chose the HAPEM4 as the tool to predict the inhalation exposure as part of the initial national-scale assessment. The HAPEM4 was a likely choice for the exposure modeling component of NATA based on its specific design features including its ability to process large amounts of input data thus enabling a national assessment at the census tract scale, its ability to predict exposure concentrations for both outdoor and indoor locations, its ability to calculate annual average exposures which reflect time-dependent patterns in ambient concentrations and activity patterns, and its ability to estimate exposures for workers at their workplace and also during their commute. HAPEM4 is also desirable because of the probabilistic selection of the activity pattern data used by the model.

As part of the NATA activities, the HAPEM4 will be run to estimate inhalation exposure levels to selected HAPs, including those on the EPA's urban HAPs list[1], for all census tracts in the contiguous United States, Puerto Rico, and the U.S. Virgin Islands. Prior to running the HAPEM4, pollutant-specific microenvironmental (ME) factors need to be developed for each HAP/microenvironment combination. The list of HAPs and HAPEM4 microenvironments for which ME factors were sought can be found in Tables 1 and 2, respectively. This report provides details of the development of the HAPEM4 ME factors to be used in the NATA analyses.

Table 1. List of HAPs for Development of ME Factors[a]

1	acetaldehyde	13	1,2-dichloroethane (ethylene dichloride)	25	nickel compounds
2	acrolein	14	1,3-dichloropropene	26	7-PAH
3	acrylonitrile	15	ethylene dibromide (1,2-dibromoethane)	27	polychlorinated biphenyls
4	arsenic	16	ethylene oxide	28	propylene dichloride (1,2-dichloropropane)
5	benzene	17	formaldehyde	29	quinoline
6	beryllium compounds	18	hexachlorobenzene	30	styrene[b]
7	1,3-butadiene	19	hydrazine	31	2,3,7,8-TCDD
8	cadmium compounds	20	lead compounds - organic	32	1,1,2,2-tetrachloroethane
9	carbon tetrachloride	21	lead compounds - inorganic	33	tetrachloroethylene (perchloroethylene)
10	chloroform	22	manganese compounds	34	trichloroethylene
11	chromium compounds	23	mercury compounds	35	vinyl chloride
12	coke oven emissions	24	methylene chloride (dichloromethane)		

[a] In addition to this list, the following pollutants were also included for future development of ME factors: ethyl benzene, hexane, methyl-tertiary-butyl-ether (MTBE), propionaldehyde, toluene, and xylenes.
[b] Styrene is the only HAP in this table that is not on EPA's urban HAPs list.

[1]The urban HAPs list was published in the Federal Register Notice describing EPA's Integrated Urban Air Toxics Strategy (64 FR 38706).

Table 2. HAPEM4 Microenvironments

MICROENVIRONMENT #	MICROENVIRONMENT	
	SPECIFIC	GENERAL
1	Car	In vehicle
2	Bus	In vehicle
3	Truck	In vehicle
4	Other	In vehicle
5	Public garage	Indoors
6	Parking lot/garage	Outdoors
7	Near road	Outdoors
8	Motorcycle	Outdoors
9	Service station	Indoors
10	Service station	Outdoors
11	Residential garage	Indoors
12	Other repair shop	Indoors
13	Residence - no gas stove	Indoors
14	Residence - gas stove	Indoors
15	Residence - attached garage	Indoors
16	Residential - stove and garage	Indoors
17	Office	Indoors
18	Store	Indoors
19	Restaurant	Indoors
20	Manufacturing facility	Indoors
21	School	Indoors
22	Church	Indoors
23	Shopping mall	Indoors
24	Auditorium	Indoors
25	Health care facility	Indoors
26	Other public building	Indoors
27	Other location	Indoors
28	Not specified	Indoors
29	Construction site	Outdoors
30	Residential grounds	Outdoors
31	School grounds	Outdoors
32	Sports arena	Outdoors
33	Park/golf course	Outdoors
34	Other location	Outdoors
35	Not specified	Outdoors

MICROENVIRONMENT #	MICROENVIRONMENT	
	SPECIFIC	GENERAL
36	Train/subway	In vehicle
37	Airplane	In vehicle

METHODOLOGY

Defining the HAPEM4 ME Factors

It is important to point out prior to defining the ME factors that the goals of the initial NATA assessment are primarily concerned with HAP releases from inventoried sources (i.e., certain sources and source types whose emissions originate outdoors), so air quality estimates and ME factors in the HAPEM4 assessment will consider only exposures associated with emissions from these sources. Thus, the exposure predictions will not consider the effects of emissions of HAPs from indoor sources (e.g., internal combustion sources, off-gassing from wood products, consumer products, etc.). However, it is equally important to point out that indoor sources of HAPs could be important to total exposure levels and for determining specific HAP threshold levels.

The data used to calculate ME factors for use in the HAPEM4 came primarily from journal articles, agency reports, and scientific conference proceedings that report results from measurement studies that concurrently measured ambient pollutant concentrations with those in one or more of the various microenvironments shown in Table 2. The ratio of concurrent measurements of indoor pollutant concentrations to those collected outdoors in the immediate vicinity of the indoor microenvironment is typically referred to as an I/O ratio. For this report, this ratio, which is applicable to all HAPEM4 indoor and in-vehicle microenvironments, is referred to as the penetration factor, or *PEN*. Penetration factors are not applicable to outdoor microenvironments (all *PEN* factors for outdoor microenvironments have been set to 1.0 for this project).

In addition to the development of *PEN* factors for the HAPEM4 microenvironments, this work investigated the collection of measurement data for a new ME factor for the HAPEM4. This new factor, called the proximity factor (abbreviated *PROX*), relates a HAP's concentration measured or modeled at a specified location to that measured at an outdoor location that is either in close proximity to one of HAPEM4's indoor or in-vehicle microenvironments, or is itself one of HAPEM4's outdoor microenvironments. A third ME factor, called the multiplicative factor (abbreviated *MULT*), is the product of the *PEN* and *PROX* factors. The *PEN*, *PROX*, and *MULT* factors are defined mathematically in Equations 1, 2, and 3, respectively. Equation 2a applies to indoor or in-vehicle microenvironments, and Equation 2b applies to outdoor microenvironments.

$$PEN = \frac{(\text{indoor or in-vehicle ME conc.})}{(\text{outdoor conc. in immediate vicinity of indoor or in-vehicle ME})} \quad (1)$$

$$\mathrm{PROX}_i = \frac{\text{(outdoor conc. in immediate vicinity of indoor or in-vehicle ME)}}{\text{(measured or modeled ambient conc.)}} \quad (2a)$$

$$\mathrm{PROX}_o = \frac{\text{(outdoor ME conc.)}}{\text{(measured or modeled ambient conc.)}} \quad (2b)$$

$$\mathrm{MULT} = \mathrm{PEN} \times \mathrm{PROX}_i = \frac{\text{(indoor or in-vehicle ME conc.)}}{\text{(measured or modeled ambient conc.)}} \quad (3)$$

Calculating HAPEM4 ME Concentrations and Estimation of Proximity Factors

The HAPEM4 estimates concentrations within microenvironments through the relationship:

$$\mathrm{ME}(m,c,t) = \mathrm{ADD}(m) + [\mathrm{PROX}(m)][\mathrm{PEN}(m)][\mathrm{AMB}(c,t)] \quad (4)$$

where:

ME(m,c,t):	concentration in microenvironment *m* located in census tract *c* at time *t*,
ADD(m):	additive factor for microenvironment *m*,
PROX(m):	proximity factor for microenvironment *m*,
PEN(m):	penetration factor for microenvironment *m*, and
AMB(c,t):	ambient concentration for census tract *c* at time *t*.

The additive factor (*ADD*) accounts for emission sources within or near to a microenvironment. The *ADD's* primary function is to account for emissions of a pollutant that originate indoors. Since this term is itself a concentration, the value of *ADD* can be set equal to zero, indicating no contribution from indoor sources. As stated previously, the initial NATA assessments are concerned with HAP releases from outdoor sources, therefore for these analyses, the *ADD* term has been set to zero. The *PEN* accounts for the relationship between the concentration in the microenvironment and the concentration in the outdoor air in the immediate vicinity of the microenvironment, when the microenvironment contains no sources. For example, the *PEN* factor for the indoors, residence microenvironment would represent the ratio of the indoor concentration to the concentration in the air surrounding the residence when sources are absent in the residence. The *PROX* accounts for the relationship between the outdoor concentration in the vicinity of the microenvironment and the concentration at the location represented by *AMB(c,t)*.

In some applications of the HAPEM4, the ambient concentration is determined by measurements made by a fixed-site monitor. If this fixed-site monitor is located at a greater distance from the predominant emission sources (e.g., roadways) than the microenvironment is, then the monitor would tend to record lower values than the outdoor concentration at the microenvironment. In this case, the *PROX* factor should be greater than unity to compensate for the relatively low reading at the fixed-site monitor.

Estimating Ambient HAP Concentrations Using ASPEN

In the NATA application of HAPEM4, values for *AMB(c,t)* are provided by the ASPEN (Assessment System for Population Exposure Nationwide) dispersion model rather than by fixed-site monitors. The ASPEN first defines a receptor grid for each emission source which extends out 50 km from the source. This receptor grid, and hence the concentration estimates, varies according to emission source type (i.e., point sources, mobile sources, or area sources). Next, the model uses emissions and meteorological data specific to the census tract to estimate pollutant concentrations at each receptor point. The model then interpolates the receptor concentrations to the census tracts which fall within the 50 km study area. Finally, ASPEN weights the estimated pollutant concentrations by population to produce an average concentration value for each census tract.

The ASPEN uses the following designations for estimating concentrations within a census tract, depending on whether or not the tract contains the emission source under evaluation. These methods, related to census tracts defined as resident and non-resident tracts, are briefly summarized below.

- <u>Resident Tract</u>: The census tract containing a particular source is called the "resident" tract for that source. To avoid the effects of steep pollutant gradients within the resident tract, ASPEN determines an average concentration for the entire tract rather than the concentration at the tract's centroid[2]. The method varies with the type of emission source as follows:

    <u>Point sources</u>: For tracts with centroids close to a major point source, the ambient concentration is estimated by spatial averaging of the ambient concentrations estimated to fall within the bounds of the tracts, rather than by interpolation to the centroid. Because of the difficulty in characterizing the exact boundary locations of each tract, ASPEN uses a circle whose area equals that of the census tract to perform the spatial averaging.

    <u>Mobile and area sources</u>: In the resident tract, the mobile and area sources are treated as multiple "pseudo point sources" geographically dispersed throughout the census tract rather than as a single source. For resident tracts that have radii <u>greater than 0.3 km</u>, ambient concentrations are estimated on the basis of five pseudo point sources. The average concentration for the census tract is determined by spatially averaging the ambient concentrations associated with the receptors defined for the five pseudo sources which fall within the bounds of the tract. And, as in the case of point sources, the tract is assumed to be a circle with an area equal to that of the census tract for purposes of spatial averaging. One of the five pseudo sources is located at the

[2] The centroid is the geographical center of a census tract.

center of this circle. The other four sources are located halfway between the center and the hypothetical circumference in each of the four principle compass directions. For resident tracts with radii less than 0.3 km, ambient concentrations are set equal to zero.

- Non-Resident Tract: The remaining tracts in the 50 km study zone are referred to as "non-resident" tracts. The ASPEN uses a log-log interpolation procedure to estimate the pollutant concentration at the population centroid of each non-resident tract. These estimates are population-weighted.

The ASPEN User's Guide (SAI, 1999) provides more detailed descriptions of these methods.

Ideally, the concentration values provided by ASPEN are unbiased estimates of the outdoor concentration at locations within the census tract where people are likely to reside and work. The values can be used without adjustment to represent outdoor (ambient) concentrations for microenvironments that do not tend to be in close proximity to the predominant sources of the pollutant. Consequently, the appropriate *PROX* factor for such microenvironments is unity.

However, the ASPEN model estimates ambient HAP concentrations by source category (i.e., major, area, "onroad" vehicles, and "nonroad" vehicles)[3], hence the estimates of outdoor concentrations are biased low for microenvironments that are usually located near predominant sources of a pollutant. The most prevalent example of this is for HAPs emitted by onroad motor vehicles that impact microenvironments in close proximity to roadways. For onroad mobile source pollutants such as benzene, these "close proximity" microenvironments include outdoor locations near roads (HAPEM4 microenvironment No. 7), vehicles (Nos. 1, 2, 3, 4, 8, and 36), service stations (No. 10), and parking facilities (No. 6). In these cases, the appropriate proximity factor should be greater than unity.

Table 3 lists the microenvironments whose *PROX* factors (from the literature) for acetaldehyde, acrolein, benzene, 1,3-butadiene, and formaldehyde for the onroad mobile source category are greater than unity. All other combinations of pollutants, microenvironments, and source categories have been assigned a default *PROX* factor equal to 1.0 (see Appendix C).

[3] The definitions for major and area sources are in Title I of the Clean Air Act Amendments (CAAA) of 1990, while the "mobile source" terms are defined in Title II of the CAAA.

Table 3. Microenvironments that have *PROX* Factors Greater Than 1.0 for Acetaldehyde, Acrolein, Benzene, 1,3-Butadiene, and Formaldehyde For the "Onroad" Mobile-Source Category Only

MICROENVIRONMENT NO.	MICROENVIRONMENT	
	SPECIFIC	GENERAL
1	Car	In vehicle
2	Bus	In vehicle
3	Truck	In vehicle
4	Other	In vehicle
6	Parking lot/garage	Outdoors
7	Near road	Outdoors
8	Motorcycle	Outdoors
10	Service station	Outdoors
36	Train/subway	In vehicle

Literature Search

A broad literature search was conducted of all available sources containing measurement data for use in developing the *PEN* factors for HAPEM4. The search was accomplished with the aid of on-line library search engines that captured relevant literature from the United States and other countries. These library search engines included, but were not limited to, the National Technical Information Service (NTIS), Enviroline, Transportation Research Information Services (TRIS), Wilson Applied Science & Technology Abstracts, Energy Science and Technology, PASCAL, MEDLINE, TOXLINE, Occupational Safety and Health (NIOSHTIC®), and the Abstracts in New Technologies and Engineering (ANTE). The search was based on a large set of key words to ensure that it was comprehensive. The pollutants and microenvironments in Tables 1 and 2, respectively, were included as key words in the on-line search. Additional key words were used to focus the search on studies that had the potential for reporting results that had both indoor and outdoor measurements.

The search was conducted using the procedure described below.

Step 1

The on-line search was conducted using key words as described above. The search included all literature dating back to 1994. Literature published prior to 1994 was included in an earlier on-line search conducted by TRJ Environmental (see Step 5). Including years prior to 1994 in this search would have yielded more documents than could have been reviewed given the resources available for this project. The search initially yielded titles and key word descriptors for 5,424 documents encompassing all of the HAPs in Table 1 (including the six HAPs listed at the end of the table). All of the titles and key word descriptors were reviewed and ranked for the potential of containing data useful to the development of a ME factor. Three categories of rankings were used: documents that had a high probability of containing relevant information, documents that had a moderate probability of containing relevant information, and documents that were unlikely to contain, or had a low probability of containing, relevant information.

<u>Step 2</u>

The next step was to retrieve the abstracts for each citation deemed to have either a high- or moderate probability of containing both indoor and outdoor measurements for the various HAPs. Of the original set of 5,424 titles obtained in Step 1, 251 abstracts were obtained because, based on the title review, they were thought to have the potential for providing the needed information for determining *PEN* factors, (i.e., high or moderate probability). The abstracts were obtained, reviewed, and ranked in a fashion similar to that in Step 1 to determine which articles or documents were most likely to provide the needed information for calculating *PEN* factors.

<u>Step 3</u>

The third step in the literature search was to obtain the complete paper or report for each abstract from Step 2 that was categorized as having either a high or moderate probability of containing relevant information for determining *PEN* factors. Of the 251 abstracts reviewed in Step 2, 100 were categorized with either a high or moderate potential for containing the necessary information for determining a *PEN* factor. The complete documents for these 100 references were obtained and reviewed for information needed to determine *PEN* factors.

<u>Step 4</u>

Because of the relative paucity of information obtained from the on-line literature search described in the three steps above, researchers obtained additional documents from studies that preceded those of the on-line search (i.e., pre-1994). These studies were thought to contain useful information on *PEN* factors and were identified during the review of papers and reports from the original on-line search. As a result of this step, researchers obtained and reviewed an additional 39 papers and reports for useful information on *PEN* factors.

<u>Step 5</u>

Concurrent with the activities described in Steps 1 through 4, researchers re-examined literature that had been obtained for an earlier review of scientific studies related to the measurement of *PEN* factors (refer to Fletcher et al. (1999) for a description of this work). This research included a total of 68 documents that were also collected and reviewed. Researchers were careful not to duplicate the documents collected in this step with those collected in Steps 1 through 3. Most of the documents collected in this step preceded the five-year period (i.e., 1994-1999) for which the studies in Steps 1 through 3 were collected.

Grouping HAPs and Microenvironments

Because of the paucity of published I/O measurement data for most of the 1,295 HAP/ME combinations (i.e., 35 HAPs × 37 microenvironments), it was decided to group similar HAPs together. Microenvironments were also grouped based on similarity to each other. The purpose of this grouping was to allow assignment of ME factors to the groups, based on the best data available, so that more HAP/ME combinations could be covered (and to minimize the assignment of generic default values).

Microenvironmental Groups

Based on the characteristics of the 37 HAPEM4 microenvironments, each was assigned to one of five groups. Each group consists of microenvironments expected to have similar *PEN* factors, thus allowing ME factors developed for one microenvironment to be applied to other microenvironments in the same group. Table 4 shows the five ME groups used in this project, as well as the mapping between the original 37 HAPEM4 microenvironments and the five ME groups.

Table 4. Description of ME Groups

ME #	HAPEM4 Microenvironments		Location[a]	Bldg. Type[b]	ME Group[c]
	ME Designation	General ME Type			
1	Car	In vehicle	–	–	5
2	Bus	In vehicle	–	–	5
3	Truck	In vehicle	–	–	5
4	Other	In vehicle	–	–	5
5	Public garage	Indoors	–	O	2
6	Parking lot/garage	Outdoors	N	–	3
7	Near road	Outdoors	N	–	3
8	Motorcycle	Outdoors	N	–	3
9	Service station	Indoors	–	O	2
10	Service station	Outdoors	N	–	3
11	Residential garage	Indoors	–	R	1
12	Other repair shop	Indoors	–	O	2
13	Residence - no gas stove	Indoors	–	R	1
14	Residence - gas stove	Indoors	–	R	1
15	Residence - attached garage	Indoors	–	R	1
16	Residential - stove and garage	Indoors	–	R	1
17	Office	Indoors	–	O	2
18	Store	Indoors	–	O	2

ME #	HAPEM4 Microenvironments		Location[a]	Bldg. Type[b]	ME Group[c]
	ME Designation	General ME Type			
19	Restaurant	Indoors	–	O	2
20	Manufacturing facility	Indoors	–	O	2
21	School	Indoors	–	O	2
22	Church	Indoors	–	O	2
23	Shopping mall	Indoors	–	O	2
24	Auditorium	Indoors	–	O	2
25	Health care facility	Indoors	–	O	2
26	Other public building	Indoors	–	O	2
27	Other location	Indoors	–	O	2
28	Not specified	Indoors	–	O	2
29	Construction site	Outdoors	A	–	4
30	Residential grounds	Outdoors	A	–	4
31	School grounds	Outdoors	A	–	4
32	Sports arena	Outdoors	A	–	4
33	Park/golf course	Outdoors	A	–	4
34	Other location	Outdoors	A/N	–	3/4[d]
35	Not specified	Outdoors	A/N	–	3/4[d]
36	Train/subway	In vehicle	–	–	5
37	Airplane	In vehicle	–	–	5

[a] N = near road; A = away from road
[b] R = residence; O = other building
[c] 1 = indoors - residence; 2 = indoors - other building; 3 = outdoors, near road; 4 = outdoors, away from road; 5 = in vehicle
[d] Use average of factors determined for Groups 3 and 4.

The five ME groups were established based on the general ME type (indoor, outdoor, or in-vehicle), expected location relative to roadways (near road, away from road), and building type (residence, other). This five-group classification shown in Table 4 is similar to the ME categories used in previous versions of the HAPEM. The current groupings include information on location for outdoor microenvironments and building type for indoor microenvironments. *PROX* factors are likely to be influenced by ME location relative to roadway sources, while *PEN* factors are affected by the structural design and usage patterns of indoor microenvironments.

In general, researchers used the actual HAPEM4 ME designations to assign a microenvironment to one of the five groups. However, for certain microenvironments, researchers used CO concentration data from a personal exposure monitoring study in Denver to determine whether the microenvironment should be assigned to a "near road" or "away from road" group (USEPA, 1984). Researchers assigned two indoor microenvironments with broad descriptors ("other indoor location" and "indoors, not specified") to non-residence groups on the assumption that these microenvironments are not used to indicate residential locations.

Although these ME groups can be useful in situations where no data are available in the literature for a particular HAP/ME combination, there are limitations to this method of approximation. Different microenvironments, even those in the same group, have unique characteristics which may cause them to have different ME factors for some or all pollutants. However, the use of ME groups (essentially, extrapolating available data to closely related situations) is considered preferable to the use of more generic default assumptions.

<u>Pollutant Lifetime Groups</u>

For the purpose of estimating *PEN* factors for pollutants without I/O ratios available in the literature, researchers used the lifetime grouping method developed by TRJ Environmental (see Long and Johnson, 1999; included here in Appendix A). This method classifies HAPs into five groups based on expected atmospheric residence lifetime. The HAPs belonging to each group are expected to have similar decay or removal rates in typical microenvironments. However, in the case of certain HAPs, insufficient data were available to definitively assign them exclusively into either the short, medium, or long lifetime categories. Therefore, these HAPs [identified as lifetime Groups 2 (medium short lifetime category) and 4 (medium long lifetime category) in Table 5] were assigned to Group 3 (medium lifetime category) for this project. Furthermore, Groups 2 and 4 contain only three HAPs for which no literature data were available for most microenvironments. In the future, as additional data on atmospheric lifetimes of HAPs become available, it may be possible to further subdivide these categories into additional groupings having narrower time increments and then reassign the HAPs among the larger number of groups. Because the atmospheric lifetime of a pollutant should be a major factor in determining its I/O ratio for a given microenvironment (in the absence of indoor sources), pollutants in each lifetime group should exhibit similar *PEN* factors.

Researchers considered both atmospheric transformation reactions for gaseous HAPs and removal by deposition for particle-phase HAPs. Although the groups are not directly derived from structure or composition of each HAP, some broad associations can be made between structural class (e.g., aromatics, halogenated hydrocarbons) and lifetime group. Table 5 lists the lifetime group for each of the HAPs considered in this project, and the paper in Appendix A gives the lifetime classification for all 188 HAPs.

Table 5. HAP Groups for Use in HAPEM4

HAP #	Pollutant	Lifetime Group[b]	Source Distribution Group[c]	Predominant Ambient Sources
1	acetaldehyde	1	LN	motor vehicles (rxn product)
2	acrolein	1	LN	motor vehicles (rxn product)
3	acrylonitrile	4[d]	PS	chemical manufacturing facilities (vehicle exhaust)
4	arsenic compounds	5	PS	smelters; semiconductor manufacturing
5	benzene[a]	5	LN	motor vehicles; chemical manufacturing
6	beryllium compounds	5	PS	smelters; metal manufacturing
7	1,3-butadiene	1	LN	motor vehicles; chemical manufacturing
8	cadmium compounds	5	PS	smelters; power generation
9	carbon tetrachloride	5	PD	various manufacturing facilities; agricultural chemicals
10	chloroform	5	PD	dry cleaning
11	chromium compounds	5	PS	smelters; metal manufacturing facilities; power generation
12	coke oven emissions	--	PS	blast furnaces and steel mills
13	1,2-dichloroethane (ethylene dichloride)	5	PD	metal degreasing; chemical preparations
14	1,3-dichloropropene	1	AR	agricultural soil fumigation
15	ethylene dibromide (dibromoethane)	5	PS	chemical manufacturing
16	ethylene oxide	5	AR	agricultural fumigation
17	formaldehyde	3	LN	motor vehicles (rxn product)
18	hexachlorobenzene	5	AR	hydraulic cement; agricultural use as pesticide
19	hydrazine	1	PS	chemical manufacturing
20	lead compounds - organic	--	--	sources unknown (formerly motor vehicles; lead additives)
21	lead compounds - inorganic	5	PS	smelters; manufacturing facilities; power generation
22	manganese compounds	5	PS	various manufacturing
23	mercury compounds	5	PS	power generation; various manufacturing facilities

HAP #	Pollutant	Lifetime Group[b]	Source Distribution Group[c]	Predominant Ambient Sources
24	methylene chloride (dichloromethane)	5	PS	chemical and semiconductor manufacturing; laboratories
25	nickel compounds	5	PS	smelters; power generation; various manufacturing
26	7-PAH (2 categories: lower and upper bound)	2[d]	AR	residential burning (fireplaces, grills); diesel exhaust
27	polychlorinated biphenyls (aroclors)	5	PD	waste incineration and disposal; atmospheric redistribution
28	propylene dichloride (1,2-dichloropropane)	5	PD	dry cleaning; various manufacturing facilities
29	quinoline	3	PS	various manufacturing facilities
30	styrene	1	PS	polymer manufacturing facilities
31	2,3,7,8-TCDD (2 categories: lower and upper bound)	3	AR	residential burning; waste incineration; manufacturing; atmospheric redistribution
32	1,1,2,2-tetrachloroethane	5	PD	metal degreasing
33	tetrachloroethylene (perchloroethylene)	5	PD	dry cleaning; metal degreasing
34	trichloroethylene	5	PD	chemical manufacturing
35	vinyl chloride	2[d]	PS	chemical manufacturing

[a] Pollutants that have a long atmospheric lifetime and a line source distribution. These pollutants are expected to have ME factors similar to those developed for CO.
[b] Estimated atmospheric lifetimes. 1 = short (<1 day); 2 = medium short; 3 = medium (1-5 days); 4 = medium long; 5 = long (>5 days).
[c] Expected distribution of ambient sources. AR = area sources (e.g., residential fireplaces); LN = line sources (e.g., roadways); PD = point sources, densely distributed (e.g., dry cleaning establishments); PS = point sources, sparsely distributed (e.g., smelters, manufacturing facilities).
[d] Were placed in Group 3 for estimation of ME factors.

There are a number of limitations to the pollutant lifetime grouping method. One limitation is that the method does not explicitly consider the effect of multiple phases of a single pollutant on HAP lifetimes. This approach treats semi-volatile organics and other pollutants that may be present in both gas and particle phases as gaseous pollutants. Another limitation of the method is that it does not account for the production of HAPs through atmospheric transformations. Also, the method does not consider effects of HAP sorption by materials in indoor microenvironments.

RESULTS

The detailed results of the literature review are found in Appendix B. An electronic version of this information is available in the file called App_B.wpd. The first column, *Ref. No.*, has two integers separated by a hyphen. The first number always refers to the pollutant number as defined in Table 1, and the second number always refers to the microenvironment number, as defined in Table 2. The second column contains information retrieved from the literature source, including the pollutants addressed, the authors of the paper or report, the microenvironments investigated, and other information pertinent to this project. Data on ME factors, or concentration data that can be used to calculate ME factors, have been bolded. The third and last column, *Sources*, contains a code identifying the reviewer and assigning a tracking number to each reviewed document.

An Excel spreadsheet was developed that summarizes the results of the literature search described above. This file, named All_Articles.xls (provided in electronic format only), is intended to give a quick glance of the title of the paper or report, the authors, the pollutants considered, and a brief description of the results from each of the documents. In addition, there is a column entitled *Sources*; the codes in this column are matched to the codes in the *Sources* column of App_B.wpd. The documents in All_Articles.xls that do not have a code in the *Sources* column were from the earlier Fletcher et al. (1999) work described in Step 5 of the *Literature Search* subsection of the *Methodology*. The All_Articles.xls file contains four worksheets, one for each of the three researchers that reviewed the literature, and a fourth that combines all of the information from the previous three worksheets. Within each worksheet, the documents reviewed are divided between those that yielded information on ME factors (these are found at the top of each worksheet), and those reviewed papers or reports that did not provide information on ME factors. The two sections of each worksheet are divided by a bright yellow band.

Because this project is concerned with developing *PEN* factors for ambient pollutants that penetrate into indoor microenvironments, not all of the data reported in App_B.wpd are useful; that is, most of the I/O measurement studies of HAPs report indoor concentrations that are substantially greater than those measured outdoors. This is attributable to indoor sources of the HAPs being measured, which are not a primary concern of this project. Therefore, the I/O ratios are typically greater (often by a substantial amount) than unity. For this reason, the following guidelines were employed to calculate the *PEN* factors from studies that reported I/O measurement data:

Case 1: If a study reports I/O measurement data whose median and/or mean is less than or equal to unity, then this value is used with preference given to the median. If more than one study reports mean and/or median I/O values less than or equal to unity, then the average of the values from these studies are used. Note, however, that median and mean values are not combined to form an average.

Case 2: For situations not covered by Case 1, and where only the range of I/O values were reported, and the range extended below unity, the

PEN (I/O) factor was calculated by splitting the difference between the minimum value in the range and 1.0.

Case 3: For HAP/ME combinations where there was no indication of the I/O ratio being less than unity, 1.0 was used as a default value.

The results of the assignment of *PEN* and *PROX* factors are provided in Appendix C (also provided electronically in the file named App_C.wpd). Appendix C shows each pollutant (one pollutant per page), the HAPEM4 microenvironments and associated ME numbers, and the HAPEM4 ME (i.e., *PEN*, *PROX*, and *MULT*) factors defined above. In addition, there is a column for the additive, or *ADD*, values, i.e., concentrations that represent the contribution to a microenvironment from a source(s) within the microenvironment (e.g., benzene from smoking in a residence or in an automobile). Although identification of *ADD* factors was not within the scope of this project, they have been estimated for several HAP/ME combinations and can be included after the data are compiled. *PEN* factors for coke oven emissions (HAP #12) and MTBE could not be estimated since there was insufficient information to categorize them using the lifetime grouping methodology. The *Data Code* column in Appendix C indicates how the *PEN* and *PROX* factors were derived for each HAP/ME combination:

1 – indicates that measurement data for that particular combination were available and used,
2 – indicates that useful measurement data for the HAP/microenvironment pair were not available, and the *PEN* or *PROX* factor was obtained through the grouping scheme described in the *Methodology*,
3 – indicates that a default value of 1.0 was used. Note that for the *PEN* factors, the use of this default value only applies to those outdoor microenvironments that were in Groups 3 and 4 (see the *Grouping HAPs and Microenvironments* subsection of the *Methodology*).

Finally, the codes in the *Ref. Sources* column are directly matched to the *Sources* codes in Appendix B (as well as the App_B.wpd file) and the All_Articles.xls file.

DISCUSSION

The Use of a Linear Model for the Initial NATA Assessment

Equation 4 is acknowledgably an oversimplification of the physical processes that affect ME concentrations. In addition, Equation 4 does not include probabilistic components to account for the inherent variability of these processes. Ideally, ME concentrations would be estimated through the use of a probabilistic mass balance algorithm similar to those incorporated in recent versions of the probabilistic NAAQS[4] Exposure Model for Ozone (pNEM/O_3) (Johnson et al., 1996) and the probabilistic NAAQS Exposure Model for Carbon Monoxide (pNEM/CO) (Johnson et al., 2000). These exposure models provide short-term (i.e., less than 1 hour) estimates of ME concentrations which account for time-varying changes in outdoor (ambient)

[4] National Ambient Air Quality Standards

concentration, air exchange rate, filtration, decay and other removal processes, and indoor emission rates. Values for the various parameters are selected from appropriate distributions that are specific to pollutant and microenvironment.

A mass-balance modeling algorithm was not implemented in HAPEM4 because (1) the refinement would have greatly increased computer program run times and (2) available data were judged inadequate for developing distributions for many of the algorithm parameters. In addition, the initial NATA assessment was focused on annual exposures which were assumed to be relatively insensitive to the short-term variations in ME concentrations provided by mass balance models. This assumption was based on the observation that the relationship between ME concentration and ambient concentration tends to become more linear as averaging time increases. For example, Dockery and Spengler (1981) analyzed a mass balance model applicable to particulate matter and found that the long-term relationship between indoor and outdoor concentration could be approximated by a simple linear function. The coefficients of this function were determined by performing linear regression analyses on empirical data.

The assumption of linearity has been used in other exposure models applied to HAPs. For example, the Benzene Exposure and Absorbed Dose Simulation (BEADS) model developed by MacIntosh et al. (1995) estimated the benzene concentration inside vehicles by the expression:

$$\text{benzene inside vehicle} = \alpha + (\beta)(\text{ambient benzene})$$

where the coefficients α and β were randomly selected from normal distributions. The means of these distributions were based on the results of a regression analysis performed by Chang et al. (1991) on empirical data collected during a field study in Raleigh, North Carolina.

To summarize, mass balance models are preferred when short-term exposure estimates are required and when analysts are able to identify appropriate data for estimating model parameters. Linear models such as Equation 4 are considered more appropriate for screening level analyses such as the initial NATA that attempts to estimate long-term (e.g., annual) exposures. This is because, compared to mass balance models, linear models typically require less data for parameter estimation and run faster.

SUMMARY

This project provides an up-to-date investigation into the availability of scientific studies that reported concurrent indoor and outdoor measurements of HAPs. We found that relatively few studies had concurrently measured indoor and outdoor concentrations of the HAPs listed in Table 1. Examination of the results of the literature review (Appendix B) revealed that much of the published measurement data were for aromatic hydrocarbons, particularly the BTEX compounds (i.e., benzene, toluene, ethylbenzene, and xylenes). Furthermore, the studies reported I/O values for only a few of the many microenvironments of interest to this work. These key microenvironments included automobiles (HAPEM4 microenvironment #1), residences (#13), and offices (#17). We found the I/O values reported in the literature to be highly variable, with most of the values being greater than unity, indicating a source(s) of the HAPs in the indoor microenvironment.

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APPENDIX A

LIFETIME GROUPING METHODOLOGY

(Memo to EPA from TRJ Environmental, Inc.)

(In files: TRJmemo2.wpd; TRJtable.wpd)

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MEMORANDUM

To: Ted Palma, USEPA

From: Tom Long and Ted Johnson
TRJ Environmental, Inc.

Date: April 6, 1999

Project: EPA Purchase Order 8D-2091-NALX
TRJ Project No. 324

Memo No. 2: Classification of Hazardous Air Pollutants into Groups Likely to Exhibit Similar Microenvironmental Factors

Under Purchase Order No. 8D-2091-NALX, TRJ Environmental, Inc. (TRJ) is assisting the U. S. Environmental Protection Agency (EPA) in developing microenvironmental factors suitable for use with the current version of the Hazardous Air Pollutant Exposure Model (HAPEM). In typical applications, HAPEM estimates the concentration in a particular microenvironment (C_{ME}) by the linear relationship

$$C_{ME} = ADD + (MULT)(C_{out})$$

in which C_{out} is the outdoor (ambient) pollutant concentration. The microenvironmental factors ADD and MULT are constants specific to the microenvironment and pollutant. Usually ADD represents the contribution of indoor sources, whereas MULT is the ratio of indoor to outdoor concentration expected when there are no indoor sources.

A recent memorandum prepared by Fletcher, LaPointe, Long, and Johnson (1999) summarizes the results of an in-depth review of relevant field research which may be useful in estimating microenvironmental factors. This memorandum presents the results of a supplementary effort in which Tom Long of TRJ evaluated the physical and chemical properties of each HAP and then attempted to assign the HAP to one of five groups. The HAPs belonging to each group are expected to exhibit similar decay or removal rates in typical microenvironments. As the indoor/outdoor (I/O) ratio in the absence of indoor sources (i.e., MULT) is typically a function of the decay/removal rate, these groupings should provide a means for making rough estimates of MULT when measured indoor/outdoor data are unavailable or ambiguous.

This memorandum summarizes the development of the grouping method, describes the method itself, and outlines some limitations of the method which indicate the need for further research and data collection. Tables attached to the report classify 179 of the 189 HAPs into five groups likely to have similar (microenvironmental) ME factors. For the remaining 10 HAPs, insufficient information was available to assign them to ME groups.

Overview of Project

TRJ initiated the work effort by performing a literature search to identify articles pertaining to the relationship between indoor/outdoor concentration (I/O) ratios and the kinetics of HAP removal from the atmosphere. Based on this literature review, a grouping method was developed which assigns HAPs to groups according to their estimated half-lives or lifetimes in the atmosphere.

Five groups were established, ranging from compounds with short lifetimes to those with long lifetimes. A table is included for each of the five groups which lists the phase, structural class, and type of removal mechanism for each HAP. Other information is also included when applicable, such as whether the HAP is likely to be present in more than one phase, or whether the HAP is either a product or a precursor in transformation reactions involving other HAPs.

This method has several limitations, primarily due to the limited amount of information available in the literature. Only broad groupings are possible, and ranking of compounds within a group cannot be accomplished at this point. Although HAPs likely to be present in multiple phases are identified, lifetimes are only computed for a single phase (usually the gas phase). In addition, reported lifetimes do not include production of HAPs from atmospheric transformation reactions. Sorption, which can be a removal mechanism over the short term and a source in the long term, is not included in the lifetime estimate.

Background Work and Literature Search

A literature search for this portion of the project identified several articles which were directly useful in developing the grouping method. These articles are briefly summarized below.

- Kelly et al. (1994) prepared a summary of all ambient concentrations and atmospheric lifetimes reported in the literature for the 189 HAPs identified in the 1990 Clean Air Act Amendments. "Lifetime" was defined as the time required for a one-unit logarithmic (base *e*) decrease in concentration, and the reported lifetimes were grouped into bins of <1 day, 1 – 5 days, and >5 days. Lifetime information was available for all but 11 of the 189 HAPs. The lifetimes given in this database formed the basis for the HAP grouping method.

- Atkinson (1986) prepared an extensive review of the kinetics of atmospheric reactions between hydroxyl radical and various organic compounds. The atmospheric lifetime of triethylamine, one of the HAPs without lifetime information given in Kelly et al. (1994), was estimated from this reference.

- Fogh et al. (1997) measured deposition rates for generated, radiolabeled 0.5 mm particles in residences by subtracting the air exchange rate from the total removal rate. The deposition rate was then related to the deposition velocity and particle diameter. This reference is useful in estimating lifetimes for particulate matter of known diameter.

- One article provided additional information on I/O ratios for HAPs which is useful for relating atmospheric lifetime to I/O ratio. Lewis & Zweidinger (1992) measured I/O ratios for several compounds, including benzene and lead.

In addition to the above articles, information gathered by Fletcher, LaPointe, Long, and Johnson (1999) during the literature review on I/O ratios was considered in grouping pollutants.

Description of Proposed Grouping Method

The proposed method for grouping HAPs with similar ME factors is based on the concept that a compound's atmospheric lifetime will determine its I/O ratio in the absence of indoor sources. If the removal rate of a particular compound in an indoor ME is low, over time the indoor concentration of the compound will build up until it is nearly equal to the outdoor concentration. If the removal rate is high, that is, if the atmospheric lifetime is short, the indoor concentration will remain low relative to the outdoor concentration. Therefore, compounds with similar atmospheric lifetimes should have similar I/O ratios.

This method groups together HAPs with similar atmospheric lifetimes. Sufficient information is available in the literature to classify the 189 HAP into five lifetime groups: those with short, medium-short, medium, medium-long, and long atmospheric lifetimes. As more lifetime data become available, it may be possible to further subdivide these groups or to rank the HAPs within the groups, but for the time being, no more than five groups can be identified.

Atmospheric lifetimes are generally those estimated by Kelly et al. (1994). For gaseous, reactive HAPs, several atmospheric transformation reactions were considered, including reaction with hydroxyl radical, ozone, liquid water, and light (photolysis). For particle-phase HAPs, dry and wet deposition were included as removal mechanisms. In some cases, lifetimes were directly available in the literature; for other HAPs, Kelly et al. (1994) used reported or estimated rate constants to calculate lifetimes. For triethylamine, TRJ Environmental estimated a rate constant and lifetime based on kinetic data from Atkinson (1986).

The groups created by this method are not directly related to structure or composition of the HAPs. Nevertheless, some structural classes appear to be associated with a particular lifetime range (e.g., aromatics tend to have short lifetimes). This may allow the remaining few HAPs without lifetime information to be assigned to a ME group on a preliminary basis.

With additional analysis, it may be possible to assign a range of I/O ratios (MULT values) to each of the five groupings based on the lifetime characterization. In general, the I/O ratios should decrease as lifetime decreases. The relationship between I/O ratio and structural class (e.g., halogenated aromatics) is discussed below.

HAP Lifetime Groups

The HAPs in each of the five lifetime groups are listed in Tables I - V. Table VI lists those HAPs without lifetime information, and Table VII summarizes the distribution of structural classes among the lifetime groups. Each table entry provides the name of a HAP, its CAS registry number, the predominant phase in which it is found in indoor air, its classification into one of ten structural groups, and the predominant mechanism for its removal from indoor air. A comments column is also included which provides information on existence of multiple phases, the likelihood of HAP formation in the atmosphere, metal densities, and other details.

Table VII indicates that broad associations can be made between some structural classes and lifetime groups. In particular, aromatics, hydrocarbons, nitrogenated organics, pesticides, and sulfates tend to be short-lived in the atmosphere, whereas halogenated aromatics, halogenated hydrocarbons, and inorganics tend to have long lifetimes. Oxygenated organics and phthalates have a range of lifetimes. These correlations may be useful in estimating the lifetime of a compound in the absence of other information, but they should be used with caution since not all compounds in each class follow the trend.

Method Limitations

Although a number of HAPs are likely to be present in more than one phase in the atmosphere, the proposed grouping method does not explicitly consider the effect of multiple phases on HAP lifetime. HAPs are considered to be in the gas phase unless the particle phase is clearly more important. This approach treats hydrophobic pesticides and other semi-volatile organic compounds, which may be associated with particles, as gaseous pollutants. HAPs likely to be in more than one phase are identified in the attached grouping tables.

Another limitation of this method is that it does not account for the production of HAPs through the transformation of other atmospheric contaminants, including other HAPs. Generation of HAPs in the atmosphere, such as formaldehyde, would tend to decrease their overall removal rate and extend their atmospheric lifetime. It is also relevant to consider which HAPs are likely to be precursors of other HAPs, so that information on concentration of precursors may be used to help determine expected concentrations of products.

The effect of HAP sorption to the contents of indoor MEs, such as carpeting and furniture, is also not considered in this grouping method. Over the short term, sorption could be a removal mechanism, decreasing the indoor concentration of a HAP. Conversely, if a large sorbed mass of a HAP is present in a ME, the sorbed fraction could act as an indoor source, increasing the HAP concentration. These competing effects make it difficult to determine the influence of sorption on indoor concentration and I/O ratio.

Recommendations for Further Work

Assigning a range of MULT values to each of the lifetime groups will improve the usefulness of this grouping method. Analysis of I/O ratios available in the literature for compounds in each of the five lifetime classes should help determine the proper range for each group. As additional data become available on both atmospheric lifetimes and I/O ratios, this information will strengthen the quantitative relationship between the lifetime groups and MULT values.

Inclusion of other removal (and source) mechanisms in the method is another area for future work. Precursor/product relationships among HAPs can be investigated further to help determine which HAPs are likely to show a significant effect on I/O ratio due to transformation reactions. HAPs involved in sorptive interactions which may act either to reduce or increase indoor concentration can also be identified. Some information is available on particle density, but the relationship between density and particle deposition rate may be useful for refining the grouping method.

Additional work on grouping HAPs may allow further subdivision of the current five groups and ranking of pollutants within the groups, improving the utility of the method for estimating ME factors for HAPs without I/O concentration data.

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Table I. HAPs with short atmospheric lifetimes (< 1 day).

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
acetaldehyde	75-07-0	gas	Oxy Org	reaction	
acetamide	60-35-5	gas	Nitro Org	reaction	
2-acetylaminofluorene	53-96-3	gas	Nitro Org	reaction	also particle phase
acrolein	107-02-8	gas	Oxy Org	reaction	
acrylic acid	79-10-7	gas	Oxy Org	reaction	
allyl chloride	107-05-1	gas	Hal Hydro	reaction	
4-aminobiphenyl	92-67-1	gas	Nitro Org	reaction	also particle phase
aniline	62-53-3	gas	Nitro Org	reaction	
o-anisidine	90-04-0	gas	Nitro Org	reaction	
benzidine	92-87-5	gas	Nitro Org	reaction	also particle phase
bis(2-ethylhexyl) phthalate	117-81-7	gas	Phthal	reaction	also particle phase
1,3-butadiene	106-99-0	gas	Hydro	reaction	
calcium cyanamide	156-62-7	particle	Inorg	reaction	
captan	133-06-2	gas	Pestic	reaction	also particle phase
carbaryl	63-25-2	gas	Pestic	reaction	also particle phase
catechol	120-80-9	gas	Arom	reaction	
chlordane	57-74-9	gas	Pestic	reaction	also particle phase
chlorine	7782-50-5	gas	Inorg	photolysis	
chlorobenzilate	510-15-6	gas	Pestic	reaction	also particle phase
chloroprene	126-99-8	gas	Hal Hydro	reaction	
cresols/cresylic acid	1319-77-3	gas	Arom	reaction	
o-cresol	95-48-7	gas	Arom	reaction	
m-cresol	108-39-4	gas	Arom	reaction	
p-cresol	106-44-5	gas	Arom	reaction	
cumene	98-82-8	gas	Arom	reaction	
2,4-D, salts and esters	94-75-7	gas	Pestic	reaction	also particle phase
DDE	3547-04-4	gas	Pestic	photolysis	also particle phase
diazomethane	334-88-3	gas	Nitro Org	rxn with ozone	

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
dibenzofurans	132-64-9	gas	Oxy Org	reaction	also particle phase
dibutylphthalate	84-74-2	gas	Phthal	reaction	also particle phase
3,3'-dichlorobenzidene	91-94-1	gas	Nitro Org	photolysis	also particle phase
1,3-dichloropropene	542-75-6	gas	Hal Hydro	reaction	
dichlorvos	62-73-7	gas	Pestic	reaction	
diethanolamine	111-42-2	gas	Nitro Org	reaction	
n,n-diethyl aniline	121-69-7	gas	Nitro Org	reaction	
diethyl sulfate	64-67-5	gas	Sulfat	rxn with liquid water	
3,3'-dimethoxybenzi-dine	119-90-4	gas	Nitro Org	reaction	also particle phase
dimethyl aminoazobenzene	60-11-7	gas	Nitro Org	reaction	also particle phase
3,3'-dimethyl benzidine	119-93-7	gas	Nitro Org	reaction	also particle phase
dimethyl carbamoyl chloride	79-44-7	gas	Nitro Org	reaction	
1,1-dimethyl hydrazine	57-14-7	gas	Nitro Org	reaction	
dimethyl sulfate	77-78-1	gas	Sulfat	rxn with liquid water	
1,2-diphenylhydrazine	122-66-7	gas	Nitro Org	reaction	
ethyl benzene	100-41-4	gas	Arom	reaction	
ethyl carbamate (urethane)	51-79-6	gas	Nitro Org	reaction	
heptachlor	76-44-8	gas	Pestic	reaction	
hexachlorocyclopenta-diene	77-47-4	gas	Hal Hydro	reaction	
hexane	110-54-3	gas	Hydro	reaction	
hydrazine	302-01-2	gas	Nitro Org	reaction	
isophorone	78-59-1	gas	Oxy Org	reaction	
lindane (all isomers)	58-89-9	gas	Pestic	reaction	also particle phase
maleic anhydride	108-31-6	gas	Oxy Org	reaction	also particle phase
methoxychlor	72-43-5	gas	Pestic	reaction	also particle phase
methyl ethyl ketone (2-butanone)	78-93-3	gas	Oxy Org	photolysis	

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
methyl hydrazine	60-34-4	gas	Nitro Org	reaction	
methyl isocyanate	624-83-9	gas	Nitro Org	reaction	
4,4'-methylene bis(2-chloroaniline)	101-14-4	gas	Nitro Org	reaction	also particle phase
methylene diphenyl diisocyanate (MDI)	101-68-8	gas	Nitro Org	reaction	
4,4-methylenedianiline	101-77-9	gas	Nitro Org	reaction	also particle phase
napthalene	91-20-3	gas	Arom	reaction	
2-nitropropane	79-46-9	gas	Nitro Org	reaction	
N-nitroso-*N*-methylurea	684-93-5	gas	Nitro Org	reaction	
N-nitrosodimethyl-amine***	62-75-9	gas	Nitro Org	photolysis	
N-nitrosomorpholine	59-89-2	gas	Nitro Org	reaction	
parathion	56-38-2	gas	Pestic	reaction	also particle phase
phenol	108-95-2	gas	Oxy Org	reaction	
p-phenylenediamine	106-50-3	gas	Nitro Org	reaction	
phosphine	7803-51-2	gas	Inorg	reaction	
phosphorus	7723-14-0	particle	Inorg	rxn with oxygen	
propoxur (Baygon)	114-26-1	gas	Pestic	reaction	also particle phase
1,2-propylenimine (2-methyl-aziridine)	75-55-8	gas	Nitro Org	reaction	
styrene	100-42-5	gas	Arom	reaction	
2,4-toluene diamine	95-80-7	gas	Nitro Org	reaction	also particle phase
2,4-tolune diisocyanate	584-84-9	gas	Nitro Org	reaction	
o-toluidine	95-53-4	gas	Nitro Org	reaction	
triethylamine	121-44-8	gas	Nitro Org	reaction	
trifluralin	1582-09-8	gas	Pestic	reaction	also particle phase
vinyl acetate	108-05-4	gas	Oxy Org	reaction	
vinylidene chloride (1,1-dichloroethylene)	75-35-4	gas	Hal Hydro	reaction	
xylenes (isomers and mixture)	1330-20-7	gas	Arom	reaction	

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
o-xylenes	95-47-6	gas	Arom	reaction	
m-xylenes	108-38-3	gas	Arom	reaction	
glycol ethers	0	gas	Oxy Org	reaction	

[a] Structural class abbreviations: Arom = aromatic; Hal Arom = halogenated aromatic; Hal Hydro = halogenated hydrocarbon; Hydro = hydrocarbon; Inorg = inorganic; Nitro Org = nitrogenated organic; Oxy Org = oxygenated organic; Pestic = pesticide; Phthal = phthalate; Sulfat = sulfate
[b] Reaction is with hydroxyl radical unless indicated otherwise

Table II. HAPs with short to medium atmospheric lifetimes (< 1 day to 1-5 days).

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
bis(chloromethyl)ether	542-88-1	gas	Oxy Org	rxn with liquid water	
chloromethyl methyl ether	107-30-2	gas	Oxy Org	rxn with liquid water	
ethylene imine (aziridine)	151-56-4	gas	Nitro Org	reaction	
methyl methacrylate	80-62-6	gas	Oxy Org	reaction	
vinyl bromide	593-60-2	gas	Hal Hydro	reaction	
vinyl chloride	75-01-4	gas	Hal Hydro	reaction	
p-xylenes	106-42-3	gas	Arom	reaction	
polycyclic organic matter	0	gas	Arom	reaction	also particle phase

[a] Structural class abbreviations: Arom = aromatic; Hal Arom = halogenated aromatic; Hal Hydro = halogenated hydrocarbon; Hydro = hydrocarbon; Inorg = inorganic; Nitro Org = nitrogenated organic; Oxy Org = oxygenated organic; Pestic = pesticide; Phthal = phthalate; Sulfat = sulfate
[b] Reaction is with hydroxyl radical unless indicated otherwise

Table III. HAPs with medium atmospheric lifetimes (1-5 days).

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
acetophenone	98-86-2	gas	Oxy Org	reaction	
dichloroethyl ether	111-44-4	gas	Oxy Org	reaction	
dimethyl phthalate	131-11-3	gas	Phthal	reaction	
2,4-dinitrotoluene	121-14-2	gas	Nitro Org	photolysis	
1,4-dioxane (1,4-diethyleneoxide)	123-91-1	gas	Oxy Org	reaction	
1,2-epoxybutane	106-88-7	gas	Oxy Org	reaction	
ethyl acrylate	140-88-5	gas	Oxy Org	rxn with ozone	
ethylene glycol	107-21-1	gas	Oxy Org	reaction	
ethylidene dichloride (1,1-dichloroethane)	75-34-3	gas	Hal Hydro	reaction	
formaldehyde	50-00-0	gas	Oxy Org	photolysis	formed in atmospheric reactions
hydrochloric acid	7647-01-0	gas	Inorg	deposition	
hydrogen fluoride (hydrofluoric acid)	7664-39-3	gas	Inorg	deposition	
hydroquinone	123-31-9	gas	Oxy Org	reaction	also particle phase
methanol	67-56-1	gas	Oxy Org	reaction	
methyl isobutyl ketone (hexanone)	108-10-1	gas	Oxy Org	reaction	
methyl *tert*-butyl ether	1634-04-4	gas	Oxy Org	reaction	
phosgene	75-44-5	gas	Oxy Org	rxn with liquid water	
1,3-propane sulfone	1120-71-4	gas	Oxy Org	reaction	
propionaldehyde	123-38-6	gas	Oxy Org	reaction	
quinoline	91-22-5	gas	Nitro Org	reaction	
styrene oxide	96-09-3	gas	Oxy Org	reaction	
2,3,7,8-tetrachloro-dibenzo-*p*-dioxin	1746-01-6	gas	Hal Arom	reaction	also particle phase
toluene	108-88-3	gas	Arom	reaction	
2,2,4-trimethylpentane	540-84-1	gas	Hydro	reaction	

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
radionuclides	0	particle	Inorg	radioactive decay	radon in gas phase

[a] Structural class abbreviations: Arom = aromatic; Hal Arom = halogenated aromatic; Hal Hydro = halogenated hydrocarbon; Hydro = hydrocarbon; Inorg = inorganic; Nitro Org = nitrogenated organic; Oxy Org = oxygenated organic; Pestic = pesticide; Phthal = phthalate; Sulfat = sulfate

[b] Reaction is with hydroxyl radical unless indicated otherwise

Table IV. HAPs with medium to long atmospheric lifetimes (1-5 days to > 5 days).

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
acrylonitrile	107-13-1	gas	Nitro Org	reaction	
benzyl chloride	100-44-7	gas	Hal Arom	reaction	
carbon disulfide	75-15-0	gas	Inorg	reaction	
4-nitrobiphenyl	92-93-3	gas	Nitro Org	reaction	also particle phase
4-nitrophenol	100-02-7	gas	Nitro Org	reaction	also particle phase

[a] Structural class abbreviations: Arom = aromatic; Hal Arom = halogenated aromatic; Hal Hydro = halogenated hydrocarbon; Hydro = hydrocarbon; Inorg = inorganic; Nitro Org = nitrogenated organic; Oxy Org = oxygenated organic; Pestic = pesticide; Phthal = phthalate; Sulfat = sulfate

[b] Reaction is with hydroxyl radical unless indicated otherwise

Table V. HAPs with long atmospheric lifetimes (> 5 days).

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
acetonitrile	75-05-8	gas	Nitro Org	reaction	
asbestos	1332-21-4	particle	Inorg	deposition	
benzene	71-43-2	gas	Arom	reaction	
benzotrichloride	98-07-7	gas	Hal Arom	reaction	
carbon tetrachloride	56-23-5	gas	Hal Hydro	photolysis	
carbonyl sulfide	463-58-1	gas	Oxy Org	reaction	
chloroacetic acid	79-11-8	gas	Oxy Org	reaction	
2-chloroacetophenone	532-27-4	gas	Oxy Org	reaction	
chlorobenzene	108-90-7	gas	Hal Arom	reaction	
chloroform	67-66-3	gas	Hal Hydro	reaction	
1,2-dibromo-3-chloro-propane	96-12-8	gas	Hal Hydro	reaction	
1,4-dichlorobenzene(*p*)	106-46-7	gas	Hal Arom	reaction	
4,6-dinitro-*o*-cresol, and salts	534-52-1	gas	Nitro Org	reaction	also particle phase
2,4-dinitrophenol	51-28-5	gas	Nitro Org	reaction	also particle phase
epichlorohydrin (1-chloro-2,3-epoxy-propane)	106-89-8	gas	Oxy Org	reaction	
ethyl chloride (chloroethane)	75-00-3	gas	Hal Hydro	reaction	
ethylene dibromide (dibromoethane)	106-93-4	gas	Hal Hydro	reaction	
ethylene dichloride (1,2-dichloroethane)	107-06-2	gas	Hal Hydro	reaction	
ethylene oxide	75-21-8	gas	Oxy Org	reaction	
hexachlorobenzene	118-74-1	gas	Hal Arom	reaction	
hexachlorobutadiene	87-68-3	gas	Hal Hydro	reaction	
hexachloroethane	67-72-1	gas	Hal Hydro	reaction	
methyl bromide (bromomethane)	74-83-9	gas	Hal Hydro	reaction	
methyl chloride (chloromethane)	74-87-3	gas	Hal Hydro	reaction	

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
methyl chloroform (1,1,1-trichloroethane)	71-55-6	gas	Hal Hydro	reaction	
methyl iodide (iodomethane)	74-88-4	gas	Hal Hydro	reaction	
methylene chloride (dichloromethane)	75-09-2	gas	Hal Hydro	reaction	
nitrobenzene	98-95-3	gas	Nitro Org	reaction	
pentachloronitro-benzene	82-68-8	gas	Nitro Org	reaction	
pentachlorophenol	87-86-5	gas	Oxy Org	reaction	also particle phase
phthalic anhydride	85-44-9	gas	Phthal	reaction	
polychlorinated biphenyls (Aroclors)	1336-36-3	gas	Hal Arom	reaction	also particle phase
beta-propiolactone	57-57-8	gas	Oxy Org	reaction	
propylene dichloride (1,2-dichloropropane)	78-87-5	gas	Hal Hydro	reaction	
propylene oxide	75-56-9	gas	Oxy Org	reaction	
quinone	106-51-4	gas	Oxy Org	reaction	
1,1,2,2,-tetrachloro-ethane	79-34-5	gas	Hal Hydro	reaction	
tetrachloroethylene (perchloroethylene)	127-18-4	gas	Hal Hydro	reaction	
toxaphene (chlorinated camphene)	8001-35-2	gas	Pestic	deposition	also particle phase
1,2,4-trichlorobenzene	120-82-1	gas	Hal Arom	reaction	
1,1,2-trichloroethane	79-00-5	gas	Hal Hydro	reaction	
trichloroethylene	79-01-6	gas	Hal Hydro	reaction	
2,4,5-trichlorophenol	95-95-4	gas	Oxy Org	reaction	
2,4,6-trichlorophenol	88-06-2	gas	Oxy Org	reaction	
antimony cpds	0	particle	Inorg	deposition	metal density 6.7 g/cm^3
arsenic cpds (incl. Arsine)	0	particle	Inorg	deposition	arsine in gas phase; metal density 4.7 g/cm^3
beryllium cpds	0	particle	Inorg	deposition	metal density 1.8 g/cm^3

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
cadmium cpds	0	particle	Inorg	deposition	metal density 8.6 g/cm^3
chromium cpds	0	particle	Inorg	deposition	metal density 7.1 g/cm^3
cobalt cpds	0	particle	Inorg	deposition	metal density 8.9 g/cm^3
cyanide cpds	0	particle	Inorg	deposition	cyanic acid in gas phase
lead cpds	0	particle	Inorg	deposition	metal density 11.3 g/cm^3
manganese cpds	0	particle	Inorg	deposition	metal density 7.5 g/cm^3
mercury cpds	0	gas	Inorg	rxn with aqueous ozone	metal density 13.5 g/cm^3
fine mineral fibers	0	particle	Inorg	deposition	
nickel cpds	0	particle	Inorg	deposition	metal density 8.9 g/cm^3
selenium cpds	0	particle	Inorg	deposition	metal density 4.8 g/cm^3

[a] Structural class abbreviations: Arom = aromatic; Hal Arom = halogenated aromatic; Hal Hydro = halogenated hydrocarbon; Hydro = hydrocarbon; Inorg = inorganic; Nitro Org = nitrogenated organic; Oxy Org = oxygenated organic; Pestic = pesticide; Phthal = phthalate; Sulfat = sulfate
[b] Reaction is with hydroxyl radical unless indicated otherwise

Table VI. HAPs without atmospheric lifetime information.

HAP Name	CAS No.	Predominant Phase	Structural Class [a]	Main Removal Mechanism [b]	Comments
acrylamide	79-06-1	gas	Nitro Org		
bromoform	75-25-2	gas	Hal Hydro		
caprolactam	105-60-2	gas	Oxy Org		
chloramben	133-90-4	gas	Pestic		also particle phase
dimethyl formamide	68-12-2	gas	Nitro Org		
ethylene thiourea	96-45-7	gas	Nitro Org		also particle phase
hexamethylene-1,6-diisocyanate	822-06-0	gas	Nitro Org		
hexamethyl-phosphoramide	680-31-9	gas	Nitro Org		
titanium tetrachloride	7550-45-0	gas	Inorg		
coke oven emissions	0	gas	Arom		

[a] Structural class abbreviations: Arom = aromatic; Hal Arom = halogenated aromatic; Hal Hydro = halogenated hydrocarbon; Hydro = hydrocarbon; Inorg = inorganic; Nitro Org = nitrogenated organic; Oxy Org = oxygenated organic; Pestic = pesticide; Phthal = phthalate; Sulfat = sulfate
[b] Reaction is with hydroxyl radical unless indicated otherwise

Table VII. Distribution of structural classes among lifetime groups.

Structural Group	Lifetime Classes						Total
	Short	Short-Med	Med	Med-Long	Long	Other	
Aromatic	12	2	2		1	1	18
Halogenated aromatic			1	1	6		8
Hydrocarbon	2		1				3
Halogenated Hydrocarbon	5	2	1		18	1	27
Oxygenated Organic	10	3	15		11	1	40
Nitrogenated Organic	33	1	2	3	5	5	49
Pesticide	13				1	1	15
Phthalate	2		1		1		4
Sulfate	2						2
Inorganic	4		3	1	14	1	23
Total	83	8	26	5	57	10	189

APPENDIX B

RESULTS OF THE LITERATURE REVIEW

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INFORMATION / DATA FROM REVIEWED RESEARCH DOCUMENTS

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>1-1</td><td>Acetaldehyde
Source #TL17 measured acetaldehyde concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed.

The I/O average ratio calculated by TRJ researchers was 1.4, indicating the presence of sources near the vehicle. Therefore, the difference between the average in-vehicle and ambient concentrations can be used to estimate a lower bound for the ADD factor. This difference was 1.8 ppb (3.2 $\mu g/m^3$).

ADD = 3.2 $\mu g/m^3$ (Quality Code = 2)</td><td>TL17</td></tr>
<tr><td>1-1</td><td>Acetaldehyde
Author: South Coast Air Quality Management District
‣ Report gives results of concurrent <u>in-vehicle</u> and <u>ambient</u> (fixed site) monitoring study.
‣ <u>Table 3-3</u> (p. 37) presents a comparison of in-vehicle and background mean concentrations.
◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the <u>MULT</u> factor.
<u>From Table 3-3</u>:
MULT = 1.4</td><td>MZ 37 (subset of this data reported in MZ 33)</td></tr>
<tr><td>1-13</td><td>Acetaldehyde
Author: Gonzalez-Flesca, N.
Has indoor & outdoor measurements for each of the ten residences measured. Indoor samples taken in bedroom of residences. Outdoor measurements taken at various locations. In addition, a fixed, central-site monitor was used and may provide input to a proximately factor.
<u>From Tables 1 & 2</u>:
<u>PEN</u> <u>PROX</u> <u>MULT</u> <u>ADD</u>
12.2 0.71 8.7</td><td>MZ 3</td></tr>
<tr><td>1-13</td><td>Acetaldehyde
Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al.
‣ Simultaneous indoor and outdoor measurements taken in residences (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house).
‣ <u>Table 1</u> has the minima, maxima, and means of the indoor and outdoor concentrations.
‣ <u>Table 2</u> (p. 347) has the minima, maxima, means, and medians of the I/O ratios.
I/O ratio (mean) = 6.0
I/O ratio (median) = 3.6</td><td>MZ 27</td></tr>
</table>

Ref. No.	Supporting Information	Sources
1-13	Acetaldehyde Source #TL02 measured simultaneous indoor and outdoor acetaldehyde concentrations for 10 residences in Roanoke, VA during the period November 1988 - February 1989. The authors reported the data as results from a source model (Table II), from which original measured concentrations can be back-calculated. The presence of indoor sources was not independently determined. The residences were heated by either gas or electricity, with no information provided regarding cooking or garage status. Therefore, the information was assigned to ME # 13. TRJ researchers calculated concurrent I/O ratios from the original concentration data and averaged the ratios. In the absence of indoor sources, this method should yield an estimate of the PEN factor. However, the average I/O ratio was calculated to be **5.7**, indicating that significant indoor sources were present. The authors estimated the indoor source contribution for each of the residences by subtracting the measured outdoor concentration from the measured indoor concentration. The average indoor source contribution was 7.6 $\mu g/m^3$. This represents a lower bound on the ADD factor. **ADD = 7.6 $\mu g/m^3$** (Quality Code = 1)	TL02
1-13	Acetaldehyde Author: Barguil, S., Le Moullec, Y., Person, A., Laurent, A-M, and Festy, B. ‣ Study which reports concurrent indoor and outdoor measurements taken in **residences** (5 detached houses and 4 apartments). ◦ The paper reports the average I/O measurements (Fig 2. — bar chart) of samples taken over the entire length of the study (Sept. 1987 – Aug. 1988). **I/O ratios (average of 75 samples):** **PEN = 2.0**	MZ 36
1-17	Acetaldehyde Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an **office building** for several different days. I/O ratios provided – see tables 1, 2, & 3. **Mean PEN (building wide) = 1.3** (Range: 0.1 – 2.2)	MZ 10
1-34	Acetaldehyde Author: Gonzalez-Flesca, N. Has indoor & outdoor measurements for each of the ten residences measured. Indoor samples taken in bedroom of residences. Outdoor measurements taken at various locations. In addition, a fixed, central-site monitor was used and may provide input to a proximately factor. **From Table 1:** **PROX** **0.71** (note: this is the same value as shown for PROX above)	MZ 3

Ref. No.	Supporting Information	Sources
3-13	Acrylonitrile Source #TL03 measured simultaneous indoor and outdoor acrylonitrile concentrations for 44 residences in Toronto in the winter and spring of 1996. The authors reported average indoor and outdoor concentrations (Table 1), from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was **5.3**, indicating the presence of significant indoor sources. Therefore, the difference between the average indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor. This difference was 0.11 $\mu g/m^3$. **ADD = 0.11 μg/m^3** (Quality Code = 2)	TL03
5-1	Benzene Author: Leung, PL.; Harrison, RM. In-vehicle, immediately outside the vehicle (out-vehicle), and roadside SIMULTANEOUS sampling on six different roads. Roadside (static/fixed-site) sampling sites at different distances from road and measured at different heights Ambient air concentrations – continuous measurements at a background location – measured data each hour throughout the year. Ambient data presented as mean over the sampling period (p. 194) Table 2: DAILY means and standard deviations of concentrations in-vehicle, out-vehicle, roadside, and ambient. **Table 4: I/O ratios for benzene on six different roads** Comparison of in-vehicle vs. out-vehicle concentrations during rush hours and non-rush hours – Tables 6&7. Comparison of in-vehicle vs. out-vehicle concentrations for different types of cars – Tables 8&9. **PEN = 1.17** **MULT = 12.17** **PROX = 10.52**	RA 32
5-1	Benzene Author: Liu, C.S., Shikiya, D., Kahn, M.I., and Juarros, J. ‣ Paper reports results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Figure 1 (p. 250) summarizes the data with a bar graph. ◦ Since measurements were reported for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Fig. 1: **MULT = 2.5**	MZ 33 (Results also reported in MZ 37)

Ref. No.	Supporting Information	Sources
5-1	<u>Benzene</u> Source #<u>TL01</u> computed ME factors using regression analysis of data collected by RTI in Los Angeles. In September and October 1997, researchers collected benzene concentration measurements during a series of “commutes”. RTI data included simultaneous measurements inside the vehicle, outside the vehicle, along the roadways, and at the nearest ambient monitoring stations. ADD and MULT factors were available directly from the regression of in-vehicle concentration against ambient monitor concentration (Eq 20). The PROX factor was available from regression of outside-vehicle concentration against ambient monitor concentration (Eq 22). The PEN factor can then be calculated from the formula PEN = (MULT) / (PROX). The ME factors from Source #TL01 are: **ADD = 11 μg/m^3** ; PROX = 0.90 ; **PEN = 1.11**; MULT = 1.00 (Quality Code = 1). Source #<u>TL04</u> simultaneously measured benzene concentrations inside the vehicle (passenger sedan), outside the vehicle, and at a nearby fixed-site monitor in Raleigh, NC during the summer of 1988. The authors calculated in-vehicle / vehicle exterior ratios for each concurrent measurement pair (Table V), which can be used to estimate the PEN factor (**PEN = 1.08**; Quality Code = 1). The authors also reported median in vehicle, vehicle exterior, and fixed-site concentrations (Table II), which can be used to calculate average ratios of in-vehicle / fixed-site (I/F) and vehicle exterior / fixed-site (E/F) concentrations. TRJ researchers calculated the I/F ratio to be 6.7 and the E/F ratio to be 6.9, indicating significant sources near the vehicle (as expected). Therefore, the concentration information can be used to estimate the ADD factor from the difference between the in-vehicle and fixed-site concentration (**ADD = 9.1 μg/m^3**; Quality Code = 2). Source #<u>TL05</u> measured concurrent in-vehicle (passenger cars) and ambient benzene concentrations during city driving in Sydney, Australia (date not given). The authors report average concentrations (Table 1), from which an in-vehicle / ambient ratio can be calculated. TRJ researchers calculated this ratio to be 11, indicating significant sources near the vehicle. Therefore, the concentration information was used to estimate the ADD ME factor, as with Source #TL04 above (**ADD = 64 μg/m^3** ; Quality Code = 2). Source #<u>TL06</u> measured concurrent in-vehicle (passenger car) and vehicle exterior benzene concentrations during suburban commuting in New Jersey during the period from January 1991 to July 1992. The authors report the average concentrations in graphical form (Figure 4), allowing calculation of the in-vehicle / vehicle exterior average ratio (PEN factor). TRJ researchers scaled the concentrations from the graph and computed the PEN factor as follows: in-vehicle conc. = 13.0; vehicle exterior conc. = 13.4 (**PEN = 0.97**; Quality Code = 2).	TL01, TL04, TL05, TL06
5-1	<u>Benzene</u> Author: Shahnaz Alimokhtari Vayghani and Clifford Weisel Data presented for paired measurements of in-car and "at the pump" concentrations *during refueling* (Table 1). **I/O* ratio (median) = 2.3** * I=in-cabin, O=at the pump.	MZ 13

Ref. No.	Supporting Information	Sources
5-1	<u>Benzene</u> Author: Jo, W.K.; Park, K.H. In-vehicle and ambient concentrations of VOCs measured prior to and during idling presented GRAPHICALLY. - p. 220. Fig. 1. See RA21(data presented in table format), MZ12. Bar graphs of concentrations measured in-car and ambient are presented for both idling and driving conditions. Mean ambient roadway air samples and invehicle concentrations with standard deviation for 115 commutes in Korean urban route for two types of cars (old model=Elantra; new model =Sonata II). NEW MODEL: Mean indoor conc reported: 49ug/m^3 Mean outdoor conc reported: 24.9ug/m^3 **PEN= I/O = 49/24.9 = 1.97** OLD MODEL: Mean indoor conc reported: 49.1ug/m^3 Mean outdoor conc reported: 25.8ug/m^3 **PEN= I/O = 49.1/25.8 = 1.9**	RA 19 RA21 MZ 12
5-1	<u>Benzene</u> Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>**car**</u>, <u>subway</u>, <u>bicycling (other)</u>, and walking. -- See <u>Table I</u>, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' <u>residences</u> and in <u>offices</u> -- See <u>Table III</u>, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 1.8**	MZ 34
5-1	<u>Benzene</u> Author: Weisel, C.P., Nicholas, N.J., and Lioy, P.J. ‣ Numerous HAPs/VOCs were measured in automobile interiors. Ambient outdoor HAPs measured at the start of a commute and at the end of a commute for benzene and xylenes. ◦ <u>Table 7</u> – provides mean automobile cabin and suburban outdoor concentrations for benzene and xylenes from this study. ‣ <u>No</u> measurements from the exterior of the vehicle were reported. Therefore, only calculation of a MULT factor is feasible. ‣ This study also summarizes indoor and outdoor measurements from other studies (TEAM and SCAQMD). The average values reported do not appear to be concurrent. <u>From Table 7</u>: **MULT (mean value) = 12.0**	MZ 16

Ref. No.	Supporting Information	Sources
5-1	Benzene Author: Wan-Kuen Jo and Kun-Ho Park Table 1has data on concentrations for **in-auto**, in-bus, and ambient air. Also, just below this table, the authors provide ratios for in-auto/in-bus/fixed-site. Finally, a possible proximity factor is suggested (also just below Table 1). No measurements for outside the vehicle were reported. **PEN** **PROX** **MULT** [Ratio calculated using median measurement values] **N/A** **N/A** **9.4**	MZ 14
5-1	Benzene Source #TL17 measured benzene concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed. The I/O average ratio calculated by TRJ researchers was **2.5**, indicating the presence of in-vehicle sources. Therefore, the difference between the average in-vehicle and ambient concentrations can be used to estimate a lower bound for the ADD factor. This difference was 8 ppb (25 $\mu g/m^3$). **ADD = 25 $\mu g/m^3$** (Quality Code = 2)	TL17
5-1	Benzene Author: Jo, W.K.; Park, K.H. In-vehicle and ambient concentrations of VOCs measured prior to and during idling presented GRAPHICALLY. - p. 220. Fig. 1 See RA21, MZ12. Bar graphs of concentrations measured in-car and ambient are presented for both idling and driving conditions.	RA 19 MZ 12
5-1	Benzene Author: Duffy, B.L., Nelson, P.F. Average in-vehicle concentrations (ppb) in catalyst equipped vs. non catalyst equipped cars and ambient air concentrations – Table 1. I/O ratios – Table 2 (p.3880). POST-1986 CARS **MULT = 11 (morning commute)** **I/O ratio = PEN =22.1/2 = 11.05 (morning peak-hour)** **PROX = MULT/PEN = 11/11.05 = 0.99 (morning)** **MULT= 3 (midday)** **I/O ratio = PEN =____(midday)** PRE-1986 CARS **MULT = 27 (morning commute)** **I/O ratio = PEN = 48.1/1.8 = 26.7 (morning peak-hour)** **PROX = MULT/PEN =27/26.7 = 1.01** **MULT = 18 (midday)** **I/O ratio = PEN =____(midday)**	RA 7

Ref. No.	Supporting Information	Sources
5-1	Benzene Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for **in-vehicle (ME #1)**, car exterior, fixed-site, and sidewalk (i.e., near road) (ME #7). Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. From Table II *(Median values)*: **PROX PEN MULT** **PEN Range** (from Table V)**: 0.75 – 2.49** **6.9 0.96 6.7**	MZ 28
5-2	Benzene Source #TL19 measured benzene concentrations in buses and along the roadway (10 meters from the road) during commutes in the city of Taegu, Korea during the winter of 1996-97. The authors present mean concentrations for approximately 50 samples (Table 2), from which an I/O average ratio can be calculated. The I/O ratio calculated by TRJ researchers was **2.9**, indicating the presence of benzene sources. Since the buses used diesel fuel, the roadway is likely to be a larger benzene source than the bus microenvironment. This situation, with the source occurring between the ambient monitor and the microenvironment, provides information relevant to the PROX factor rather than the PEN factor. In this case, the two factors cannot be distinguished since no measurements were made directly at the bus exterior. Therefore, the I/O ratio can be used to estimate the MULT factor for this microenvironment. MULT = 2.9 (Quality Code = 2)	TL19
5-2	Benzene Author: Wan-Kuen Jo and Kun-Ho Park Table 1has data on concentrations for in-auto, **in-bus**, and ambient air. Also, just below this table, the authors provide ratios for in-auto/in-bus/fixed-site. Finally, a possible proximity factor is suggested (also just below Table 1). Assumed that in-bus and roadway concentrations were the same. **PEN PROX MULT** [All ratios calculated using median measurement values.] **1.0 3.5 3.5**	MZ 14
5-2	Benzene Author: Duffy, B.L., Nelson, P.F. Average in-vehicle concentrations (ppb) in catalyst equipped vs. non catalyst equipped cars and ambient air concentrations – Table 1. I/O ratios – Table 2 (p.3880). **I/O ratio = PEN = 9.4/10.3 = 0.91; 7.2/7.9 = 0.91 (morning peak-hour)** **I/O ratio = PEN = 4.5/5.7 = 0.79 (midday)** **I/O ratio = PEN = 6/9.1 = 0.66 (evening peak-hour)**	RA 7

Ref. No.	Supporting Information	Sources
5-2	Benzene Source #TL05 measured concurrent in-vehicle (bus) and ambient benzene concentrations during city driving in Sydney, Australia (date not given). The authors report individual concentration pairs (Table 5), from which in-vehicle / vehicle exterior ratios can be calculated. The average of these ratios is an estimate of the PEN factor. **PEN = 0.84**; (Quality Code = 1)	TL05
5-4	Benzene Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, **bicycling (other)**, and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.9**	MZ 34
5-5	Benzene Author: Schwar, M.; Booker, J.; Tait, L. Comparison of concentrations **in the car park** vs. **at the exit of the car park**. Max. concentrations averaged over specified time periods. Table 7. WEEKDAYS (11 GARAGES) Mean of averaged 1-hr inside car park conc: 0.25mg/m^3 Mean of averaged 1-hr exit of car park conc: 0.16mg/m^3 **PEN= I/O = 0.25/0.16 = 1.6** WEEKENDS (5 GARAGES) Mean of averaged 1-hr inside car park conc: 0.24mg/m^3 Mean of averaged 1-hr exit of car park conc: 0.34mg/m^3 **PEN= I/O = 0.24/.34 = 0.71**	RA 24
5-5	Benzene Source #TL05 measured concurrent benzene concentrations in a covered parking garage and at an ambient monitoring site in Sydney, Australia (date not given). The authors report average concentrations, allowing calculation of the I/O average ratio. TRJ researchers calculated this ratio to be **41**, indicating significant sources in the parking garage. Therefore, the concentration information was used to estimate the ADD factor by subtracting the ambient concentration from the parking garage concentration. **ADD = 38 μg/m^3** ; (Quality Code = 2)	TL05

Ref. No.	Supporting Information	Sources
5-7	Benzene Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for in-vehicle (ME #1), car exterior, fixed-site, and sidewalk (i.e., **near road) (ME #7)**. Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. From Table II: **PROX** **4.4** *Median value*	MZ 28
5-7	Benzene Source #TL01 computed ME factors using regression analysis of data collected by RTI in Los Angeles. In September and October 1997, researchers collected benzene concentration measurements during a series of "commutes". RTI data included simultaneous measurements along the roadway and at the nearest ambient monitoring stations. ADD and MULT factors were available directly from the regression of roadside concentration against ambient monitor concentration (Eq 25). The ME factors from Source #TL01 are: **ADD = 3 μg/m^3** ; **MULT = 1.40** (Quality Code = 1). Source #TL04 simultaneously measured benzene concentrations along the roadway and at a nearby fixed-site monitor in Raleigh, NC during the summer of 1988. The authors reported median sidewalk and fixed-site concentrations (Table II), which can be used to calculate a ratio of average sidewalk / fixed-site concentrations. TRJ researchers calculated this ratio to be **4.4**, indicating significant sources near the roadway (as expected). Therefore, the concentration information can be used to estimate the ADD factor from the difference between the sidewalk and fixed-site concentration (**ADD = 5.5 μg/m^3** ; Quality Code = 2).	TL01, TL04
5-11	Benzene Source #TL18 measured simultaneous garage and outdoor benzene concentrations at three New Jersey residences with attached garages during December 1987. The authors report mean concentrations for each residence (Table 3), from which I/O average ratios can be computed. For all three residences, the I/O ratio was greater than 1 (**I/O ratio = 2.1, 6.5, and 15**, respectively). This indicates the presence of significant sources within the garages. Therefore, the difference between the mean garage and outdoor concentrations can be used to estimate a lower bound for the ADD factor. These differences were 5.2 μg/m^3, 26.2 μg/m^3, and 93.4 μg/m^3 respectively. Taking the arithmetic mean of these values, ADD can be estimated to be 42 μg/m^3 (geometric mean = 23 μg/m^3). **ADD = 42 μg/m^3** (Quality Code = 2)	TL18

Ref. No.	Supporting Information	Sources
5-13	<u>Benzene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al. ‣ Summary of TEAM study in NJ (Fall, 1981). ‣ Samples collected for: *personal air* - two consecutive 12-hr samples taken from appr. 350 people, *outdoor air* - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath. <u>Table 9</u> reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best concurrent I/O ratios for **residences** from this study.) **PEN = 1.9** (median value)	MZ 22
5-13	<u>Benzene</u> Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>car</u>, <u>subway</u>, <u>bicycling (other)</u>, and walking. -- See <u>Table I</u>, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' **<u>residences</u>** and in <u>offices</u> -- See <u>Table III</u>, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34
5-13	<u>Benzene</u> Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. NOTE: See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 1.86 (spring); 2.46 (summer)**	RA 29
5-13	<u>benzene</u> Author: Barguil, S., Le Moullec, Y., Person, A., Laurent, A-M, and Festy, B. ‣ Study which reports concurrent indoor and outdoor measurements taken in **residences** (5 detached houses and 4 apartments). ◦ The paper reports the average I/O measurements (Fig 2. - bar chart) of samples taken over the entire length of the study (Sept. 1987 - Aug. 1988). **<u>I/O ratios (average of 75 samples)</u>:** **PEN = 2.75**	MZ 36

Ref. No.	Supporting Information	Sources
5-13	<u>Benzene</u> Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **I/O ratio provided: 1.04=PEN** Ambient air conc. provided: 1805ug/m^3 (mean),1916ug/m^3(median), 537ug/m^3(min), 3263ug/m^3(max),742ug/m^3(std. dev) Indoor air conc provided: 1882ug/m^3 (mean), 1774ug/m^3(median), 626ug/m^3(min), 3788ug/m^3(max), 1009ug/m^3(std. dev) **MULT = (indoor conc)/(ambient conc) = 1774/1916 = 0.93 (from median conc)** Since PEN>1 ==> calculate ADD: Indoor conc (median) = 1774ug/m^3; PEN = I/O = 1.04; Outdoor conc (calculated) = 1774/1.04 = 1705ug/m^3 **69ug/m^3<ADD<1774 ug/m^3** **PROX (calculated from medians) 1705/1916 =0.37**	RA 14
5-13	<u>Benzene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30
5-13	<u>Benzene</u> Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ <u>Table 29</u> (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for <u>matched</u> samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ <u>Table 46</u> (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ <u>Table 47</u> (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. <u>From Table 29</u>: **<u>LA(1/84)</u> <u>LA(5/84)</u> <u>Contra(6/84)</u> <u>Avg.</u>** **PEN** (medians)**:** **1.1** **1.7** **2.3** **1.7**	MZ 38

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>5-13</td><td><u>Benzene</u>
Author: Gonzalez-Flesca, N.
Has indoor & outdoor measurements for each of the ten residences measured. Indoor samples taken in bedroom of residences. Outdoor measurements taken at various locations. In addition, a fixed, central-site monitor was used and may provide input to a proximately factor.
<u>From Tables 1 & 2</u>:
<u>PEN</u> <u>PROX</u> <u>MULT</u> <u>ADD</u>
2.6 0.76 2.0</td><td>MZ 3</td></tr>
<tr><td>5-13</td><td><u>Benzene</u>
Author: Crump, D.R.
Indoor & outdoor measurements of HAPs over 2 years with data reported for a summer season only and a winter season only. Measurements are for four newly constructed unoccupied test houses. Although the methods state that measurements were taken in the living room, kitchen, bedrooms, and bathroom; only the average for the whole house was reported.
The mean, max, and minimum data provided for each house and for each contaminant measured in each house for two consecutive years.

<table>
<tr><th><u>House T1</u></th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><td></td><td><u>Yr. 1</u></td><td><u>Yr. 2</u></td><td><u>Summer</u></td><td><u>Winter</u></td><td><u>(S and W only)</u></td></tr>
<tr><td>benzene</td><td>4.5</td><td>0.8</td><td>1.0</td><td>1.0</td><td>1.0</td></tr>
<tr><th><u>House T2</u></th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><td></td><td><u>Yr. 1</u></td><td><u>Yr. 2</u></td><td><u>Summer</u></td><td><u>Winter</u></td><td><u>(S and W only)</u></td></tr>
<tr><td>benzene</td><td>0.9</td><td>1.0</td><td>0.75</td><td>1.0</td><td>0.9</td></tr>
<tr><th><u>House M3</u></th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><td></td><td><u>Yr. 1</u></td><td><u>Yr. 2</u></td><td><u>Summer</u></td><td><u>Winter</u></td><td><u>(S and W only)</u></td></tr>
<tr><td>benzene</td><td>1.3</td><td>1.4</td><td>1.0</td><td>1.25</td><td>1.1</td></tr>
<tr><th><u>House M4</u></th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><td></td><td><u>Yr. 1</u></td><td><u>Yr. 2</u></td><td><u>Summer</u></td><td><u>Winter</u></td><td><u>(S and W only)</u></td></tr>
<tr><td>benzene</td><td>1.3</td><td>0.8</td><td>1.25</td><td>1.0</td><td>1.1</td></tr>
</table>
*Mean values

<u>benzene</u>
Overall Mean: 1.0
(all houses, S and W only)</td><td>MZ 2</td></tr>
<tr><td>5-13</td><td><u>Benzene</u>
Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P.
SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea.
Median, mean, standard deviation, range of concentrations, median I/O ratios provided – Tables 3,4&5

I/O ratio provided from median conc = PEN = 1.1</td><td>RA 35</td></tr>
</table>

Ref. No.	Supporting Information	Sources
5-13	<u>Benzene</u> Author: Gilli, G Concurrent indoor and outdoors (apartment),ambient fixed-site, and personal samples collected. I/O ratios reported (Table 3) I/O Ratios for Benzene: **3.78 (day), 2.68 (night)** Mean indoor, outdoor, and personal concentrations reported (Table 4) **Dec. 1991 mean *I/O ratio* provided:** **3.78 (day) = PEN (day);** **2.68 (night) = PEN (night**) Winter 1991mean *ambient conc* provided = 9.84 ppb Dec. 1991 mean indoor conc provided (day) = 16.25 ppb Dec. 1991 mean indoor conc provided (night) = 18.38 ppb **MULT(day) = (indoor conc)/(ambient conc) = 16.25/9.84 = 1.65** **MULT(night) = (indoor conc)/(ambient conc) = 18.38/9.84 = 1.87** Winter 1991mean *ambient conc* provided = 9.84 ppb Dec. 1991 mean outdoor conc provided (day) = 16.45 ppb Dec. 1991 mean outdoor conc provided (night) = 18.73 ppb **PROX (day) = (outdoor conc)/(ambient conc) = 16.45/9.84 = 1.67** **PROX (night) = (outdoor conc)/(ambient conc) = 18.73/9.84 = 1.9**	RA 16 MZ 8
5-13	<u>Benzene</u> Author: Lebret, E., van de Wiel, H.J., Bos, H.P., Noij, D., and Boleij, J.S.M. ‣ <u>Table 2</u> (p. 326) reports median and maximum HAP concentrations in **residences** (a total of approx. 300) of three different age groups; the median and maximum outdoor concs.; and the overall median I/O ratio for all homes. ◦ These concentrations were weekly averages. **<u>Median, overall I/O ratios</u>:** **benzene = 2**	MZ 26
5-13	<u>Benzene</u> Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ <u>Table 1</u> has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ <u>Table 2</u> (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 3.8** **I/O ratio (median) = 1.7**	MZ 27
5-13	<u>Benzene</u> Author: Schneider, P.; Lorinci, G.; Gebefugi, IL.; Heinrich, J.; Kettrup, A. Simultaneous I/O sampling in residences (p.284) Concentration profiles provided by height at which sampling took place. Table 5: median I/O ratios supplied for bedroom, living room, kitchen. Table 6: median I/O ratios (for bedroom, living room, kitchen) presented by apartment age group (old vs. new) **I/O =PEN = 1.7 (kitchen); 1.5 (living room); 1.3 (bedroom)** **Mean I/O = 1.5**	RA 30

Ref. No.	Supporting Information	Sources
5-13	<u>Benzene</u> Author: Brown, V. and Crump, D. ‣ Measurement study at **residences** using passive samplers. ◦ Samplers were exposed for 1-month periods. ◦ Far more indoor measurements (173) were taken than outdoor measurements (13). ◦ Matched samples <u>not</u> reported. ‣ <u>Table 1</u> (p. 386) reports the min, max, median, and mean for inside 173 homes; and also reports the mean for outdoors for 13 homes. Indoors*: <u>median</u> / <u>mean</u> / <u>min</u> / <u>max</u>; Outdoors*: <u>mean</u>; **<u>mean I/O</u>** benzene: 7 / 8 / 2 / 32; 5; **1.6** * All values in $\mu g/m^3$. ‣ <u>Fig. 1</u> (p. 391) shows the mean concentrations of benzene and toluene by month for both indoors and outdoors. ◦ Not specified how many indoor (or outdoor) measurements were included in each monthly mean reported in Fig. 1's graphs. **<u>Estimated ratios (I/O)</u>** (from Fig. 1)**:** **<u>min</u>** / **<u>max</u>** **benzene** **1.4** / **2.0**	MZ 35
5-13	<u>Benzene</u> Author: Gilli, G Concurrent indoor (apartment), outdoor fixed-site, and personal samples collected. I/O ratios reported (Table 3) I/O Ratios for Benzene: **3.78 (day), 2.68 (night)** Mean indoor, outdoor, and personal concentrations reported (Table 4)	MZ 8 RA 16
5-13	<u>Benzene</u> Author: Wallace, L. ‣ Summarizes (i.e., summary statistics: including mean, GM, and percentiles) indoor and outdoor benzene concs. for residences in the TEAM studies (Tables 2&3, p. 1131). ‣ Summaries are for LA (winter and summer), Valdez (winter and summer), and Woodland, CA (summer and winter). ◦ The LA and Valdez data are for day and night (i.e., 12-hr samples), while the Woodland data are 24-hr samples). ◦ Of the 11 indoor/outdoor combinations reported from the three cities, only 3 had the number of samples equal for both the indoor and outdoor measurements (these are circled on Tables 2 & 3). ‣ In addition, this paper summarizes mean indoor/outdoor values measured from other studies (see p. 1130). ◦ NOTE: Not possible to determine if these mean values were from concurrent measurements w/o obtaining reports on these studies. • Ref (28) — mean I/O = **1.36** } 48-hr averages measured at 161 homes in CA. • Ref (29) — mean I/O = **0.92** (summer) } Average from seventeen volunteers. — mean I/O = **1.35** (winter) ‣ Finally, mean benzene concs. were reported from other studies (see Table 4, p. 1132). ◦ All of the I/O ratios in Table 4 are > 1.0 (range: 1.4 to 4.0). <u>This study</u>: **<u>PEN</u>** **1987, summer, daytime = 1.6** **1990, summer, daytime = 2.7** **1991, winter, daytime = 1.7**	MZ 23

Ref. No.	Supporting Information	Sources
5-13	Benzene Author: Drahonovska, H. Indoor & outdoor measurements of 140 residences (both kitchen and bedroom measurements) taken for listed HAPs. Energy use for heating is broken down by electric, gas, and coal sources. Average I/O ratios provided (Table 5) for benzene. **I/O=1.6 for house heated** **I/O=1.4 for non-heated house**	MZ 4
5-13	Benzene Author: Gilli, G., Scursatone, E., and Bono, R. ‣ Indoor and outdoor simultaneous measurements taken for a **residence** (apartment). ◦ Samples were collected by 10 non-smoking university students who each collected samples for 10 consecutive days [2 integrated samples per day: 1) 8:00 - 20:00 (12-hrs), and 2) 0:00 - 8:00 (8-hrs)] in December 1991. ‣ Table 3 (p. 53) shows the mean I/O ratios for both day (i.e., 8:00 - 20:00) and night (ie, 0:00 - 8:00). Data is the average form all students. ‣ Table 4 (p. 54) shows indoor and outdoor pollutant concentrations for both day and night. NOTE: It is not clear how this data relates to the ratios reported in Table 3. It might be data for only a single student. **Average I/O data for all students (Table 3):** **benzene (day) = 3.78** **benzene (night) = 2.68**	MZ 25

Ref. No.	Supporting Information	Sources
5-13	Benzene Source #TL02 measured simultaneous indoor and outdoor benzene concentrations for 6 residences in Roanoke, VA during the period November 1988 - February 1989. The authors reported the data as results from a source model (Table II), from which original measured concentrations can be back-calculated. The presence of indoor sources was not independently determined. The residences were heated by either gas or electricity, with no information provided regarding cooking or garage status. Therefore, the information was assigned to ME # 13. TRJ researchers calculated concurrent I/O ratios from the original concentration data and averaged the ratios to estimate the PEN factor for the residences (**PEN = 1.06**; Quality Code = 1). Source #TL03 measured simultaneous indoor and outdoor benzene concentrations for 44 residences in Toronto in the winter and spring of 1996. The authors reported average indoor and outdoor concentrations (Table 1), from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was **2.3**, indicating the presence of significant indoor sources. Therefore, the difference between the average indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor (**ADD = 2.3 μg/m**^{3}; Quality Code = 2). Source #TL07 reported the indoor/outdoor benzene concentration ratio measured in June, 1990 for residences in Woodland, CA (Table 2-5). No information was given on stove/garage sources in the residences. The geometric mean ratio was **2.1**, indicating the presence of indoor sources. Therefore, the difference between the median indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor (**ADD = 1.1 μg/m**^{3}; Quality Code = 2). Source #TL13 reported simultaneous indoor and outdoor benzene concentrations for three residences in two Taiwanese cities. The authors did not provide information on the cooking or heating status in the residences. TRJ researchers calculated the I/O ratios of the mean concentrations for the three residences (0.94, 0.94, 0.88). The average of these three I/O ratios can be used as an estimate of the PEN factor for these residences (**PEN = 0.92**; Quality Code = 2).	TL02, TL03, TL07, TL13

Ref. No.	Supporting Information	Sources
5-15	Benzene Source #TL18 measured simultaneous indoor and outdoor benzene concentrations at three New Jersey residences with attached garages during December 1987. The authors report mean concentrations (Table 3) and the range of simultaneous I/O ratios (Table 4) for each residence. For two of the residences, the minimum I/O ratio was greater than 1 (I/O ratio range 1.5 - 6.7 and 1.5 - 9.3, respectively). This indicates the presence of significant indoor sources. Therefore, the difference between the mean indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor. This difference was 11.2 $\mu g/m^3$ for one residence and 25.4 $\mu g/m^3$ for the other. Using the average of these values, ADD can be estimated to be 18 $\mu g/m^3$. For the third residence, the I/O ratio ranged from 0.9 - 2.0, indicating occasional indoor sources. Assuming the minimum I/O ratio may have been due to temporal concentration variations which were observed for all residences, a reasonable estimate for the PEN factor is 1.0. **ADD = 18 $\mu g/m^3$** (Quality Code = 2); **PEN = 1.0** (Quality Code = 1)	TL18
5-17	Benzene Author: Daisey, J.M., Hodgson, A.T., Fisk, W.J., et al. ‣ Indoor/outdoor measurements for 12 **office buildings**. ‣ Table 2 (p. 3559) reports the range of I/O ratios measured for eleven of the twelve office buildings. From Table 2: **PEN (range): 0.25-4.2**	MZ 39
5-17	Benzene Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' residences and in **offices** -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34
5-17	Benzene Source #TL10 measured simultaneous indoor and outdoor benzene concentrations for 12 office buildings in the San Francisco Bay Area during the period June - September 1990. The authors calculated the I/O ratio for each building, but they reported only the range of I/O ratios for all buildings (Range = 0.25 - 4.2, Table 2). The lower end of the range can be considered an estimate of the PEN factor since indoor sources are likely to be minimal. The upper portion of the range likely indicates the presence of indoor sources. **PEN = 0.25** (Quality Code = 1)	TL10

Ref. No.	Supporting Information	Sources
5-17	<u>Benzene</u> Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an office building for several different days. I/O ratios provided – see tables 1, 2, & 3. **Mean PEN (building wide; ie., four floors) = 3.1** (Range: 1.6 – 4.8)	MZ 10
5-17	<u>Benzene</u> Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.6**	RA 35
5-19	<u>Benzene</u> Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 0.9**	RA 35
5-21 5-31	<u>Benzene</u> Author: Underwood, M.C. Concurrent indoor & outdoor samples reported for two different schools (one test school and one control school). <u>Table 1</u> provides monitoring data, both AM and PM, for two different sampling dates. <u>Figure 2</u> contains a graphical representation of I/O ratios from Table 1. In addition, concurrent fixed-site monitoring data for local air district provided. Will enable calculation of both penetration and proximity factors. **<u>From Table 1</u>:** **<u>PEN</u> <u>PROX</u> <u>MULT</u>** **Test sch., Rm. B3, 8/11/92: 1.4 0.60 0.83** **Test sch., Rm. B4, 8/11/92: 1.1 0.60 0.67** **Test sch., Rm. B3, 11/9/92: 6.6 0.56 3.67** **Test sch., Rm. B4, 11/9/92: 6.0 0.56 3.33** **Control school, 8/11/92: 0.4 0.87 0.37** **Control school, 11/9/92: <u>3.75</u> <u>0.44</u> <u>1.67</u>** **MEDIAN: 3.5 0.66 2.02** **<u>From Table 2</u>:** **<u>PEN</u> <u>PROX</u> <u>MULT</u>** **Test sch., Rm. B3, cond. (b): 1.2 0.56 0.67** **Test sch., Rm. B4, cond. (b): 1.2 0.56 0.67** **Control school, cond. (b): >2.0 <0.2 <u>0.44</u>** **MEDIAN: 0.56**	MZ 1

Ref. No.	Supporting Information	Sources
5-26	Benzene Author: Fantuzzi, G.; Aggazzotti, G.; Righi, E.; Cavazzutti, L.; Predieri, G. Table 2 (p.53) – INDOOR and OUTDOOR concentrations provided for university libraries in Italian city (inner city and suburb locations) – median, min. and max. NOT SURE IF CONCURRENT MEASUREMENTS. INNER CITY Indoor median conc = 11ug/m^3 Outdoor median ambient conc = 11ug/m^3 **MULT = (indoor conc)/(ambient conc) = 11/11 = 1** SUBURBS Indoor median conc = 8.9ug/m^3 Outdoor median ambient conc = 4.4ug/m^3 **MULT = (indoor conc)/(ambient conc) = 8.9/4.4 = 2.02**	RA 23
5-30	Benzene Author: Gilli, G Concurrent indoor (apartment), outdoor fixed-site, and personal samples collected. I/O ratios reported (Table 3) I/O Ratios for Benzene: 3.78 (day), 2.68 (night) Mean indoor, outdoor, and personal concentrations reported (Table 4)	MZ 8 RA 16
5-30	Benzene Author: Crump, D.R. Indoor & outdoor measurements of HAPs over 2 years with data reported for a summer season only and a winter season only. Measurements are for four newly constructed unoccupied test houses. Although the methods state that measurements were taken in the living room, kitchen, bedrooms, and bathroom; only the average for the whole house was reported. The mean, max, and minimum data provided for each house and for each contaminant measured in each house for two consecutive years	MZ 2
5-34	Benzene Author: Gonzalez-Flesca, N. Has indoor & outdoor measurements for each of the ten residences measured. Indoor samples taken in bedroom of residences. Outdoor measurements taken at various locations. In addition, a fixed, central-site monitor was used and may provide input to a proximately factor. **From Table 1:** **PROX** **0.76** (note: this is the same value as shown for PROX above)	MZ 3

Ref. No.	Supporting Information	Sources
5-36	Benzene Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, **subway**, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.7**	MZ 34
6-27	Beryllium Author: Durec, F., Durecova, A., et al. ‣ Paper reports results of concurrent indoor and outdoor sampling. However, the type of indoor location was not specified -- ICF surmised that this was a government laboratory and thus labeled it as ***indoor, other location*** **(ME #27)**. ◦ Fig. 2 is a line plot of the outdoor/indoor ratio of the air concs. of Be. This graph is difficult to read, but the text states that the average outdoor and indoor Be concs. are 2.5 mBq/m^3 and 1.7 mBq/m^3, resp. Therefore, the average I/O ratio = **0.68**.	MZ 24
7-1	1,3-butadiene Source #TL04 measured concurrent in-vehicle and vehicle exterior 1,3-butadiene concentrations in Raleigh, NC during the summer of 1988. The authors calculated the in-vehicle / vehicle exterior ratios for each concurrent measurement pair (Table V). The median ratio can be used to estimate the PEN factor. Source #TL05 measured concurrent in-vehicle (passenger cars) and ambient 1,3-butadiene concentrations during city driving in Sydney, Australia (date not given). The authors report average concentrations (Table 1), from which an in-vehicle / ambient ratio can be calculated. Measurable concentrations were found inside the vehicle, but not at the ambient monitor site, indicating significant sources near the vehicle. Therefore, TRJ researchers estimated the ADD ME factor by subtracting the ambient detection limit from the in-vehicle concentration information. **ADD = 12 μg/m^3** ; (Quality Code = 2) **PEN = 1.21**; (Quality Code = 1)	TL04, TL05

Ref. No.	Supporting Information	Sources
7-1	<u>1,3-butadiene</u> Author: Duffy, B.L., Nelson, P.F. Average in-vehicle concentrations (ppb) in catalyst equipped vs. non catalyst equipped cars and ambient air concentrations – Table 1. I/O ratios – Table 2 (p.3880). POST-1986 CARS **MULT =** 55 (morning commute) **MULT=** 1 (midday) PRE-1986 CARS **MULT =** 115 (morning commute) **MULT** = 1 (midday)	RA 7
7-1	<u>1,3-Butadiene</u> Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for **<u>in-vehicle (ME #1)</u>**, car exterior, fixed-site, and sidewalk (i.e., <u>near road) (ME #7</u>). Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. <u>From Table II</u> (Median values): **<u>PROX</u>** **<u>PEN</u>** **<u>MULT</u>** **PEN Range** (from Table V)**: 0.44 – 14.33** **2.2** **1.1** **2.4**	MZ 28
7-2	<u>1,3-butadiene</u> Author: Duffy, B.L., Nelson, P.F. Average in-vehicle concentrations (ppb) in catalyst equipped vs. non catalyst equipped cars and ambient air concentrations – Table 1. I/O ratios – Table 2 (p.3880). **I/O ratio = PEN = 2.6/2.8 = 0.93; 2.1/2 = 1.05 (morning peak-hour)** **I/O ratio = PEN = 1.2/1.4 = 0.86 (midday)** **I/O ratio = PEN = 1.8/2.3 = 0.78 (evening peak-hour)**	RA 7
7-2	<u>1,3-butadiene</u> Source #<u>TL05</u> measured concurrent in-vehicle (bus) and ambient 1,3-butadiene concentrations during city driving in Sydney, Australia (date not given). The authors report individual concentration pairs (Table 5), from which in-vehicle / vehicle exterior ratios can be calculated. The average of these ratios is an estimate of the PEN factor. **PEN = 0.91**; (Quality Code = 1)	TL05

Ref. No.	Supporting Information	Sources
7-7	1,3-butadiene Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for in-vehicle (ME #1), car exterior, fixed-site, and sidewalk (i.e., near road) (ME #7). Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. From Table II: **PROX** **1.0** *Median values*	MZ 28
7-13	1,3-Butadiene Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 3.25 (spring); nothing provide for summer**	RA 29
8-1	Cadmium Author: South Coast Air Quality Management District ‣ Report gives results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Table 3-3 (p. 37) presents a comparison of in-vehicle and background mean concentrations. ◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Table 3-3: **MULT = 0.3**	MZ 37 (subset of this data reported in MZ 33)
8-1	Cadmium Source #TL17 measured cadmium concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 0.33). This ratio can be used as an estimate of the MULT factor. **MULT = 0.33** (Quality Code = 2)	TL17
9-1	Carbon tetrachloride Author: South Coast Air Quality Management District ‣ Report gives results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Table 3-3 (p. 37) presents a comparison of in-vehicle and background mean concentrations. ◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Table 3-3: **MULT = 1.0**	MZ 37 (subset of this data reported in MZ 33)

Ref. No.	Supporting Information	Sources
9-1	Carbon tetrachloride Source #TL17 measured carbon tetrachloride concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 1.0). This ratio can be used as an estimate of the MULT factor. **MULT = 1.0** (Quality Code = 2)	TL17
9-13	Carbon tetrachloride Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30
9-13	Carbon tetrachloride. Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **This compound had non detect results and thus I/O ratio was not provided.**	RA 14
9-13	Carbon tetrachloride Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ Table 1 has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ Table 2 (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 1.3** **I/O ratio (median) = 1.4**	MZ 27

Ref. No.	Supporting Information	Sources
9-13	<u>Carbon tetrachloride</u> Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ <u>Table 29</u> (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for <u>matched</u> samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ <u>Table 46</u> (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ <u>Table 47</u> (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. <u>From Table 29</u>: **<u>LA(1/84)</u>** **<u>LA(5/84)</u>** **<u>Contra(6/84)</u>** **<u>Avg.</u>** **PEN** (medians)**:** **1.0** **1.1** **2.2** **1.4**	MZ 38
9-13	<u>Carbon tetrachloride</u> Source #<u>TL07</u> reported the indoor/outdoor carbon tetrachloride concentration ratio measured in June, 1990 for residences in Woodland, CA (Table 2-5). No information was given on stove/garage sources in the residences. The geometric mean ratio was 1.0, although all of the indoor and outdoor measurements were near the method quantifiable limit. This ratio provides an estimate of the PEN factor (PEN = 1.0). **PEN = 1.0**; (Quality Code = 2)	TL07
9-13	<u>Carbon tetrachloride</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al. Summary of TEAM study in NJ (Fall, 1981). Samples collected for: *personal air* - two consecutive 12-hr samples taken from appr. 350 people, *outdoor air* - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath. <u>Table 9</u> reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best concurrent I/O ratios for **residences** from this study.) **PEN = 1.7** (median value)	MZ 22
10-1	<u>Chloroform</u> Author: South Coast Air Quality Management District ‣ Report gives results of concurrent **<u>in-vehicle</u>** and <u>ambient</u> (fixed site) monitoring study. ‣ <u>Table 3-3</u> (p. 37) presents a comparison of in-vehicle and background mean concentrations. ◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the <u>MULT</u> factor. <u>From Table 3-3</u>: **MULT = 0.75**	MZ 37 (subset of this data reported in MZ 33)

Ref. No.	Supporting Information	Sources
10-1	Chloroform Source #TL17 measured chloroform concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 0.75). This ratio can be used as an estimate of the MULT factor. **MULT = 0.75** (Quality Code = 2)	TL17
10-13	Chloroform Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ Table 29 (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for matched samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ Table 46 (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ Table 47 (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. From Table 29: **LA(1/84)** **LA(5/84)** **Contra(6/84)** **Avg.** **PEN** (medians)**:** **2.5** **25.0** **0.7** **9.4**	MZ 38
10-13	Chloroform Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al. Summary of TEAM study in NJ (Fall, 1981). Samples collected for: *personal air* - two consecutive 12-hr samples taken from appr. 350 people, *outdoor air* - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath. Table 9 reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best available I/O ratios for **residences** from this study.) **PEN = 3.9** (median value)	MZ 22
10-13	Chloroform Source #TL03 measured simultaneous indoor and outdoor chloroform concentrations for 44 residences in Toronto in the winter and spring of 1996. The authors reported average indoor and outdoor concentrations (Table 1), from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was **4.2**, indicating the presence of significant indoor sources. Therefore, the difference between the average indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor. This difference was 0.67 $\mu g/m^3$. **ADD = 0.67** $\mu g/m^3$ (Quality Code = 2)	TL03

Ref. No.	Supporting Information	Sources
10-13	Chloroform Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30
10-13	Chloroform Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ Table 1 has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ Table 2 (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = M** **I/O ratio (median) = > 2**	MZ 27
10-17	Chloroform Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an **office building** for several different days. I/O ratios provided – see tables 1,2, & 3. **Mean PEN (building wide; ie., two floors) = 3.3** (Range: 2.4 – 4.1)	MZ 10
11-1	Chromium Author: Liu, C.S., Shikiya, D., Kahn, M.I., and Juarros, J. ‣ Paper reports results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Figure 1 (p. 250) summarizes the data with a bar graph. ◦ Since measurements were reported for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Fig. 1: **MULT = 0.6**	MZ 33 (Results also reported in MZ 37)
11-1	Chromium Source #TL17 measured chromium concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 0.52). This ratio can be used as an estimate of the MULT factor. **MULT = 0.52** (Quality Code = 2)	TL17

Ref. No.	Supporting Information	Sources
11-13	Chromium Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **Chromium: no I/O ratio provided.**	RA 29
11-13	Chromium Source #TL09 measured simultaneous indoor and outdoor hexavalent chromium concentrations for approximately 30 - 50 residences in Hamilton, Ontario during the summer of 1993. The authors reported average indoor and outdoor concentrations from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was 0.35. This value can be used as an estimate of the PEN factor for these residences. **PEN = 0.35** (Quality Code = 2)	TL09
11-20	Chromium Source #TL11 measured simultaneous indoor and outdoor hexavalent and total chromium concentrations at 21 industrial sites in Hudson County, New Jersey during 1989 and 1990. The sites were chosen because they are known to have soils containing chromite ore processing residue, which was used as a fill material in the area for several decades. The authors reported average indoor and outdoor concentrations from which the I/O average ratio can be computed. The I/O average ratios calculated by TRJ researchers were 0.31 for hexavalent chromium and 0.62 for total chromium. These values can be used as an estimate of the PEN factors for these facilities. However, it should be noted that these factors were developed for facilities known to have chromium contamination. **PEN = 0.31 for hexavalent Cr** (Quality Code = 2); **PEN = 0.62 for total Cr** (Quality Code = 2)	TL11
13-1	Ethylene dichloride (1,2-dichloroethane) Author: Liu, C.S., Shikiya, D., Kahn, M.I., and Juarros, J. ‣ Paper reports results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Figure 1 (p. 250) summarizes the data with a bar graph. ◦ Since measurements were reported for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Fig. 1: **MULT = 3.0**	MZ 33 (Results also reported in MZ 37)

Ref. No.	Supporting Information	Sources
13-1	Ethylene dichloride Source #TL17 measured 1,2-dichloroethane concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed. The I/O average ratio calculated by TRJ researchers was **3.3**, indicating the presence of sources near the vehicle. However, the mean in-vehicle concentration was less than the standard deviation. This result should be interpreted with caution, particularly since 1,2-dichloroethane is not a typical automotive pollutant. The difference between the average in-vehicle and ambient concentrations can be used to estimate a lower bound for the ADD factor. This difference was 0.023 ppb (0.093 $\mu g/m^3$). **ADD = 0.093 $\mu g/m^3$** (Quality Code = 2)	TL17
13-13	Ethylene dichloride (1,2-dichloroethane) Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ Table 29 (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for matched samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ Table 46 (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ Table 47 (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. From Table 29: **LA(1/84) LA(5/84) Contra(6/84) Avg.** **PEN** (medians)**: 1.0 1.1 4.7 2.3**	MZ 38
13-13	1,2 Dichloroethane (ethylene dichloride) Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **This compound had non detect results and thus I/O ratio was not provided.**	RA 14

Ref. No.	Supporting Information	Sources
14-13	1,3-dichloropropene Source #TL03 measured simultaneous indoor and outdoor 1,3-dichloropropene concentrations for 44 residences in Toronto in the winter and spring of 1996. The authors reported average indoor and outdoor concentrations (Table 1), from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was 0.81. This value can be used as an estimate of the PEN factor for these residences. **PEN = 0.81** (Quality Code = 2)	TL03
15-1	Ethylene dibromide Author: Liu, C.S., Shikiya, D., Kahn, M.I., and Juarros, J. ‣ Paper reports results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Figure 1 (p. 250) summarizes the data with a bar graph. ◦ Since measurements were reported for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Fig. 1: **MULT = 0.86**	MZ 33 (Results also reported in MZ 37)
15-1	Ethylene dibromide Source #TL17 measured ethylene dibromide concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 0.88). This ratio can be used as an estimate of the MULT factor. **MULT = 0.88** (Quality Code = 2)	TL17
17-1	Formaldehyde Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by **car**, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.9**	MZ 34

Ref. No.	Supporting Information	Sources
17-1	Formaldehyde Source #TL17 measured formaldehyde concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed. The I/O average ratio calculated by TRJ researchers was **1.8**, indicating the presence of in-vehicle sources. Therefore, the difference between the average in-vehicle and ambient concentrations can be used to estimate a lower bound for the ADD factor. This difference was 5.7 ppb (7 $\mu g/m^3$). **ADD = 7 $\mu g/m^3$** (Quality Code = 2)	TL17
17-1	Formaldehyde Author: Liu, C.S., Shikiya, D., Kahn, M.I., and Juarros, J. ‣ Paper reports results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Figure 1 (p. 250) summarizes the data with a bar graph. ◦ Since measurements were reported for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Fig. 1: **MULT = 1.8**	MZ 33 (Results also reported in MZ 37)
17-4	Formaldehyde Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, **bicycling (other)**, and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.9**	MZ 34
17-13	Formaldehyde Author: Peters, J.M. Concurrent indoor and outdoor monitoring in residences – Table 3-20a (p. 3-92), Table 3-20b (p. 3-93). This study primarily looked at O_3 and PM. From Table 3-20b: **PEN (median) = 3.75** (range: 0.01 – 40.0)	MZ 15

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>17-13</td><td>Formaldehyde
Author: Drahonovska, H.
Indoor & outdoor measurements of 140 residences (both kitchen and bedroom measurements) taken for listed HAPs. Energy use for heating is broken down by electric, gas, and coal sources. Average I/O ratios provided (Table 5) for formaldehyde.
I/O=4.8 for house heated
I/O=3.2 for non-heated house</td><td>MZ 4</td></tr>
<tr><td>17-13</td><td>Formaldehyde
Author: Gonzalez-Flesca, N.
Has indoor & outdoor measurements for each of the ten residences measured. Indoor samples taken in bedroom of residences. Outdoor measurements taken at various locations. In addition, a fixed, central-site monitor was used and may provide input to a proximately factor.
From Tables 1 & 2:
<table>
<tr><th>PEN</th><th>PROX</th><th>MULT</th><th>ADD</th></tr>
<tr><td>8.9</td><td>0.72</td><td>6.4</td><td></td></tr>
</table></td><td>MZ 3</td></tr>
<tr><td>17-13</td><td>Formaldehyde
Author: Crump, D.R.
Indoor & outdoor measurements of HAPs over 2 years with data reported for a summer season only and a winter season only. Measurements are for four newly constructed unoccupied test houses. Although the methods state that measurements were taken in the living room, kitchen, bedrooms, and bathroom; only the average for the whole house was reported.
The mean, max, and minimum data provided for each house and for each contaminant measured in each house for two consecutive years.
<table>
<tr><th>House T1</th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><th></th><th>Yr. 1</th><th>Yr. 2</th><th>Summer</th><th>Winter</th><th>(S and W only)</th></tr>
<tr><td>formaldehyde</td><td>19.7</td><td>21.0</td><td>21.0</td><td>18.5</td><td>19.8</td></tr>
</table>
<table>
<tr><th>House T2</th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><th></th><th>Yr. 1</th><th>Yr. 2</th><th>Summer</th><th>Winter</th><th>(S and W only)</th></tr>
<tr><td>formaldehyde</td><td>17.0</td><td>18.5</td><td>17.3</td><td>14.0</td><td>16.2</td></tr>
</table>
<table>
<tr><th>House M3</th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><th></th><th>Yr. 1</th><th>Yr. 2</th><th>Summer</th><th>Winter</th><th>(S and W only)</th></tr>
<tr><td>formaldehyde</td><td>13.7</td><td>20.0</td><td>17.7</td><td>15.0</td><td>16.4</td></tr>
</table>
<table>
<tr><th>House M4</th><th colspan="4">PEN*</th><th>Mean</th></tr>
<tr><th></th><th>Yr. 1</th><th>Yr. 2</th><th>Summer</th><th>Winter</th><th>(S and W only)</th></tr>
<tr><td>formaldehyde</td><td>14.3</td><td>22.5</td><td>19.7</td><td>17.5</td><td>18.6</td></tr>
</table>
*Mean values
<table>
<tr><th></th><th>HCHO</th></tr>
<tr><td>Overall Mean:
(all houses, S and W only)</td><td>17.8</td></tr>
</table></td><td>MZ 2</td></tr>
</table>

Ref. No.	Supporting Information	Sources
17-13	Formaldehyde Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ Table 1 has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ Table 2 (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 5.3** **I/O ratio (median) = 3.2**	MZ 27
17-13	Formaldehyde Author: Barguil, S., Le Moullec, Y., Person, A., Laurent, A-M, and Festy, B. ‣ Study which reports concurrent indoor and outdoor measurements taken in **residences** (5 detached houses and 4 apartments). ◦ The paper reports the average I/O measurements (Fig 2. - bar chart) of samples taken over the entire length of the study (Sept. 1987 - Aug. 1988). **I/O ratios (average of 75 samples):** **PEN = 1.8**	MZ 36
17-13	Formaldehyde Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' **residences** and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34

Ref. No.	Supporting Information	Sources
17-13	Formaldehyde Source #TL02 measured simultaneous indoor and outdoor formaldehyde concentrations for 10 residences in Roanoke, VA during the period November 1988 - February 1989. The authors reported the data as results from a source model (Table II), from which original measured concentrations can be back-calculated. The presence of indoor sources was not independently determined. The residences were heated by either gas or electricity, with no information provided regarding cooking or garage status. Therefore, the information was assigned to ME # 13. TRJ researchers calculated concurrent I/O ratios from the original concentration data and averaged the ratios. In the absence of indoor sources, this method should yield an estimate of the PEN factor. However, the average I/O ratio was calculated to be **7.6**, indicating that significant indoor sources were present. The authors estimated the indoor source contribution for each of the residences by subtracting the measured outdoor concentration from the measured indoor concentration. The average indoor source contribution was **13.8 μg/m^3**. This represents a lower bound on the ADD factor. Source #TL14 measured simultaneous week-long indoor and neighborhood ambient formaldehyde concentrations at approximately 40 residences near Houston, TX during the period June-October 1981. The ratio of mean concentrations was near **7**, indicating that significant indoor sources were present. Source #TL15 measured simultaneous week-long indoor and neighborhood ambient formaldehyde concentrations at approximately 80 residences near Houston, TX during the summer of 1980. The ratio of mean concentrations was near **7**, indicating that significant indoor sources were present. **ADD = 13.8 μg/m^3** (Quality Code = 1)	TL02, TL14, TL15
17-17	Formaldehyde Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' residences and in **offices** -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34

Ref. No.	Supporting Information	Sources
17-17	Formaldehyde Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an **office building** for several different days. I/O ratios provided – see tables 1, 2, & 3. **Mean PEN (building wide) = 2.6** (Range: 1.1 – 4.7)	MZ 10
17-26	Formaldehyde Author: Fantuzzi, G.; Aggazzotti, G.; Righi, E.; Cavazzutti, L.; Predieri, G. Table 2 (p.53) – INDOOR and OUTDOOR ambient concentrations provided for university libraries in Italian city (inner city and suburb locations) – median, min. and max. NOT SURE IF CONCURRENT MEASUREMENTS. INNER CITY Indoor median conc = 22.9ug/m^3 Outdoor median ambient conc = 22ug/m^3 **MULT = (indoor conc)/(ambient conc) = 22.9/22 = 1.04** SUBURBS Indoor median conc = 10.5ug/m^3 Outdoor median ambient conc = 9.2ug/m^3 **MULT = (indoor conc)/(ambient conc) =10.5/9.2 = 1.14**	RA 23
17-30	Formaldehyde Author: Crump, D.R. Indoor & outdoor measurements of HAPs over 2 years with data reported for a summer season only and a winter season only. Measurements are for four newly constructed unoccupied test houses. Although the methods state that measurements were taken in the living room, kitchen, bedrooms, and bathroom; only the average for the whole house was reported. The mean, max, and minimum data provided for each house and for each contaminant measured in each house for two consecutive years	MZ 2
17-34	Formaldehyde Author: Gonzalez-Flesca, N. Has indoor & outdoor measurements for each of the ten residences measured. Indoor samples taken in bedroom of residences. Outdoor measurements taken at various locations. In addition, a fixed, central-site monitor was used and may provide input to a proximately factor. **From Table 1:** **PROX** **0.72** (note: this is the same value as shown for PROX above)	MZ 3

Ref. No.	Supporting Information	Sources
17-36	Formaldehyde Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, **subway**, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.8**	MZ 34
18-13	Hexachlorobenzene Source #TL03 measured simultaneous indoor and outdoor hexachlorobenzene concentrations for 44 residences in Toronto in the winter and spring of 1996. The authors reported average indoor and outdoor concentrations (Table 1), from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was 0.82. This value can be used as an estimate of the PEN factor for these residences. **PEN = 0.82** (Quality Code = 2)	TL03
20/21-1	Lead Source #TL17 measured lead concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 1.05). This ratio can be used as an estimate of the MULT factor. **MULT = 1.05** (Quality Code = 2)	TL17
20/21-1	Lead Author: Liu, C.S., Shikiya, D., Kahn, M.I., and Juarros, J. ‣ Paper reports results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Figure 1 (p. 250) summarizes the data with a bar graph. ◦ Since measurements were reported for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Fig. 1: **MULT = 1.0**	MZ 33 (Results also reported in MZ 37)
20/21-7	Lead Source #TL16 computed the MULT factor for outdoor locations near roadways based on outdoor/ambient mean concentrations from two data sets (**MULT =1.5**; Quality Code = 2).	TL16

Ref. No.	Supporting Information	Sources
20/21-13	Lead Source #TL12 measured simultaneous indoor and outdoor lead concentrations at two apartment buildings in New York City prior to July 1978. The author calculated the I/O ratio for each pair of measurements and reported the mean I/O ratio for each building (Site A = 0.82; Site D = 0.87). Statistical analyses performed by the author showed that the ratios were not significantly different. The average of these two values can be used as an estimate of the PEN factor for these apartment buildings (**PEN = 0.85**; Quality Code = 1). Source #TL16 computed the MULT factor for residences based on indoor/outdoor mean concentrations from several data sets (**MULT = 0.70**; Quality Code = 2).	TL12, TL16
20/21-13	Lead Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O = PEN = 0.96 (spring); none supplied for summer**	RA 29
20/21-17	Lead Source #TL08 measured simultaneous indoor and outdoor lead concentrations at a university office in Bradford, England during July 1990. Lead concentrations were measured using active samplers mounted on either side of an open window. The authors calculated the ratio of the mean indoor and outdoor concentrations (Table 1) to be 0.86. This value can be used as an estimate of the PEN factor for this office. However, the reported value may be an upper bound on the PEN factor since high air exchange rates would be expected through the open window. **PEN = 0.86** (Quality Code = 2)	TL08
20/21-26	Lead Source #TL12 measured simultaneous indoor and outdoor lead concentrations at a museum in New York City prior to July 1978. The author calculated the I/O ratio for each pair of measurements and reported the mean I/O ratio (0.63).This value can be used as an estimate of the PEN factor for this public building. **PEN = 0.63** (Quality Code = 1)	TL12
20/21-27	Lead Source #TL16 computed the MULT factor for other indoor locations based on indoor/outdoor mean concentrations from several data sets (**MULT = 0.55**; Quality Code = 2).	TL16
22-13	Manganese Author: Wallace, L. and Slonecker, T. Paper reports PTEAM results of concurrent indoor and outdoor sampling of a residence for both $PM_{2.5}$ Mn and PM_{10} Mn for both daytime and nighttime (one sampling day) (See Table 4, pg.64). Arithmetic means provided with percentiles. **Median values for Mn PM10 and PM2.5:** **PEN (day) PEN (night)** **PM10: 0.66 0.55** **PM2.5: 0.73 0.75**	MZ 6

Ref. No.	Supporting Information	Sources
22-13	Manganese Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 1.53 (spring); 0.97 (summer)**	RA 29
22-13	Manganese (Also, PM2.5 and PM10) Author: Pellizzari, E.D., Clayton, C.A., Rodes, C.E., Mason, R.E., et al. ‣ Results of an exposure study to fine and PM10 Mn. ‣ Table 9 (p. 732) summarizes Mn concs. in PM for matched 3-day monitoring periods. ◦ The reporting of indoor, outdoor, and two fixed-site locations enables calculation of a penetration factor, and two proximity factors (also resulting in two MULT factors). **PEN = 0.46** **PEN = 0.46 (same as before)** **PROX (fixed site 2) = 6.23** **PROX (roof site) = 0.81** **MULT (fixed site 2) = 2.77** **MULT (roof site) = 0.35**	MZ 7
22-30	Manganese (Also, PM2.5 and PM10) Author: Pellizzari, E.D., Clayton, C.A., Rodes, C.E., Mason, R.E., et al. ‣ Results of an exposure study to fine and PM10 Mn. ‣ Table 9 (p. 732) summarizes Mn concs. in PM for matched 3-day monitoring periods. ◦ The reporting of indoor, outdoor, and two fixed-site locations enables calculation of a penetration factor, and two proximity factors (also resulting in two MULT factors). **PEN = 0.46** **PEN = 0.46 (same as before)** **PROX (fixed site 2) = 6.23** **PROX (roof site) = 0.81** **MULT (fixed site 2) = 2.77** **MULT (roof site) = 0.35**	MZ 7
24-17	Methylene chloride Source #TL10 measured simultaneous indoor and outdoor methylene chloride concentrations for 12 office buildings in the San Francisco Bay Area during the period June - September 1990. The authors calculated the I/O ratio for each building, but they reported only the range of I/O ratios for all buildings (Range = 1.0 - 45, Table 2). The lower end of the range can be considered an estimate of the PEN factor since indoor sources are likely to be minimal. The upper portion of the range likely indicates the presence of indoor sources. **PEN = 1.0** (Quality Code = 1)	TL10
24-17	Methylene chloride (dichloromethane) Author: Daisey, J.M., Hodgson, A.T., Fisk, W.J., et al. ‣ Indoor/outdoor measurements for 12 **office buildings**. ‣ Table 2 (p. 3559) reports the range of I/O ratios measured for eleven of the twelve office buildings. From Table 2: **PEN (range): 1.0–45.0**	MZ 39

Ref. No.	Supporting Information	Sources
25-1	Nickel Author: South Coast Air Quality Management District ‣ Report gives results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Table 3-3 (p. 37) presents a comparison of in-vehicle and background mean concentrations. ◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Table 3-3: **MULT = 0.5**	MZ 37 (subset of this data reported in MZ 33)
25-1	Nickel Source #TL17 measured nickel concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 0.47). This ratio can be used as an estimate of the MULT factor. **MULT = 0.47** (Quality Code = 2)	TL17
26-13	PAHs Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **Use B(a)P as indicator species for PAHs** **I/O =PEN = 1.1 (spring); nothing provided for summer**	RA 29
26-13	PAH [B(a)P] Author: Ando, M., Katagiri, K., Tamura, K., Yamamoto, S. Study reports indoor and outdoor concentrations of B(a)P in residences in both Tokyo and Beijing. Although the authors never specifically call the I/O samples concurrent, the presumption is that they are for each city (Fig. 8 & 10, resp.). They also report the I/O concentrations (Fig. 12) for residences using 3 different fuel types (coal, coal gas, and NG). **PEN** **0.7** (median and mean of two values calculated from regression lines)	MZ 17
26-17	PAHs [B(a)P, B(k)F, and B(ghi)P] Author: Ando, M., Tamura, K., and Katagiri, K. Concurrent indoor and outdoor measurements for PAHs (see Fig. 6a-c, p. 300) presented in scatter plots with regression lines. [NOTE: Indoor ME never specified in paper -- using picture provided and judgement, it was decided that the ME is an **office**.] From Fig. 6a (B(a)P): **PEN = 1.2** (estimated from regression line on scatter plot)	MZ 21

Ref. No.	Supporting Information	Sources
26-20	PAHs [acenaphtene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, dibenz(ah)anthracene, benzo(ghi)perylene, indeno(123-cd)pyrene] Author: Branisteanu, R.; Aiking, H. Sampling inside coal-fired power plant (six different locations) and sampling /urban measurements in 5 different locations covering the whole town area (p. 534). Table 1 and Table 2 – indoor and outdoor concentrations of PAHs provided. NOT SURE IF CONCURRENT MEASUREMENTS. **Used B(a)P as indicator species for PAHs**. Range of B(a)P conc indoors: 0.057 - 0.4 ng/m^3 Mean indoors conc (calc from 6 locations in plant) = 0.12 ng/m^3 Range of B(a)P conc in ambient outdoors: 80 - 1250 ng/m^3 Mean ambient conc (calc from 5 locations in city) = 716 ng/m^3 **MULT = (mean indoor conc)/(mean ambient conc) = 0.12/716 = 1.7E-4**	RA 22
26-20	(see Tables 2&3 of article for list of individual PAHs) PAHs Author: Petry, T.; Schmid, P.; Schlatter, C. Air sampling at 5 different workplaces. Environmental/ambient monitoring done in March & July, 1992 at sampling site in town center – stationary fixed-site monitoring. Table 2 (p.642) provides geometric mean concentrations of PAHs at different locations.	RA 15
27-13	PCB Author: Currado, G.M. and Harrad, S. Concurrent indoor and outdoor (ambient monitoring) samples taken for PCB conogeners Sum PCB concentrations reported for two office buildings and two different residences (presented in Figure 1, p. 3046). **ΣPCB: PEN PROX MULT** **House 1: 1.86 7.0 13.0** **House 2: 1.83 3.0 5.5**	MZ 9
27-17	PCB Author: Currado, G.M. and Harrad, S. Concurrent indoor and outdoor (ambient monitoring) samples taken for PCB conogeners Sum PCB concentrations reported for two office buildings and two different residences (presented in Figure 1, p. 3046). **ΣPCB: PEN PROX MULT** **Office 1: 180. 0.5 90.0** **Office 2: 8.0 1.0 8.0**	MZ 9
27-30	PCB Author: Currado, G.M. and Harrad, S. Concurrent indoor and outdoor (ambient monitoring) samples taken for PCB conogeners Sum PCB concentrations reported for two office buildings and two different residences (presented in Figure 1, p. 3046). **ΣPCB: PROX** **House 1: 7.0** **House 2: 3.0**	MZ 9

Ref. No.	Supporting Information	Sources
30-13	<u>Styrene</u> Author: Drahonovska, H. Indoor & outdoor measurements of 140 residences (both kitchen and bedroom measurements) taken for listed HAPs. Energy use for heating is broken down by electric, gas, and coal sources. **<u>Average I/O ratios provided (Table 4) for styrene</u>:** **I/O = 0.2–0.9 for bedroom and kitchen, respectively.**	MZ 4
30-13	<u>Styrene</u> Source #<u>TL03</u> measured simultaneous indoor and outdoor styrene concentrations for 44 residences in Toronto in the winter and spring of 1996. The authors reported average indoor and outdoor concentrations (Table 1), from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was **43**, indicating the presence of significant indoor sources. Therefore, the difference between the average indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor (**ADD = 0.13 μg/m^3**; Quality Code = 2). Source #<u>TL07</u> reported the indoor/outdoor styrene concentration ratio measured in June, 1990 for residences in Woodland, CA (Table 2-5). No information was given on stove/garage sources in the residences. The geometric mean ratio was **8.5**, indicating the presence of significant indoor sources. Therefore, the difference between the median indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor (**ADD = 0.77 μg/m^3**; Quality Code = 2).	TL03, TL07
30-13	<u>Styrene</u> Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ <u>Table 29</u> (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for <u>matched</u> samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ <u>Table 46</u> (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ <u>Table 47</u> (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. <u>From Table 29</u>: **<u>LA(1/84)</u> <u>LA(5/84)</u> <u>Contra(6/84)</u> <u>Avg.</u>** **PEN** (medians)**: 0.9 1.0 1.5 1.1**	MZ 38
30-13	<u>Styrene</u> Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.1**	RA 35

Ref. No.	Supporting Information	Sources
30-13	<u>Styrene</u> Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 0.88 (spring); 2.00 (summer)**	RA 29
30-13	<u>Styrene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30
30-13	<u>Styrene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al. Summary of TEAM study in NJ (Fall, 1981). Samples collected for: *personal air* - two consecutive 12-hr samples taken from appr. 350 people, *outdoor air* - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath. <u>Table 9</u> reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best concurrent I/O ratios for **residences** from this study.) **PEN = 2.7** (median value)	MZ 22
30-13	<u>Styrene.</u> Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **I/O ratio provided: 1.08 =PEN** Ambient air conc. provided: 747ug/m^3 (mean), 403ug/m^3(median) Indoor air conc provided: 805ug/m^3 (mean), 532ug/m^3(median) **MULT = (indoor conc)/(ambient conc) = 532/403 = 1.32 (from median conc)** Since PEN>1 ==> calculate ADD: Indoor conc (median) = 532ug/m^3; PEN = I/O = 1.08; Outdoor conc (calculated) = 532/1.08 = 492ug/m^3 **___ug/m^3<ADD<___ ug/m^3** **PROX (calculated from medians) =(outdoor conc)/(ambient conc) =492/403 = 1.22**	RA 14

Ref. No.	Supporting Information	Sources
30-17	Styrene Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.3**	RA 35
30-17	Styrene Source #TL10 measured simultaneous indoor and outdoor styrene concentrations for 12 office buildings in the San Francisco Bay Area during the period June - September 1990. The authors calculated the I/O ratio for each building, but they reported only the range of I/O ratios for all buildings (Range = 0.69 - 13, Table 2). The lower end of the range can be considered an estimate of the PEN factor since indoor sources are likely to be minimal. The upper portion of the range likely indicates the presence of indoor sources. **PEN = 0.69** (Quality Code = 1)	TL10 (same as MZ 39)
30-17	Styrene Author: Shields, H.C., Fleischer, D.M., and Weschler, C.J. ‣ Indoor and outdoor concentration s for 3-types of **offices** (Telecommunications (n=50); data centers (n=9); and administrative offices (n=11)). Geometric means are provided for each office type (see Table 3). ‣ I/O ratios by HAP and office type are provided for each office type using geometric means (see Table 4). **I/O's for Styrene :** Telco: **2.0** (2.7) *Values are GM (GSD)* Data Ctrs: **3.5** (1.7) Admin. Offices: **2.1** (1.7)	MZ 11
30-17	Styrene Author: Daisey, J.M., Hodgson, A.T., Fisk, W.J., et al. ‣ Indoor/outdoor measurements for 12 **office buildings**. ‣ Table 2 (p. 3559) reports the range of I/O ratios measured for eleven of the twelve office buildings. From Table 2: **PEN (range): 0.69–13.0**	MZ 39 (same as TL 10)
30-19	Styrene Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.2**	RA 35

Ref. No.	Supporting Information	Sources
30-27	Styrene Author: Shields, H.C. and Weschler, C.J. ‣ Paper reports matched indoor/outdoor measurements at a telephone switching center (might be classified as an office (ME #17) or **other indoor location (ME #27)**. ◦ Table II - Indoor (2 locations) & outdoor concs. during the March 87 and May 87 sampling. ◦ Table III - Indoor (2 locations) & outdoor concs. during the Dec. 87 and Feb. 88 sampling. ◦ Table IV - Indoor (2 locations) & outdoor concs. during the April 88 sampling. ‣ NO outdoor measurements for styrene were reported.	MZ 29
32-13	1,1,2,2 Tetrachloroethane. Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **I/O ratio provided: 2.62=PEN** Ambient air conc. provided: 1188ug/m^3 (mean), 0ug/m^3(median), 0ug/m^3(min), 17604ug/m^3(max), 4111ug/m^3(std. dev) Indoor air conc provided: 3458ug/m^3 (mean), 965ug/m^3(median), 0ug/m^3(min), 26521ug/m^3(max), 6193ug/m^3(std. dev) **MULT = (indoor conc)/(ambient conc) = 3458/1188 = 2.91 (from mean conc)** Since PEN>1 ==> calculate ADD: Indoor conc (mean) = 3458ug/m^3; PEN = I/O = 2.62; Outdoor conc (calculated) = 3458/2.62 = 1319ug/m^3 **?ug/m^3 <ADD< ?ug/m^3** **PROX (calculated from means) =1319/1188 =1.11**	RA 14
32-17	1,1,2,2-tetrachloroethane Author: Daisey, J.M., Hodgson, A.T., Fisk, W.J., et al. ‣ Indoor/outdoor measurements for 12 **office buildings**. ‣ Table 2 (p. 3559) reports the range of I/O ratios measured for eleven of the twelve office buildings. From Table 2: **PEN (range): 0.73–2.8**	MZ 39
32-17	1,1,2,2-tetrachloroethane Source #TL10 measured simultaneous indoor and outdoor tetrachloroethane concentrations for 12 office buildings in the San Francisco Bay Area during the period June - September 1990. The authors calculated the I/O ratio for each building, but they reported only the range of I/O ratios for all buildings (Range = 0.73 - 2.8, Table 2). The lower end of the range can be considered an estimate of the PEN factor since indoor sources are likely to be minimal. The upper portion of the range likely indicates the presence of indoor sources. **PEN = 0.73** (Quality Code = 1)	TL10

Ref. No.	Supporting Information	Sources
33-1	<u>Tetrachloroethylene (perchloroethylene)</u> Author: South Coast Air Quality Management District ‣ Report gives results of concurrent **<u>in-vehicle</u>** and <u>ambient</u> (fixed site) monitoring study. ‣ <u>Table 3-3</u> (p. 37) presents a comparison of in-vehicle and background mean concentrations. ◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the <u>MULT</u> factor. <u>From Table 3-3</u>: **MULT = 0.96**	MZ 37 (subset of this data reported in MZ 33)
33-1	<u>Tetrachloroethylene (perchloroethylene)</u> Source #<u>TL17</u> measured tetrachloroethylene concentrations in commuting vehicles and at ambient monitoring sites in the Los Angeles area during the summer and winter of 1987. Measurements were made during the same time period, but were not necessarily concurrent. The authors reported mean in-vehicle and ambient concentrations (Table 3-3), from which an I/O ratio can be computed (I/O = 0.96). This ratio can be used as an estimate of the MULT factor. **MULT = 0.96** (Quality Code = 2)	TL17
33-13	<u>Tetrachloroethylene</u> Author: Begerow, J., et al. Time integrated data, first three sampling periods provide concurrent indoor/outdoor measurements for residences (see Table 2, p. 402; and in bar chart form, Figs. 3 & 4). Geometric mean, geometric standard deviation and range are reported. **<u>Geom. Mean PEN values</u>:** **<u>Essen</u> <u>Borken</u>** **winter: 1.7 1.3** **spring: 3.0 2.8** **summer: 3.6 2.6**	MZ 5
33-13	<u>Tetrochloroethylene</u> [Also, Total VHH (see explanation below)] Author: Gilli, G., Bono, R., and Scursatone, E. ‣ Paper reports results of concurrent indoor and outdoor air sampling in **residences** (apartments) in Turin. ◦ Measured concentrations are 6-hr integrated samples. ‣ Table 6 (p. 105) gives the median and ranges of the I/O ratios during both wintertime and summertime sampling. ◦ Unfortunately, only I/O ratios are reported for tetrachloroethylene singularly. The I/O ratios for the other HAPs are grouped together and reported as Total Volatile Halogenated Hydrocarbons (VHH). These include: <u>chloroform</u>, <u>carbon tetrachloride</u>, and <u>trichloroethylene</u>. **<u>I/O Ratios</u>: <u>Wintertime</u> <u>Summertime</u>** **<u>Median</u> <u>Range</u> <u>Median</u> <u>Range</u>** **Tetrachloroethylene 2.15 0.59 - 30.91 1.38 1.03 - 4.22** **Total VHH 2.69 1.85 - 29.45 1.33 0.79 - 2.75**	MZ 31

Ref. No.	Supporting Information	Sources
33-13	Tetrachloroethene / tetrachloroethylene Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **I/O ratio provided: 2.96 =PEN** Ambient air conc. provided: 245ug/m^3 (mean), 241ug/m^3(median) Indoor air conc provided: 727ug/m^3 (mean), 472ug/m^3(median) **MULT = (indoor conc)/(ambient conc) = 472/241 = 1.96 (from median conc)** Since PEN>1 ==> calculate ADD: Indoor conc (median) = 472ug/m^3; PEN = I/O = 2.96; Outdoor conc (calculated) = 472/2.96 = 159ug/m^3 **___ug/m^3<ADD<___ ug/m^3** **PROX (calculated from medians) =(outdoor conc)/(ambient conc) =159/241 = 0.66**	RA 14
33-13	Tetrachloroethylene / tetrachloroethene Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 1.17 (spring); none supplied for summer**	RA 29
33-13	Tetrachloroethylene (perchloroethylene) Source #TL03 measured simultaneous indoor and outdoor tetrachloroethylene concentrations for 44 residences in Toronto in the winter and spring of 1996. The authors reported average indoor and outdoor concentrations (Table 1), from which the I/O average ratio can be computed. Stove/garage sources in the residences were not identified. Therefore, the information was assigned to ME # 13. The I/O average ratio calculated by TRJ researchers was **2.3**, indicating the presence of significant indoor sources. Therefore, the difference between the average indoor and outdoor concentrations can be used to estimate a lower bound for the ADD factor (**ADD = 0.91 µg/m^3**; Quality Code = 2). Source #TL07 reported the indoor/outdoor tetrachloroethylene concentration ratio measured in June, 1990 for residences in Woodland, CA (Table 2-5). No information was given on stove/garage sources in the residences. The geometric mean ratio was **1.9**, indicating the presence of indoor sources. The ADD factor cannot be reliably estimated from this study since the median outdoor concentration was not quantifiable.	TL03, TL07

Ref. No.	Supporting Information	Sources
33-13	<u>Tetrachlorethylene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30
33-13	<u>Tetrachloroethylene</u> Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ <u>Table 1</u> has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ <u>Table 2</u> (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 2.2** **I/O ratio (median) = 1.8**	MZ 27
33-13	<u>Tetrachloroethylene</u> Author: Drahonovska, H. Indoor & outdoor measurements of 140 residences (both kitchen and bedroom measurements) taken for listed HAPs. Energy use for heating is broken down by electric, gas, and coal sources. Unfortunately, <u>no</u> outdoor measurements were reported.	MZ 4
33-13	<u>Tetrachloroethylene (perchloroethylene)</u> Author: Chao, C.Y.H., Tung, T.C.W., Niu, J.L., Pang, S.W., Lee, R.Y.M. ‣ Indoor values reported for bedrooms of 3 different residences. Indoor samples were all 7-day integrated samples. ‣ Two 24-h ambient (outdoor) measurements were taken for each residence, but these samples did <u>not</u> coincide with the indoor sampling. See Tables 2-4.	MZ 19
33-13	<u>Tetrachloroethylene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al. Summary of TEAM study in NJ (Fall, 1981). Samples collected for: *personal air* - two consecutive 12-hr samples taken from appr. 350 people, *outdoor air* - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath. <u>Table 9</u> reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best concurrent I/O ratios for **residences** from this study.) **PEN = 2.2** (median value)	MZ 22

Ref. No.	Supporting Information	Sources
33-13	<u>Tetrachloroethylene</u> Author: Wallace, L. (EPA/600/6-87/002a) “Blue book” ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ <u>Table 29</u> (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for <u>matched</u> samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ <u>Table 46</u> (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ <u>Table 47</u> (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. <u>From Table 29</u>: **<u>LA(1/84)</u> <u>LA(5/84)</u> <u>Contra(6/84)</u> <u>Avg.</u>** **PEN** (medians)**: 1.2 1.3 8.4 3.6**	MZ 38
33-17	<u>Tetrachloroethylene</u> Author: Shields, H.C., Fleischer, D.M., and Weschler, C.J. ‣ Indoor and outdoor concentration s for 3-types of **offices** (Telecommunications (n=50); data centers (n=9); and administrative offices (n=11)). Geometric means are provided for each office type (see Table 3). ‣ <u>I/O ratios</u> by HAP and office type are provided for each office type using geometric means (see Table 4). **<u>I/O’s for Tetrachloroethylene</u> :** Telco: **2.1** (4.6) *Values are GM (GSD)* Data Ctrs: **2.7** (2.1) Admin. Offices: **3.5** (3.7)	MZ 11
33-20	<u>tetrachloroethylene (perchloroethylene)/tetrachlroethene</u> Table 1: Indoor and outdoor air concentrations. NOT SURE IF CONCURRENT MEASUREMENTS. Indoors conc = 2.8 ppb (one sample measurement) Outdoors conc = 1.8 ppb (one sample measurement) **I/O ratio = PEN = 2.8/1.8 = 1.56**	RA 37

Ref. No.	Supporting Information	Sources
33-21 33-31	<u>Tetrachloroethylene (PCE)</u> Author: Underwood, M.C. Concurrent indoor & outdoor samples reported for two different <u>schools</u> (one test school and one control school). <u>Table 1</u> provides monitoring data, both AM and PM, for two different sampling dates. <u>Figure 2</u> contains a graphical representation of I/O ratios from Table 1. In addition, concurrent fixed-site monitoring data for local air district provided. *Should enable calculation of both penetration and proximity factors.* **<u>From Table 1</u>:** **<u>PEN</u> <u>PROX</u> <u>MULT</u>** **Test sch., Rm. B3, 8/11/92: 1.1 0.11 0.12** **Test sch., Rm. B4, 8/11/92: 1.9 0.11 0.21** **Test sch., Rm. B3, 11/9/92: 6.0 0.04 0.26** **Test sch., Rm. B4, 11/9/92: 6.3 0.04 0.27** **Control school, 8/11/92: 0.3 0.86 0.24** **Control school, 11/9/92: <u>0.5</u> <u>0.63</u> <u>0.29</u>** **MEDIAN: 3.3 0.45 0.21** **<u>From Table 2</u>:** **<u>PEN</u> <u>PROX</u> <u>MULT</u>** **Test sch., Rm. B3, cond. (b): 1.0 0.2 0.20** **Test sch., Rm. B4, cond. (b): 0.8 0.2 0.15** **Control school, cond. (b): <u>0.8</u> <u>0.13</u> <u>0.11</u>** **MEDIAN: 0.9 0.17 0.16**	MZ 1
33-27	<u>Perchloroethylene (Tetrachloroethylene)</u> Author: Shields, H.C. and Weschler, C.J. ‣ Paper reports matched indoor/outdoor measurements at a telephone switching center (might be classified as an office (ME #17) or other **indoor location (ME #27)**. ◦ <u>Table II</u> - Indoor (2 locations) & outdoor concs. during the March 87 and May 87 sampling. ◦ <u>Table III</u> - Indoor (2 locations) & outdoor concs. during the Dec. 87 and Feb. 88 sampling. ◦ <u>Table IV</u> - Indoor (2 locations) & outdoor concs. during the April 88 sampling. ◦ <u>Table VI</u> - Indoor (3 locations) & outdoor concs. during the Nov. 88 sampling. Samples collected during: **<u>PEN</u>** 03/87 & 05/87: **4.4** Range: 0.7 – 8.5 12/87 & 02/88: **2.2** Range: 1.4 – 3.0 <u>11/88:</u> **<u>1.6</u>** Range: 1.5 – 1.7 Overall avg.: **2.7**	MZ 29
33-27	<u>Tetrachloroethylene</u> Author: Hisham, M. and Grosjean, D. ‣ Paper presents results of concurrent indoor and outdoor sampling in nine different museums in the LA area. ◦ Hourly samples were collected over the course of 1-2 weeks at each museum. Hourly samples were collected around the clock. ‣ Table I (p. 859) shows the maximum and range of pollutant concs. for both indoors and outdoors at each museum. ‣ Table II (p. 861) shows the average I/O ratios calculated from all paired measurements for each museum. **Average I/O ratio range (all museums but one) (see Table II) = 0.33 to 1.58** **Average I/O ratio for above museums (not incl. Olivas or Southwest) = 0.91**	MZ 32

Ref. No.	Supporting Information	Sources
33-30	Tetrachloroethylene Author: Begerow, J. Time integrated data, first three sampling periods provide concurrent indoor/outdoor measurements for residences (see Table 2, pg.402; and in bar chart form, Figs. 3&4). Geometric mean, geometric standard deviation and range are provided.	MZ 5
34-13	Trichloroethylene (TCE) Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ Table 29 (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for matched samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ Table 46 (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ Table 47 (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. From Table 29: **LA(1/84) LA(5/84) Contra(6/84) Avg.** **PEN** (medians)**: 1.8 4.8 3.2 3.3**	MZ 38
34-13	Trichloroethylene / trichloroethene Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 1.35 (spring); none supplied for summer**	RA 29
34-13	Trichloroethylene Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30
34-13	Trichloroethylene Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ Table 1 has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ Table 2 (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 3.4** **I/O ratio (median) = 1.8**	MZ 27

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>34-13</td><td>Trichloroethylene (TCE)
Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al.
Summary of TEAM study in NJ (Fall, 1981).
Samples collected for: personal air - two consecutive 12-hr samples taken from appr. 350 people,
outdoor air - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath.
<u>Table 9</u> reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best concurrent I/O ratios for residences from this study.)

PEN = 1.5 (median value)</td><td>MZ 22</td></tr>
<tr><td>34-21
34-31</td><td>Trichloroethylene (TCE)
Author: Underwood, M.C.
Concurrent indoor & outdoor samples reported for two different schools (one test school and one control school). Table 1. provides monitoring data, both AM and PM, for two different sampling dates. Figure 2. contains a graphical representation of I/O ratios from Table 1.
In addition, concurrent fixed-site monitoring data for local air district provided. Will enable calculation of both penetration and proximity factors.
<u>From Table 1</u>:
<u>PEN</u> <u>PROX</u> <u>MULT</u>
Test sch., Rm. B3, 8/11/92: >4.1 NA NA=Not available
Test sch., Rm. B4, 8/11/92: >33.9 NA NA
Test sch., Rm. B3, 11/9/92: >5.6 NA NA
Test sch., Rm. B4, 11/9/92: >29.5 NA NA

<u>From Table 2</u>:
<u>PEN</u> <u>PROX</u> <u>MULT</u>
Test sch., Rm. B4, cond. (b): >1.25 NA NA

MEDIAN (incl. Table 1): 17.6</td><td>MZ 1</td></tr>
<tr><td>TBDL-1</td><td>Ethylbenzene
Author: Jo, W.K.; Park, K.H.
In-vehicle and ambient concentrations of VOCs measured prior to and during idling presented GRAPHICALLY. - p. 220. Fig. 1
See RA21, MZ12.
Bar graphs of concentrations measured in-car and ambient are presented for both idling and driving conditions.</td><td>RA 19
MZ 12</td></tr>
</table>

Ref. No.	Supporting Information	Sources
TBDL-1	<u>Ethylbenzene</u> Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by **<u>car</u>**, <u>subway</u>, <u>bicycling (other)</u>, and walking. -- See <u>Table I</u>, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' <u>residences</u> and in <u>offices</u> -- See <u>Table III</u>, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 2.0**	MZ 34
TBDL-1	<u>Ethylbenzene</u> Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for **<u>in-vehicle (ME #1)</u>**, car exterior, fixed-site, and sidewalk (i.e., <u>near road) (ME #7</u>). Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. <u>From Table II</u> (median values): **<u>PROX</u>** **<u>PEN</u>** **<u>MULT</u>** **PEN Range** (from Table V)**: 0.70 – 1.63** **7.0** **0.8** **5.9**	MZ 28
TBDL-1	<u>Ethylbenzene</u> Author: Jo, W.K.; Park, K.H. In-vehicle and ambient concentrations of VOCs measured prior to and during idling presented GRAPHICALLY. - p. 220. Fig. 1 See RA21 (data presented in table format), MZ12. Bar graphs of concentrations measured in-car and ambient are presented for both idling and driving conditions. Mean ambient roadway air samples and invehicle concentrations with standard deviation for 115 commutes in Korean urban route for two types of cars (old model=Elantra; new model =Sonata II). NEW MODEL: Mean indoor conc reported: 9.4ug/m^3 Mean outdoor conc reported: 9.0ug/m^3 **PEN= I/O = 9.4/9 = 1.04** OLD MODEL: Mean indoor conc reported: 13.8ug/m^3 Mean outdoor conc reported: 14.1ug/m^3 **PEN= I/O = 13.8/14.1 = 0.98**	RA 19 RA21 MZ 12

Ref. No.	Supporting Information	Sources
TBDL-4	Ethylbenzene Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, **bicycling (other)**, and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 1.1**	MZ 34
TBDL-5	Ethylbenzene Author: Schwar, M.; Booker, J.; Tait, L. Comparison of concentrations **in the car park** vs. **at the exit of the car park**. Max. concentrations averaged over specified time periods. Table 7. WEEKDAYS (11 GARAGES) Mean of averaged 1-hr inside car park conc: 0.18mg/m^3 Mean of averaged 1-hr exit of car park conc: 0.2mg/m^3 **PEN= I/O = 0.18/0.2 = 0.9** WEEKENDS (5 GARAGES) Mean of averaged 1-hr inside car park conc: 0.2mg/m^3 Mean of averaged 1-hr exit of car park conc: 0.3mg/m^3 **PEN= I/O = 0.2/0.3 = 0.67**	RA 24
TBDL-7	Ethylbenzene Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for in-vehicle (ME #1), car exterior, fixed-site, and sidewalk (i.e., **near road) (ME #7)**. Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. From Table II: **PROX** **4.0** *Median value*	MZ 28

Ref. No.	Supporting Information	Sources
TBDL-13	Ethylbenzene Author: Schneider, P.; Lorinci, G.; Gebefugi, IL.; Heinrich, J.; Kettrup, A. Simultaneous I/O sampling (p.284) Concentration profiles provided by height at which sampling took place. Table 5: median I/O ratios supplied for bedroom, living room, kitchen. Table 6: median I/O ratios (for bedroom, living room, kitchen) presented by apartment age group (old vs. new) **I/O =PEN = 3.5 (kitchen); 3.2 (living room); 2.0 (bedroom)** **Mean I/O = 2.9**	RA 30
TBDL-13	Ethylbenzene. Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **I/O ratio provided: 1.05=PEN** Ambient air conc. provided: 267 ug/m^3 (mean), 234 ug/m^3(median), 0 ug/m^3(min), 966 ug/m^3(max), 301 ug/m^3(std. dev) Indoor air conc provided: 280 ug/m^3 (mean), 286 ug/m^3(median), 0 ug/m^3(min), 674 ug/m^3(max), 240 ug/m^3(std. dev) **MULT = (indoor conc)/(ambient conc) = 286/234 =1.22 (from median conc)** Since PEN>1 ==> calculate ADD: Indoor conc (median) = 286 ug/m^3; PEN = I/O = 1.05; Outdoor conc (calculated) = 286/1.05 = 272.38 ug/m^3 **13.63ug/m^3<ADD<286 ug/m^3** **PROX (calculated from medians) = 272.38/234 = 1.16**	RA 14
TBDL-13	Ethylbenzene Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.0**	RA 35
TBDL-13	Ethylbenzene Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 1.44 (spring); 3.50 (summer)**	RA 29

Ref. No.	Supporting Information	Sources
TBDL-13	<u>Ethylbenzene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al. Summary of TEAM study in NJ (Fall, 1981). Samples collected for: *personal air* - two consecutive 12-hr samples taken from appr. 350 people, *outdoor air* - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath. <u>Table 9</u> reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best concurrent I/O ratios for **residences** from this study.) **PEN = 1.9** (median value)	MZ 22
TBDL-13	<u>Ethylbenzene</u> Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ <u>Table 1</u> has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ <u>Table 2</u> (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 6.8** **I/O ratio (median) = > 2**	MZ 27
TBDL-13	<u>Ethylbenzene</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30
TBDL-13	<u>Ethylbenzene</u> Author: Lebret, E., van de Wiel, H.J., Bos, H.P., Noij, D., and Boleij, J.S.M. ‣ <u>Table 2</u> (p. 326) reports median and maximum HAP concentrations in **residences** (a total of approx. 300) of three different age groups; the median and maximum outdoor concs.; and the overall median I/O ratio for all homes. ◦ These concentrations were weekly averages. **<u>Median, overall I/O ratios</u>:** **ethylbenzene = 5**	MZ 26

Ref. No.	Supporting Information	Sources
TBDL-13	<u>Ethylbenzene</u> Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ <u>Table 29</u> (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for <u>matched</u> samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ <u>Table 46</u> (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ <u>Table 47</u> (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. <u>From Table 29</u>: **<u>LA(1/84)</u> <u>LA(5/84)</u> <u>Contra(6/84)</u> <u>Avg.</u>** **PEN** (medians)**: 0.9 1.1 2.8 1.6**	MZ 38
TBDL-13	<u>Ethylbenzene</u> Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>car</u>, <u>subway</u>, <u>bicycling (other)</u>, and walking. -- See <u>Table I</u>, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' **<u>residences</u>** and in <u>offices</u> -- See <u>Table III</u>, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34
TBDL-17	<u>Ethylbenzene</u> Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.7**	RA 35
TBDL-17	<u>Ethylbenzene</u> Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an **office building** for several different days. I/O ratios provided – see tables 1, 2, & 3. **Mean PEN (building wide; ie., four floors) = 2.5** (Range: 1.8 – 3.0)	MZ 10

Ref. No.	Supporting Information	Sources
TBDL-17	Ethylbenzene Author: Shields, H.C. Indoor and outdoor concentration s for 3-types of offices (Telecommunications (n=50); data centers (n=9); and administrative offices (n=11), geometric means are provided for each office type See Table 3 I/O ratios by HAP and office type are provided for each office type using geometric means, (see Table 4) **I/O's for Ethylbenzene are** Telco: **1.6**; Data Cntrs.: **2.7**; Admin. Office: **1.9**	30–13
TBDL-17	Ethylbenzene Author: Daisey, J.M., Hodgson, A.T., Fisk, W.J., et al. ‣ Indoor/outdoor measurements for 12 **office buildings**. ‣ Table 2 (p. 3559) reports the range of I/O ratios measured for eleven of the twelve office buildings. From Table 2: **PEN (range): 0.48–2.5**	MZ 39
TBDL-17	Ethylbenzene Author: Shields, H.C., Fleischer, D.M., and Weschler, C.J. ‣ Indoor and outdoor concentration s for 3-types of **offices** (Telecommunications (n=50); data centers (n=9); and administrative offices (n=11)). Geometric means are provided for each office type (see Table 3). ‣ I/O ratios by HAP and office type are provided for each office type using geometric means (see Table 4). **I/O's for Ethylbenzene :** Telco: **1.6** (2.3) *Values are GM (GSD)* Data Ctrs: **2.7** (1.6) Admin. Offices: **1.9** (1.8)	MZ 11
TBDL-17	Ethylbenzene Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' residences and in **offices** -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34
TBDL-19	Ethylbenzene Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.5**	RA 35

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>TBDL-27</td><td><u>Ethylbenzene</u>
Author: Shields, H.C. and Weschler, C.J.
‣ Paper reports matched indoor/outdoor measurements at a telephone switching center (might be classified as an office (ME #17) or other indoor location (ME #27).
◦ <u>Table II</u> - Indoor (2 locations) & outdoor concs. during the March 87 and May 87 sampling.
◦ <u>Table III</u> - Indoor (2 locations) & outdoor concs. during the Dec. 87 and Feb. 88 sampling.
◦ <u>Table IV</u> - Indoor (2 locations) & outdoor concs. during the April 88 sampling.
◦ <u>Table V</u> - Indoor (3 locations) & outdoor concs. during the May 88 and July 88 sampling.
◦ <u>Table VI</u> - Indoor (3 locations) & outdoor concs. during the Nov. 88 sampling.

Samples collected during:
<u>PEN</u>
03/87 & 05/87: 1.6 Range: 1.2 – 2.0
12/87 & 02/88: 2.1 Range: 1.9 – 2.6
04/88: 1.5 Range: 1.5 – 1.5
05/88 & 07/88: 4.9 Range: 4.6 – 5.3
<u>11/88:</u> <u>2.2</u> Range: 2.0 – 2.3
Overall avg.: 2.5</td><td>MZ 29</td></tr>
<tr><td>TBDL-36</td><td><u>Ethylbenzene</u>
Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M.
‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>car</u>, <u>subway</u>, <u>bicycling (other</u>), and walking. -- See <u>Table I</u>, (p. 1596).
◦ NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient. Therefore, only calculation of a MULT factor is possible.
‣ In addition, VOC concs. were also measured in subjects’ <u>residences</u> and in <u>offices</u> -- See <u>Table III</u>, (p. 1597).
◦ Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.
‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples.
◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time.
‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.

MULT (median) = 1.0</td><td>MZ 34</td></tr>
<tr><td>TBDL-1</td><td><u>Hexane</u>
Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L.
‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for <u>in-vehicle (ME #1)</u>, car exterior, fixed-site, and sidewalk (i.e., <u>near road) (ME #7</u>). Measurements are simultaneous.
‣ Table II (p. 966) — Concs. for each of the above locations.
‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural).
‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior.
‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site.

<u>From Table II</u> (Median values):
<u>PROX</u> <u>PEN</u> <u>MULT</u> PEN Range: 0.85 – 1.3
5.3 1.1 5.8</td><td>MZ 28</td></tr>
</table>

Ref. No.	Supporting Information	Sources
TBDL-7	Hexane Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for in-vehicle (ME #1), car exterior, fixed-site, and sidewalk (i.e., **near road) (ME #7)**. Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. From Table II: **PROX** **4.2** *Median value*	MZ 28
TBDL-13	n-Hexane Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ Table 1 has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ Table 2 (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 8.7** **I/O ratio (median) = 1.8**	MZ 27
TBDL-13	n-Hexane Author: Lebret, E., van de Wiel, H.J., Bos, H.P., Noij, D., and Boleij, J.S.M. ‣ Table 2 (p. 326) reports median and maximum HAP concentrations in **residences** (a total of approx. 300) of three different age groups; the median and maximum outdoor concs.; and the overall median I/O ratio for all homes. ◦ These concentrations were weekly averages. **Median, overall I/O ratios:** **n-hexane = 2**	MZ 26
TBDL-17	Hexane Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an **office building** for several different days. I/O ratios provided – see tables 1, 2, & 3. **Mean PEN (building wide; ie., four floors) = 4.8** (Range: 1.5 – 11.7)	MZ 10
TBDL-1	MTBE Author: Lioy, Weisel, Jo, Pellizzari, Raymer Two microenvironmental combinations of MTBE were reported, including: concurrent **in-cabin** and **outside** during refueling (Fig. 2 – bar chart), and concurrent **in-cabin** and **roadway (hood of car)** (Fig. 3– scatter plot).	MZ 20

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>TBDL-1</td><td><u>MTBE</u>
Author: Wan-Kuen Jo and Kun-Ho Park
Table 1 has data on concentrations for in-auto, in-bus, and ambient air. Also, just below this table, the authors provide ratios for in-auto/in-bus/fixed-site. Finally, a possible proximity factor is suggested (also just below <u>Table 1</u>).

No measurements for outside the vehicle were reported.
<u>PEN</u> <u>PROX</u> <u>MULT</u> [Ratio calculated using median measurement values]
N/A N/A 13.9</td><td>MZ 14</td></tr>
<tr><td>TBDL-1</td><td><u>MTBE</u>
Author: Shahnaz Alimokhtari Vayghani and Clifford Weisel
Data presented for paired measurements of in-car and "at the pump" concentrations during refueling (Table 1).

I/O* ratio (median) = 4.3
* I=in-cabin, O=at the pump.</td><td>MZ 13</td></tr>
<tr><td>TBDL-2</td><td><u>MTBE</u>
Author: Wan-Kuen Jo and Kun-Ho Park
Table 1 has data on concentrations for in-auto, in-bus, and ambient air. Also, just below this table, the authors provide ratios for in-auto/in-bus/fixed-site.

Finally, a possible proximity factor is suggested (also just below <u>Table 1</u>).
Assumed that in-bus and roadway concentrations were the same.
<u>PEN</u> <u>PROX</u> <u>MULT</u> [All ratios calculated using <u>median</u> measurement values.]
1.0 4.4 4.4</td><td>MZ 14</td></tr>
<tr><td>TBDL-1</td><td><u>Toluene</u>
Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M.
‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>car</u>, <u>subway</u>, <u>bicycling (other)</u>, and walking. -- See <u>Table I</u>, (p. 1596).
◦ NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient. Therefore, only calculation of a MULT factor is possible.
‣ In addition, VOC concs. were also measured in subjects' <u>residences</u> and in <u>offices</u> -- See <u>Table III</u>, (p. 1597).
◦ Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.
‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples.
◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time.
‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.

MULT (median) = 1.5</td><td>MZ 34</td></tr>
</table>

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>TBDL-1</td><td>Toluene
Author: South Coast Air Quality Management District
‣ Report gives results of concurrent in-vehicle and ambient (fixed site) monitoring study.
‣ Table 3-3 (p. 37) presents a comparison of in-vehicle and background mean concentrations.
◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor.
From Table 3-3:
MULT = 2.5</td><td>MZ 37 (subset of this data reported in MZ 33)</td></tr>
<tr><td>TBDL-1</td><td>Toluene
Author: Shahnaz Alimokhtari Vayghani and Clifford Weisel
Data presented for paired measurements of in-car and "at the pump" concentrations during refueling (Table 1).

I/O* ratio (median) = 2.8
* I=in-cabin, O=at the pump.</td><td>MZ 13</td></tr>
<tr><td>TBDL-1</td><td>Toluene
Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L.
‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for car (ME #1), car exterior, fixed-site, and sidewalk (i.e., near road) (ME #7).
Measurements are simultaneous.
‣ Table II (p. 966) — Concs. for each of the above locations.
‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural).
‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior.
‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site.

From Table II (Median values):
PROX PEN MULT   PEN Range (from Table V): 0.73 – 1.66
7.1 0.88 6.2</td><td>MZ 28</td></tr>
<tr><td>TBDL-1</td><td>Toluene
Author: Leung, PL.; Harrison, RM.
In-vehicle, immediately outside the vehicle (out-vehicle), and roadside SIMULTANEOUS sampling on six different roads.
Roadside (static/fixed-site) sampling sites at different distances from road and measured at different heights
Ambient air concentrations – continuous measurements at a background location – measured data each hour throughout the year. Ambient data presented as mean over the sampling period (p. 194)
Table 3: DAILY means and standard deviations of concentrations in-vehicle, out-vehicle, roadside, and ambient.
Table 5: Mean I/O ratios/PEN, PROX, MULT for Toluene on six different roads
Comparison of in-vehicle vs. out-vehicle concentrations during rush hours and non-rush hours – tables 6&7.
Comparison of in-vehicle vs. out-vehicle concentrations for different types of cars – tables 8&9.

PEN = 1.11
MULT = 20.94
PROX = 17.73</td><td>RA 32</td></tr>
</table>

Ref. No.	Supporting Information	Sources
TBDL-1	<u>Toluene</u> Author: Jo, W.K.; Park, K.H. In-vehicle and ambient concentrations of VOCs measured prior to and during idling presented GRAPHICALLY. - p. 220. Fig. 1 See RA21 (data presented in table format), MZ12. Bar graphs of concentrations measured in-car and ambient are presented for both idling and driving conditions. Mean ambient roadway air samples and invehicle concentrations with standard deviation for 115 commutes in Korean urban route for two types of cars (old model=Elantra; new model =Sonata II). NEW MODEL: Mean indoor conc reported: 100ug/m^3 Mean outdoor conc reported: 81.1ug/m^3 **PEN= I/O = 100/81.1 = 1.23** OLD MODEL: Mean indoor conc reported: 129ug/m^3 Mean outdoor conc reported: 105ug/m^3 **PEN= I/O = 129/105 = 1.23**	RA 19 RA21 MZ 12
TBDL-1	<u>Toluene</u> Author: Jo, W.K.; Park, K.H. In-vehicle and ambient concentrations of VOCs measured prior to and during idling presented GRAPHICALLY. - p. 220. Fig. 1 See RA21, MZ12. Bar graphs of concentrations measured in-car and ambient are presented for both idling and driving conditions.	RA 19 MZ 12
TBDL-4	<u>Toluene</u> Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>car</u>, <u>subway</u>, **<u>bicycling (other)</u>**, and walking. -- See <u>Table I</u>, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' <u>residences</u> and in <u>offices</u> -- See <u>Table III</u>, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.7**	MZ 34

Ref. No.	Supporting Information	Sources
TBDL-5	<u>Toluene</u> Author: Schwar, M.; Booker, J.; Tait, L. Comparison of concentrations **in the car park** vs. **at the exit of the car park**. Max. concentrations averaged over specified time periods. Table 7. WEEKDAYS (11 GARAGES) Mean of averaged 1-hr inside car park conc: 0.76mg/m^3 Mean of averaged 1-hr exit of car park conc: 1.09mg/m^3 **PEN= I/O = 0.76/1.09 = 0.7** WEEKENDS (5 GARAGES) Mean of averaged 1-hr inside car park conc: 1.4mg/m^3 Mean of averaged 1-hr exit of car park conc: 1.6mg/m^3 **PEN= I/O = 1.4/1.6 = 0.88**	RA 24
TBDL-7	<u>Toluene</u> Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for <u>car (ME #1)</u>, car exterior, fixed-site, and sidewalk (i.e., **<u>near road) (ME #7)</u>**. Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. <u>From Table II</u>: **<u>PROX</u>** **4.1** *Median values*	MZ 28
TBDL-13	<u>Toluene</u> Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ <u>Table 1</u> has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ <u>Table 2</u> (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **I/O ratio (mean) = 6.1** **I/O ratio (median) = 2.6**	MZ 27

Ref. No.	Supporting Information	Sources
TBDL-13	Toluene Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' **residences** and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34
TBDL-13	Toluene Author: Crump, D.R. Indoor & outdoor measurements of HAPs over 2 years with data reported for a summer season only and a winter season only. Measurements are for four newly constructed unoccupied test houses. Although the methods state that measurements were taken in the living room, kitchen, bedrooms, and bathroom; only the average for the whole house was reported. The mean, max, and minimum data provided for each house and for each contaminant measured in each house for two consecutive years. **House T1** — PEN*: **Yr. 1** / **Yr. 2** / **Summer** / **Winter**; **Mean (S and W only)** **toluene** **2.1** **1.0** **1.0** **1.0** **1.0** **House T2** — PEN*: **Yr. 1** / **Yr. 2** / **Summer** / **Winter**; **Mean (S and W only)** **toluene** **1.3** **1.0** **1.0** **1.0** **1.0** **House M3** — PEN*: **Yr. 1** / **Yr. 2** / **Summer** / **Winter**; **Mean (S and W only)** **toluene** **1.1** **6.0** **0.67** **1.0** **0.8** **House M4** — PEN*: **Yr. 1** / **Yr. 2** / **Summer** / **Winter**; **Mean (S and W only)** **toluene** **1.3** **1.2** **1.5** **1.2** **1.35** *Mean values **toluene** **Overall Mean:** ***1.0*** **(all houses, S and W only)**	MZ 2
TBDL-13	Toluene Author: Drahonovska, H. Indoor & outdoor measurements of 140 residences (both kitchen and bedroom measurements) taken for listed HAPs. Energy use for heating is broken down by electric, gas, and coal sources. Average I/O ratios provided (Table 5) for toluene. **I/O=7.8 for house heated** **I/O=3.2 for non-heated house**	MZ 4

Ref. No.	Supporting Information	Sources
TBDL-13	<u>Toluene</u> Author: Gilli, G., Scursatone, E., and Bono, R. ‣ Indoor and outdoor simultaneous measurements taken for a **residence** (apartment). ◦ Samples were collected by 10 non-smoking university students who each collected samples for 10 consecutive days [2 integrated samples per day: 1) 8:00 - 20:00 (12-hrs), and 2) 0:00 - 8:00 (8-hrs)] in December 1991. ‣ <u>Table 3</u> (p. 53) shows the mean I/O ratios for both day (i.e., 8:00 - 20:00) and night (ie, 0:00 - 8:00). Data is the average form all students. ‣ <u>Table 4</u> (p. 54) shows indoor and outdoor pollutant concentrations for both day and night. NOTE: It is not clear how this data relates to the ratios reported in Table 3. It might be data for only a single student. **<u>Average I/O data for all students (Table 3)</u>:** **toluene (day) = 1.11** **toluene (night) = 2.86**	MZ 25
TBDL-13	<u>Toluene</u> Author: Lebret, E., van de Wiel, H.J., Bos, H.P., Noij, D., and Boleij, J.S.M. ‣ <u>Table 2</u> (p. 326) reports median and maximum HAP concentrations in **residences** (a total of approx. 300) of three different age groups; the median and maximum outdoor concs.; and the overall median I/O ratio for all homes. ◦ These concentrations were weekly averages. **<u>Median, overall I/O ratios</u>:** **toluene = 8**	MZ 26
TBDL-13	<u>Toluene</u> Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **I/O =PEN = 1.42 (spring); 4.72 (summer)**	RA 29
TBDL-13	<u>Toluene</u> Author: Barguil, S., Le Moullec, Y., Person, A., Laurent, A-M, and Festy, B. ‣ Study which reports concurrent indoor and outdoor measurements taken in **residences** (5 detached houses and 4 apartments). ◦ The paper reports the average I/O measurements (Fig 2. - bar chart) of samples taken over the entire length of the study (Sept. 1987 - Aug. 1988). **<u>I/O ratios (average of 75 samples)</u>:** **PEN = 3.6**	MZ 36

<table>
<tr><th>Ref. No.</th><th>Supporting Information</th><th>Sources</th></tr>
<tr><td>TBDL-13</td><td><u>Toluene</u>
Author: Brown, V. and Crump, D.
‣ Measurement study at residences using passive samplers.
◦ Samplers were exposed for 1-month periods.
◦ Far more indoor measurements (173) were taken than outdoor measurements (13).
◦ Matched samples <u>not</u> reported.
‣ <u>Table 1</u> (p. 386) reports the min, max, median, and mean for inside 173 homes; and also reports the mean for outdoors for 13 homes.
<table>
<tr><td></td><td colspan="4">Indoors*</td><td colspan="2">Outdoors*</td></tr>
<tr><td></td><td><u>median</u></td><td><u>mean</u></td><td><u>min</u></td><td><u>max</u></td><td><u>mean</u></td><td><u>mean I/O</u></td></tr>
<tr><td>toluene</td><td>25</td><td>40</td><td>8</td><td>1004</td><td>12</td><td>3.3</td></tr>
</table>
* All values in $\mu g/m^3$.

‣ <u>Fig. 1</u> (p. 391) shows the mean concentrations of benzene and toluene by month for both indoors and outdoors.
◦ Not specified how many indoor (or outdoor) measurements were included in each monthly mean reported in Fig. 1's graphs.
<u>Estimated ratios (I/O)</u> (from Fig. 1):
<table>
<tr><td></td><td><u>min</u></td><td><u>max</u></td></tr>
<tr><td>toluene</td><td>3.2</td><td>5.5</td></tr>
</table></td><td>MZ 35</td></tr>
<tr><td>TBDL-13</td><td><u>Toluene</u>
Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P.
SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea.
Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5.

I/O ratio provided from median conc = PEN = 1.1</td><td>RA 35</td></tr>
<tr><td>TBDL-13</td><td><u>Toluene</u>
Author: Schneider, P.; Lorinci, G.; Gebefugi, IL.; Heinrich, J.; Kettrup, A.
Simultaneous I/O sampling (p.284)
Concentration profiles provided by height at which sampling took place.
Table 5: median I/O ratios supplied for bedroom, living room, kitchen.
Table 6: median I/O ratios (for bedroom, living room, kitchen) presented by apartment age group (old vs. new)

I/O =PEN = 6.1 (kitchen); 7.5 (living room); 2.6 (bedroom)
Mean I/O = 5.4</td><td>RA 30</td></tr>
<tr><td>TBDL-17</td><td><u>Toluene</u>
Author: Daisey, J.M., Hodgson, A.T., Fisk, W.J., et al.
‣ Indoor/outdoor measurements for 12 office buildings.
‣ <u>Table 2</u> (p. 3559) reports the range of I/O ratios measured for eleven of the twelve office buildings.
<u>From Table 2</u>:
PEN (range): 0.63–5.2</td><td>MZ 39</td></tr>
</table>

Ref. No.	Supporting Information	Sources
TBDL-17	<u>Toluene</u> Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 2.4**	RA 35
TBDL-17	<u>Toluene</u> Author: Shields, H.C., Fleischer, D.M., and Weschler, C.J. ‣ Indoor and outdoor concentration s for 3-types of **offices** (Telecommunications (n=50); data centers (n=9); and administrative offices (n=11)). Geometric means are provided for each office type (see Table 3). ‣ <u>I/O ratios</u> by HAP and office type are provided for each office type using geometric means (see Table 4). **<u>I/O's for Toluene</u> :** Telco: **1.8** (2.6) *Values are GM (GSD)* Data Ctrs: **4.9** (2.5) Admin. Offices: **2.2** (2.0)	MZ 11
TBDL-17	<u>Toluene</u> Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an **office building** for several different days. I/O ratios provided – see tables 1, 2, & 3. **Mean PEN (building wide; ie., four floors) = 7.1** (Range: 2.2 – 11.5)	MZ 10
TBDL-17	<u>Toluene</u> Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>car</u>, <u>subway</u>, <u>bicycling (other</u>), and walking. -- See <u>Table I</u>, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' <u>residences</u> and in **<u>offices</u>** -- See <u>Table III</u>, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34
TBDL-19	<u>Toluene</u> Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **I/O ratio provided from median conc = PEN = 1.4**	RA 35

Ref. No.	Supporting Information	Sources
TBDL-26	Toluene Author: Fantuzzi, G.; Aggazzotti, G.; Righi, E.; Cavazzutti, L.; Predieri, G. Table 2 (p.53) – INDOOR and OUTDOOR concentrations provided for university libraries in Italian city (inner city and suburb locations) – median, min. and max. NOT SURE IF CONCURRENT MEASUREMENTS. INNER CITY Indoor median conc = 22ug/m^3 Outdoor median ambient conc = 32.5ug/m^3 **MULT = (indoor conc)/(ambient conc) = 22/32.5 = 0.68** SUBURBS Indoor median conc = 24.5ug/m^3 Outdoor median ambient conc = 16ug/m^3 **MULT = (indoor conc)/(ambient conc) = 24.5/16 = 1.53**	RA 23
TBDL-27	Toluene Author: Shields, H.C. and Weschler, C.J. ‣ Paper reports matched indoor/outdoor measurements at a telephone switching center (might be classified as an office (ME #17) or **other indoor location (ME #27)**). ◦ Table II - Indoor (2 locations) & outdoor concs. during the March 87 and May 87 sampling. ◦ Table III - Indoor (2 locations) & outdoor concs. during the Dec. 87 and Feb. 88 sampling. ◦ Table IV - Indoor (2 locations) & outdoor concs. during the April 88 sampling. ◦ Table V - Indoor (3 locations) & outdoor concs. during the May 88 and July 88 sampling. ◦ Table VI - Indoor (3 locations) & outdoor concs. during the Nov. 88 sampling. Samples collected during: **PEN** 03/87 & 05/87: **1.4** Range: 1.1 – 1.6 12/87 & 02/88: **5.0** Range: 1.2 – 13.4 04/88: **1.5** Range: 1.5 – 1.5 05/88 & 07/88: **3.1** Range: 2.3 – 5.0 11/88: **1.8** Range: 1.6 – 2.0 Overall avg.: **2.6**	MZ 29
TBDL-36	Toluene Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, **subway**, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 1.1**	MZ 34

Ref. No.	Supporting Information	Sources
TBDL-1	o-, m-, p-Xylenes Author: Jo, W.K.; Park, K.H. In-vehicle and ambient concentrations of VOCs measured prior to and during idling presented GRAPHICALLY. - p. 220. Fig. 1 See RA21 (data presented in table format), MZ12. Bar graphs of concentrations measured in-car and ambient are presented for both idling and driving conditions. Mean ambient roadway air samples and invehicle concentrations with standard deviation for 115 commutes in Korean urban route for two types of cars (old model=Elantra; new model =Sonata II). NEW MODEL: Mean indoor conc reported: 6.7 (p-), 14.1 (m-), 8.6 (o-)ug/m^3 Mean outdoor conc reported: 7.3 (p-), 14 (m-), 10.3 (o-)ug/m^3 **PEN= I/O = 0.9(p-), 1.0(m-), 0.8(o-) ==>choose 0.9** OLD MODEL: Mean indoor conc reported: 13.3 (p-), 26.3 (m-), 17.4 (o-)ug/m^3 Mean outdoor conc reported: 14.5 (p-), 27.9 (m-), 20.8 (o-)ug/m^3 **PEN= I/O = 0.9(p-), 0.9(m-), 0.8(o-) ==>choose 0.9**	RA 19 RA21 MZ 12
TBDL-1	Xylenes Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by **car**, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 1.7** (avg. of MULT for m,p- = 1.6, and o-xylene = 1.8)	MZ 34

Ref. No.	Supporting Information	Sources
TBDL-1	Xylenes Author: Weisel, C.P., Nicholas, N.J., and Lioy, P.J. ‣ Numerous HAPs/VOCs were measured in automobile interiors. Ambient outdoor HAPs measured at the start of a commute and at the end of a commute for benzene and xylenes. ◦ Table 7 – provides mean automobile cabin and suburban outdoor concentrations for benzene and xylenes from this study. ‣ No measurements from the exterior of the vehicle were reported. Therefore, only calculation of a MULT factor is feasible. ‣ This study also summarizes indoor and outdoor measurements from other studies (TEAM and SCAQMD). The average values reported do not appear to be concurrent. From Table 7: **MULT (mean value), (m&p) = 12.0** **MULT (mean value), (o) = 14.8**	MZ 16
TBDL-1	Xylenes Author: South Coast Air Quality Management District ‣ Report gives results of concurrent **in-vehicle** and ambient (fixed site) monitoring study. ‣ Table 3-3 (p. 37) presents a comparison of in-vehicle and background mean concentrations. ◦ Since measurements were reported only for in-vehicle and fixed site monitors -- the only ME factor that can be estimated from this work is the MULT factor. From Table 3-3: **MULT = 2.2**	MZ 37 (subset of this data reported in MZ 33)
TBDL-1	Xylenes Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for **car (ME #1)**, car exterior, fixed-site, and sidewalk (i.e., near road) (ME #7). Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. From Table II (median values): **PROX** **PEN** **MULT** **PEN Range** (from Table V)**: 0.66/0.64* – 1.60/1.55*** **7.6/6.9*** **0.88**** **6.7/6.1** * First value is for m,p-xylene, second value is for o-xylene. ** Same PEN factor for m,p-xylene and o-xylene.	MZ 28

Ref. No.	Supporting Information	Sources
TBDL-4	Xylenes Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, **bicycling (other)**, and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' residences and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.9** (avg. of MULT for m,p- = 0.8, and o-xylene = 0.9)	MZ 34
TBDL-5	o-, m-, p-Xylenes Author: Schwar, M.; Booker, J.; Tait, L. Comparison of concentrations **in the car park** vs. **at the exit of the car park**. Max. concentrations averaged over specified time periods. Table 7. WEEKDAYS (11 GARAGES) Mean of averaged 1-hr inside car park conc: 1.34mg/m^3 Mean of averaged 1-hr exit of car park conc: 0.22mg/m^3 **PEN= I/O =1.34/0.22 = 6.09** WEEKENDS (5 GARAGES) Mean of averaged 1-hr inside car park conc: 0.3mg/m^3 Mean of averaged 1-hr exit of car park conc: 0.34mg/m^3 **PEN= I/O =0.3/0.34 = 0.88**	RA 24
TBDL-7	Xylenes Author: Chan, C-C, Ozkaynak, H., Spengler, J.D., and Sheldon, L. ‣ Paper reports measurement results and parameters (i.e., min, 25%, median, 75%, max., mean, and SD) for car (ME #1), car exterior, fixed-site, and sidewalk (i.e., **near road) (ME #7**). Measurements are simultaneous. ‣ Table II (p. 966) — Concs. for each of the above locations. ‣ Table III (p. 968) — Median concs. measured inside vehicles and at a fixed site for three different driving routes (urban, interstate, and rural). ‣ Table V (p. 970) — I/O ratios for in-vehicle/car exterior. ‣ Fig. 1 (p. 969) — Ratios of median concs. between in-vehicle and fixed site. From Table II: **PROX** **4.3/4.0** *Median values* * First value is for m,p-xylene, second value is for o-xylene.	MZ 28

Ref. No.	Supporting Information	Sources
TBDL-13	<u>o-, m-, p-Xylenes</u> Author: Schneider, P.; Lorinci, G.; Gebefugi, IL.; Heinrich, J.; Kettrup, A. Simultaneous I/O sampling (p.284) Concentration profiles provided by height at which sampling took place. Table 5: median I/O ratios supplied for bedroom, living room, kitchen. Table 6: median I/O ratios (for bedroom, living room, kitchen) presented by apartment age group (old vs. new) **m-, p-xylenes: I/O =PEN = 2.8 (kitchen); 2.4 (living room); 1.7 (bedroom)** **o-xylenes: I/O =PEN = 2.3 (kitchen); 2.2 (living room); 1.5 (bedroom)** **Mean I/O = 2.15**	RA 30
TBDL-13	<u>o-, m-, p-Xylenes</u> Author: Mukherjee, S.; Ellenson, WD.; Lewis, RG.; Stevens, RK. See RA11 Median concentrations of indoor and outdoor provided for spring and summer. Median I/O ratios by season supplied – tables 2, 8 and 9. **m-, p-Xylene: I/O =PEN = 1.42 (spring); 3.72 (summer)** **o-Xylene: I/O =PEN = 1.38 (spring); 3.92 (summer)** **Mean I/O for spring: 1.4** **Mean I/O for summer: 3.82**	RA 29
TBDL-13	<u>Xylenes</u> Author: De Bortoli, M., Knoppel, H., Pecchio, E., Peil, A., et al. ‣ Simultaneous indoor and outdoor measurements taken in **residences** (5 apartments and 9 single family homes) and one office building. NOTE, however, that the data were not reported separately for the office, nor were the data separated according to the type of residence (i.e., apartment or house). ‣ <u>Table 1</u> has the minima, maxima, and means of the indoor and outdoor concentrations. ‣ <u>Table 2</u> (p. 347) has the minima, maxima, means, and medians of the I/O ratios. **<u>1,3-xylene & 1,4-xylene</u>:** **<u>1,2-xylene</u>:** **I/O ratio (mean) = 7.8** **I/O ratio (mean) = 8.0** **I/O ratio (median) = 2.3** **I/O ratio (median) = 3.0**	MZ 27
TBDL-13	<u>Xylenes</u> Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., Sparacino, C., et al. ‣ Results of the TEAM study that report measurements of personal and outdoor air sampling; in addition, breath and drinking water samples were measured. ◦ The personal and outdoor air measurements were 12-hr integrated samples. These roughly correspond to daytime (6am-6pm) and nighttime (6pm-6am). Unfortunately, the personal and outdoor results for NJ (Table 2) are combined into 24-hr averages. ‣ Fig. 2 (p. 297) has a bar graph of the nighttime (6pm-6am) personal (might be used as a surrogate for indoor residence) and outdoor concentrations. NOTE: these are geometric means with more than four times the number of personal (347) compared to outdoor samples (84). ◦ *Also, all I/O ratios are greater than 1.5.* ‣ Table 3 also has 24-hr averaged results of personal air and outdoor air sampling for Greensboro, NC and Devils Lake, ND.	MZ 30

Ref. No.	Supporting Information	Sources
TBDL-13	<u>Xylenes</u> Author: Crump, D.R. Indoor & outdoor measurements of HAPs over 2 years with data reported for a summer season only and a winter season only. Measurements are for four newly constructed unoccupied test houses. Although the methods state that measurements were taken in the living room, kitchen, bedrooms, and bathroom; only the average for the whole house was reported. The mean, max, and minimum data provided for each house and for each contaminant measured in each house for two consecutive years. **<u>House T1</u>** **PEN*** (**<u>Yr. 1</u>** **<u>Yr. 2</u>** **<u>Summer</u>** **<u>Winter</u>**) **Mean** **<u>(S and W only)</u>** **xylenes** **11.6** **6.3** **10.5** **3.2** **6.9** **<u>House T2</u>** **PEN*** (**<u>Yr. 1</u>** **<u>Yr. 2</u>** **<u>Summer</u>** **<u>Winter</u>**) **Mean** **<u>(S and W only)</u>** **xylenes** **9.1** **5.3** **9.0** **3.0** **6.0** **<u>House M3</u>** **PEN*** (**<u>Yr. 1</u>** **<u>Yr. 2</u>** **<u>Summer</u>** **<u>Winter</u>**) **Mean** **<u>(S and W only)</u>** **xylenes** **4.3** **5.0** **4.8** **1.6** **3.2** **<u>House M4</u>** **PEN*** (**<u>Yr. 1</u>** **<u>Yr. 2</u>** **<u>Summer</u>** **<u>Winter</u>**) **Mean** **<u>(S and W only)</u>** **xylenes** **4.7** **11.3** **6.25** **5.2** **5.7** *Mean values **<u>xylenes</u>** **Overall Mean:** ***5.4*** **(all houses, S and W only)**	MZ 2
TBDL-13	<u>Xylenes</u> Author: Wallace, L. (EPA/600/6-87/002a) "Blue book" ‣ Bound volume of results from the TEAM studies. Indoor ME is **residence**. ‣ <u>Table 29</u> (pp. 61-62) provide indoor/outdoor comparisons (and ratios) for <u>matched</u> samples. ◦ These concentrations are median values for the 12-hr nighttime samples collected for two seasons (Jan. 1984 and May 1984) in LA, and during June 1984 in Contra Costa. ‣ <u>Table 46</u> (p. 97) provides median concentrations for indoor air in New Jersey (three different sampling periods) and California (also three different sampling periods). ‣ <u>Table 47</u> (p. 98) provides median concentrations for outdoor air in New Jersey (the same three sampling periods for NJ in Table 46) and California (the same three sampling periods for CA in Table 46). ◦ However, the number of outdoor measurements are always less than the number of indoor measurements. <u>From Table 29</u>: **<u>PEN</u>** <u>(medians)</u>**:** **<u>LA(1/84)</u>** **<u>LA(5/84)</u>** **<u>Contra(6/84)</u>** **<u>Avg.</u>** **m,p xylene:** **0.9** **1.1** **4.3** **2.1** **o-xylene** **1.0** **1.2** **4.7** **2.3**	MZ 38
TBDL-13	<u>Xylenes</u> Author: Drahonovska, H. Indoor & outdoor measurements of 140 residences (both kitchen and bedroom measurements) taken for listed HAPs. Energy use for heating is broken down by electric, gas, and coal sources. Average I/O ratios provided (Table 5) for xylenes. **I/O=4.2 for house heated** **I/O=3.2 for non-heated house**	MZ 4

Ref. No.	Supporting Information	Sources
TBDL-13	Xylenes Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' **residences** and in offices -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34
TBDL-13	Xylenes Author: Lebret, E., van de Wiel, H.J., Bos, H.P., Noij, D., and Boleij, J.S.M. ‣ Table 2 (p. 326) reports median and maximum HAP concentrations in **residences** (a total of approx. 300) of three different age groups; the median and maximum outdoor concs.; and the overall median I/O ratio for all homes. ◦ These concentrations were weekly averages. **Median, overall I/O ratios:** **xylenes = 3**	MZ 26
TBDL-13	o-,m-,p-Xylenes Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **m-, p-xylenes: I/O ratio provided from median conc = PEN = 1.1** **o-xylenes: I/O ratio provided from median conc = PEN = 1.3** **Mean I/O = 1.2**	RA 35
TBDL-13	Xylenes (based on p-Xylene results) Author: Bouhamra, W.S. Table 2 (p.199) -- Indoor VOCs concentrations. Table 3 (p.200) -- Ambient air VOCs concentrations. Min, max., mean, median, std. deviation provided. Table 4 (p.202) -- I/O ratios. Sampled during Dec 94-Jan 95. CONCURRENT MEASUREMENTS. **I/O ratio provided: 1.06=PEN** Ambient air conc. provided: 1152 ug/m^3 (mean), 1071 ug/m^3(median) Indoor air conc provided: 1222 ug/m^3 (mean), 998 ug/m^3(median) **MULT = (indoor conc)/(ambient conc) = 998/1071 = 0.93 (from median conc)** Since PEN>1 ==> calculate ADD: Indoor conc (median) = 998 ug/m^3; PEN = I/O = 1.06; Outdoor conc (calculated) = 998/1.06 = 941 ug/m^3 **____ug/m^3<ADD<___ ug/m^3** **PROX (calc from medians) = (outdoor conc)/(ambient conc) = 941/1071 = 0.88**	RA 14

Ref. No.	Supporting Information	Sources
TBDL-13	Xylenes Author: Barguil, S., Le Moullec, Y., Person, A., Laurent, A-M, and Festy, B. ‣ Study which reports concurrent indoor and outdoor measurements taken in **residences** (5 detached houses and 4 apartments). ◦ The paper reports the average I/O measurements (Fig 2. - bar chart) of samples taken over the entire length of the study (Sept. 1987 - Aug. 1988). **I/O ratios (average of 75 samples):** **PEN = 2.4**	MZ 36
TBDL-13	m-xylene; p-xylene; o-xylene Author: Wallace, L.A., Pellizzari, E.D., Hartwell, T.D., et al. Summary of TEAM study in NJ (Fall, 1981). Samples collected for: *personal air* - two consecutive 12-hr samples taken from appr. 350 people, *outdoor air* - two consecutive 12-hr samples taken from appr. 90 people, also drinking water and breath. Table 9 reports a summary of median, max. concs., and ratios (from both the median and max. conc. data) for 85 matched overnight personal air and overnight outdoor air samples. (It is our conclusion that this data provides the best concurrent I/O ratios for r**esidences** from this study.) **PEN = 1.7** (median value) — o-xylene **PEN = 1.6** (median value) — m,p-xylene	MZ 22
TBDL-13	Xylenes Author: Gilli, G., Scursatone, E., and Bono, R. ‣ Indoor and outdoor simultaneous measurements taken for a residence (apartment). ◦ Samples were collected by 10 non-smoking university students who each collected samples for 10 consecutive days [2 integrated samples per day: 1) 8:00 - 20:00 (12-hrs), and 2) 0:00 - 8:00 (8-hrs)] in December 1991. ‣ Table 3 (p. 53) shows the mean I/O ratios for both day (i.e., 8:00 - 20:00) and night (ie, 0:00 - 8:00). Data is the average form all students. ‣ Table 4 (p. 54) shows indoor and outdoor pollutant concentrations for both day and night. NOTE: It is not clear how this data relates to the ratios reproted in Table 3. It might be data for only a single student. **Average I/O data for all students (Table 3):** **xylene (day) = 1.02** **xylene (night) = 2.58**	MZ 25
TBDL-17	Xylenes Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by car, subway, bicycling (other), and walking. -- See Table I, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate.* ‣ In addition, VOC concs. were also measured in subjects' residences and in **offices** -- See Table III, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs.	MZ 34

Ref. No.	Supporting Information	Sources
TBDL-17	Xylenes Author: Brickus, L.; Cardoso, J.; de Aquino Neto, F. Reports concurrent measurements of aldehyde and VOC concentrations on four different floors of an **office building** for several different days. I/O ratios provided – see tables 1, 2, & 3. **Mean PEN (building wide; ie., four floors) = 3.5** (Range: 2.0 – 6.6)	MZ 10
TBDL-17	Xylenes Author: Shields, H.C., Fleischer, D.M., and Weschler, C.J. ‣ Indoor and outdoor concentration s for 3-types of **offices** (Telecommunications (n=50); data centers (n=9); and administrative offices (n=11)). Geometric means are provided for each office type (see Table 3). ‣ I/O ratios by HAP and office type are provided for each office type using geometric means (see Table 4). **I/O's for xylene :** *Values are GM (GSD)* **Telco** / **Data Cnt.** / **Admin. office** **xylene (m&p)** **1.6**(2.6) **2.7**(1.7) **1.5**(1.9) **xylene (o)** **2.0**(2.7) **3.5**(1.7) **2.1**(1.7)	MZ 11
TBDL-17	o-,m-,p-Xylenes Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **m-, p-xylenes: I/O ratio provided from median conc = PEN = 1.7** **o-xylenes: I/O ratio provided from median conc = PEN = 1.7** **Mean I/O = 1.7**	RA 35
TBDL-17	Xylenes Author: Daisey, J.M., Hodgson, A.T., Fisk, W.J., et al. ‣ Indoor/outdoor measurements for 12 **office buildings**. ‣ Table 2 (p. 3559) reports the range of I/O ratios measured for eleven of the twelve office buildings. From Table 2: **PEN (range), m,p-xylene: 0.47 – 3.7** **PEN (range), o-xylene: 0.51 – 3.3**	MZ 39
TBDL-19	o-,m-,p-Xylenes Author: Baek, S.O.; Kim, Y.S.; Perry, R.; Spencer, R.D.; Green, M.A.; Biggs, P. SIMULTANEOUS indoor/outdoor sampling at six residences, six offices, six restaurants in two cities in Korea. Median, mean, standard deviation, range of concentrations, median I/O ratios provided for each mE – Tables 3,4&5. **m-, p-xylenes: I/O ratio provided from median conc = PEN = 1.4** **o-xylenes: I/O ratio provided from median conc = PEN = 1.4** **Mean I/O = 1.4**	RA 35

Ref. No.	Supporting Information	Sources
TBDL-26	<u>Xylenes</u> Author: Fantuzzi, G.; Aggazzotti, G.; Righi, E.; Cavazzutti, L.; Predieri, G. Table 2 (p.53) – INDOOR and OUTDOOR concentrations provided for university libraries in Italian city (inner city and suburb locations) – median, min. and max. NOT SURE IF CONCURRENT MEASUREMENTS. INNER CITY Indoor median conc = 38ug/m^3 Outdoor median ambient conc = 59ug/m^3 **MULT = (indoor conc)/(ambient conc) = 38/59 = 0.64** SUBURBS Indoor median conc = 25.5ug/m^3 Outdoor median ambient conc = 24ug/m^3 **MULT = (indoor conc)/(ambient conc) = 25.5/24 = 1.06**	RA 23
TBDL-27	<u>Xylenes</u> Author: Shields, H.C. and Weschler, C.J. ‣ Paper reports matched indoor/outdoor measurements at a telephone switching center (might be classified as an office (ME #17) or other **indoor location (ME #27)**. ◦ <u>Table II</u> - Indoor (2 locations) & outdoor concs. during the March 87 and May 87 sampling. ◦ <u>Table III</u> - Indoor (2 locations) & outdoor concs. during the Dec. 87 and Feb. 88 sampling. ◦ <u>Table IV</u> - Indoor (2 locations) & outdoor concs. during the April 88 sampling. ◦ <u>Table V</u> - Indoor (3 locations) & outdoor concs. during the May 88 and July 88 sampling. ◦ <u>Table VI</u> - Indoor (3 locations) & outdoor concs. during the Nov. 88 sampling. Samples collected during: **<u>PEN</u>** 03/87 & 05/87: **1.7** Range: 1.0 – 2.1 12/87 & 02/88: **2.0** Range: 1.5 – 2.7 04/88: **1.4** Range: 1.3 – 1.4 05/88 & 07/88: **7.9** Range: 3.7 – 17.9 <u>11/88:</u> **<u>2.2</u>** Range: 1.9 – 2.5 Overall avg.: **3.0**	MZ 29
TBDL-36	<u>Xylenes</u> Author: Chan, C-C., Spengler, J.D., Ozkaynak, H., and Lefkopoulou, M. ‣ Results of sampling field study where measurements of VOC concs. were taken while subjects commuted by <u>car</u>, **<u>subway</u>**, <u>bicycling (other)</u>, and walking. -- See <u>Table I</u>, (p. 1596). ◦ *NOTE: No ambient monitoring data were reported so values taken for those subjects while walking would have to be used as a surrogate for ambient.* ***Therefore, only calculation of a MULT factor is possible.*** ‣ In addition, VOC concs. were also measured in subjects' <u>residences</u> and in <u>offices</u> -- See <u>Table III</u>, (p. 1597). ◦ *Measurements taken on a sidewalk next to a busy street are used as a surrogate for ambient monitoring.* ‣ Note that while the these samples may have overlapped, it is not specified which sets of measurements (if any) were paired samples. ◦ Nor is it specified where the sidewalk (i.e., the surrogate for ambient, outdoors) concentrations were taken in relation to the other MEs, or with respect to time. ‣ Tables I and III provide median, mean, and max. concs. for the different VOCs and various MEs. **MULT (median) = 0.9** (m,p-xylene = 0.9, and o-xylene = 0.9)	MZ 34

Ref. No.	Supporting Information	Sources
To be assigned	320 VOCs, with 261 VOCs measured in the outdoor air and 66 measured indoors. Author: Shah, J., Singh, H. Distribution of multiple VOCs in indoor and outdoor air – NATIONAL VOC DATABASE. Outdoor data measured in urban, rural, suburban, remote, or near source. Indoor data measured in residential and workplace/commercial locations. UNABLE TO DETERMINE WHETHER CONCURRENT MEASUREMENTS WITHOUT ACCESS TO THE DATABASE.	MZ 18

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APPENDIX C

ME FACTOR RESULTS

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Microenvironmental Factors by Pollutant, Microenvironment, and Source Category for Specified HAPs

Pollutant: Acetaldehyde (#1) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a]**		**PEN [Data Code] [a]**	**MULT = PROX × PEN**		**Reference Sources**
		Onroad [b]	**Major, area, and nonroad [c]**		**Onroad [d]**	**Major, area, and nonroad [d]**	
Car - In vehicle / 1		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Bus - In vehicle / 2		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Truck - In vehicle / 3		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Other - In vehicle / 4		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Public garage - Indoors / 5		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Parking lot/garage - Outdoors / 6		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Near road - Outdoors / 7		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Motorcycle - Outdoors / 8		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Service station - Indoors / 9		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Service station - Outdoors / 10		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Residential garage - Indoors / 11		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Other repair shop - Indoors / 12		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Residence (no CO source) - Indoors/13		1.0 [3]	1.0 [3]	0.75 [1]	0.75	0.75	MZ 27
Residence (gas stove) - Indoors / 14		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (attached garage) - Indoors/15		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (stove and garage)- Indoors/16		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Office - Indoors / 17		1.0 [3]	1.0 [3]	0.55 [1]	0.55	0.55	MZ 10
Store - Indoors / 18		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Restaurant - Indoors / 19		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Manufacturing facility - Indoors / 20		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
School - Indoors / 21		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Church- Indoors / 22		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Shopping mall - Indoors / 23		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Auditorium - Indoors / 24		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Health care facility - Indoors / 25		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Other public building - Indoors / 26		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Other location - Indoors / 27		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Not specified - Indoors / 28		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Train/subway - In vehicle / 36		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Airplane - In vehicle / 37		0.0 [3]	0.0 [3]	0.90 [2]	0	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] Onroad vehicle source category (see text).
[c] Major, area, and nonroad-mobile source categories (see text).
[d] The MULT factor is the product of the PROX factor and the PEN factor for the onroad vehicle source category and for the major, area, and nonroad-mobile source categories for this pollutant.

Formula: Microenvironmental concentration, $\mu g/m^3$ = ADD + (PROX)(PEN)(monitor concentration, $\mu g/m^3$).
Abbreviations: ADD = additive factor; PROX = proximity factor; PEN = penetration factor; MULT = PROX × PEN.

Pollutant: Acrolein (#2) HAPEM ME / Number	ADD (μg/m³)	PROX [Data Code] [a]		PEN [Data Code] [a]	MULT = PROX × PEN		Reference Sources
		Onroad [b]	Major, area, and nonroad [c]		Onroad [d]	Major, area, and nonroad [d]	
Car - In vehicle / 1		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Bus - In vehicle / 2		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Truck - In vehicle / 3		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Other - In vehicle / 4		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Public garage - Indoors /5		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Parking lot/garage - Outdoors / 6		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Near road - Outdoors / 7		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Motorcycle - Outdoors / 8		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Service station - Indoors / 9		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Service station - Outdoors / 10		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Residential garage - Indoors / 11		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Other repair shop - Indoors / 12		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Residence (no CO source) - Indoors/13		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (gas stove) - Indoors / 14		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (attached garage) - Indoors/15		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (stove and garage)- Indoors/16		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Office - Indoors / 17		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Store - Indoors / 18		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Restaurant - Indoors / 19		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Manufacturing facility - Indoors / 20		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
School - Indoors / 21		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Church- Indoors / 22		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Shopping mall - Indoors / 23		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Auditorium - Indoors / 24		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Health care facility - Indoors / 25		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Other public building - Indoors / 26		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Other location - Indoors / 27		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Not specified - Indoors / 28		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Train/subway - In vehicle / 36		3.5 [2]	1.0 [3]	0.90 [2]	3.15	0.9	
Airplane - In vehicle / 37		0.0 [3]	0.0 [3]	0.90 [2]	0	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] Onroad vehicle source category (see text).
[c] Major, area, and nonroad-mobile source categories (see text).
[d] The MULT factor is the product of the PROX factor and the PEN factor for the onroad vehicle source category and for the major, area, and nonroad-mobile source categories for this pollutant.

Formula: Microenvironmental concentration, μg/m³ = ADD + (PROX)(PEN)(monitor concentration, μg/m³).

Abbreviations: ADD = additive factor; PROX = proximity factor; PEN = penetration factor; MULT = PROX × PEN.

Pollutant: Acrylonitrile (#3) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors /5		1.0 [3]	0.81 [2]	0.81	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.81 [2]	0.81	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.72 [2]	0.72	
Other repair shop - Indoors / 12		1.0 [3]	0.81 [2]	0.81	
Residence (no CO source) - Indoors/13		1.0 [3]	0.72 [2]	0.72	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.72 [2]	0.72	
Residence (attached garage) - Indoors/15		1.0 [3]	0.72 [2]	0.72	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.72 [2]	0.72	
Office - Indoors / 17		1.0 [3]	0.81 [2]	0.81	
Store - Indoors / 18		1.0 [3]	0.81 [2]	0.81	
Restaurant - Indoors / 19		1.0 [3]	0.81 [2]	0.81	
Manufacturing facility - Indoors / 20		1.0 [3]	0.81 [2]	0.81	
School - Indoors / 21		1.0 [3]	0.81 [2]	0.81	
Church- Indoors / 22		1.0 [3]	0.81 [2]	0.81	
Shopping mall - Indoors / 23		1.0 [3]	0.81 [2]	0.81	
Auditorium - Indoors / 24		1.0 [3]	0.81 [2]	0.81	
Health care facility - Indoors / 25		1.0 [3]	0.81 [2]	0.81	
Other public building - Indoors / 26		1.0 [3]	0.81 [2]	0.81	
Other location - Indoors / 27		1.0 [3]	0.81 [2]	0.81	
Not specified - Indoors / 28		1.0 [3]	0.81 [2]	0.81	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Arsenic compnds (#4) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors /5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: <u>Benzene</u> (#5) HAPEM ME / Number	ADD (μg/m³)	PROX [Data Code] [a]		PEN [Data Code] [a]	MULT = PROX × PEN		Reference Sources
		Onroad [b]	Major, area, and nonroad [c]		Onroad [d]	Major, area, and nonroad [d]	
Car - In vehicle / 1		6.9 [1]	1.0 [3]	0.96 [1]	6.6	0.96	MZ 28
Bus - In vehicle / 2		3.5 [1]	1.0 [3]	0.79 [1]	2.8	0.79	MZ 14[e], RA 7[f]
Truck - In vehicle / 3		5.2 [2]	1.0 [3]	0.88 [2]	4.6	0.88	
Other - In vehicle / 4		5.2 [2]	1.0 [3]	0.88 [2]	4.6	0.88	
Public garage - Indoors /5		1.0 [3]	1.0 [3]	0.86 [1]	0.9	0.86	RA 24
Parking lot/garage - Outdoors / 6		4.4 [2]	1.0 [3]	1.0 [3]	4.4	1	
Near road - Outdoors / 7		4.4 [1]	1.0 [3]	1.0 [3]	4.4	1	MZ 28
Motorcycle - Outdoors / 8		4.4 [2]	1.0 [3]	1.0 [3]	4.4	1	
Service station - Indoors / 9		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Service station - Outdoors / 10		4.4 [2]	1.0 [3]	1.0 [3]	4.4	1	
Residential garage - Indoors / 11		1.0 [3]	1.0 [3]	0.77 [2]	0.8	0.77	
Other repair shop - Indoors / 12		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	1.0 [3]	0.88 [1]	0.9	0.88	MZ 2
Residence (gas stove) - Indoors / 14		1.0 [3]	1.0 [3]	0.77 [2]	0.8	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	1.0 [3]	1.0 [1]	1.0	1	TL 18
Residence (stove and garage)- Indoors/16		1.0 [3]	1.0 [3]	0.77 [2]	0.8	0.77	
Office - Indoors / 17		1.0 [3]	1.0 [3]	0.63 [1]	0.6	0.63	MZ 39
Store - Indoors / 18		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Restaurant - Indoors / 19		1.0 [3]	1.0 [3]	0.9 [1]	0.9	0.9	RA 35
Manufacturing facility - Indoors / 20		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
School - Indoors / 21		1.0 [3]	1.0 [3]	0.7 [1]	0.7	0.7	MZ 1
Church- Indoors / 22		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Shopping mall - Indoors / 23		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Auditorium - Indoors / 24		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Health care facility - Indoors / 25		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Other public building - Indoors / 26		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Other location - Indoors / 27		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Not specified - Indoors / 28		1.0 [3]	1.0 [3]	0.78 [2]	0.8	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1.0 [3]	1.0	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1.0 [3]	1.0	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1.0 [3]	1.0	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1.0 [3]	1.0	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1.0 [3]	1.0	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1.0 [3]	1.0	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1.0 [3]	1.0	1	
Train/subway - In vehicle / 36		5.2 [2]	1.0 [3]	0.88 [2]	4.6	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.0 [3]	0.88 [2]	0.0	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] Onroad vehicle source category (see text).
[c] Major, area, and nonroad-mobile source categories (see text).
[d] The MULT factor is the product of the PROX factor and the PEN factor for the onroad vehicle source category and for the major, area, and nonroad-mobile source categories for this pollutant.
[e] Reference used to derive PROX factor
[f] Reference used to derive PEN factor

<u>Formula</u>: Microenvironmental concentration, $\mu g/m^3$ = ADD + (PROX)(PEN)(monitor concentration, $\mu g/m^3$).

<u>Abbreviations</u>: ADD = additive factor; PROX = proximity factor; PEN = penetration factor; MULT = PROX × PEN.

Pollutant: **<u>Beryllium cmpds</u> (#6)** **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors /5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.7[c] [1]	0.7	MZ 24
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.
[c] Indoor location is a laboratory

Pollutant: 1,3-butadiene (#7) HAPEM ME / Number	ADD (µg/m³)	PROX [Data Code] [a]		PEN [Data Code] [a]	MULT = PROX × PEN		Reference Sources
		Onroad [b]	Major, area, and nonroad [c]		Onroad [d]	Major, area, and nonroad [d]	
Car - In vehicle / 1		2.2 [1]	1.0 [3]	1.0 [1]	2.2	1	MZ 28
Bus - In vehicle / 2		3.5 [2]	1.0 [3]	0.9 [1]	3.15	0.9	RA 7
Truck - In vehicle / 3		2.8 [2]	1.0 [3]	0.90 [2]	2.52	0.9	
Other - In vehicle / 4		2.8 [2]	1.0 [3]	0.90 [2]	2.52	0.9	
Public garage - Indoors / 5		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Parking lot/garage - Outdoors / 6		1.0 [2]	1.0 [3]	1.0 [3]	1	1	
Near road - Outdoors / 7		1.0 [1]	1.0 [3]	1.0 [3]	1	1	MZ 28
Motorcycle - Outdoors / 8		1.0 [2]	1.0 [3]	1.0 [3]	1	1	
Service station - Indoors / 9		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Service station - Outdoors / 10		1.0 [2]	1.0 [3]	1.0 [3]	1	1	
Residential garage - Indoors / 11		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Other repair shop - Indoors / 12		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Residence (no CO source) - Indoors/13		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (gas stove) - Indoors / 14		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (attached garage) - Indoors/15		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (stove and garage)- Indoors/16		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Office - Indoors / 17		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Store - Indoors / 18		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Restaurant - Indoors / 19		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Manufacturing facility - Indoors / 20		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
School - Indoors / 21		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Church- Indoors / 22		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Shopping mall - Indoors / 23		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Auditorium - Indoors / 24		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Health care facility - Indoors / 25		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Other public building - Indoors / 26		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Other location - Indoors / 27		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Not specified - Indoors / 28		1.0 [3]	1.0 [3]	0.80 [2]	0.8	0.8	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Train/subway - In vehicle / 36		2.8 [2]	1.0 [3]	0.90 [2]	2.52	0.9	
Airplane - In vehicle / 37		0.0 [3]	0.0 [3]	0.90 [2]	0	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] Onroad vehicle source category (see text).
[c] Major, area, and nonroad-mobile source categories (see text).
[d] The MULT factor is the product of the PROX factor and the PEN factor for the onroad vehicle source category and for the major, area, and nonroad-mobile source categories for this pollutant.

Formula: Microenvironmental concentration, µg/m³ = ADD + (PROX)(PEN)(monitor concentration, µg/m³).

Abbreviations: ADD = additive factor; PROX = proximity factor; PEN = penetration factor; MULT = PROX × PEN.

Pollutant: Cadmium compounds (#8) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: <u>Carbon tetrachloride</u> (#9) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.55 [1]	0.55	MZ 27
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Chloroform (#10) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.85 [1]	0.85	MZ 38
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: <u>Chromium compounds</u> (#11) HAPEM ME / Number	ADD ($\mu g/m^3$)	PROX [Data Code] [a, b]	PEN [Data Code] [a]	MULT	Reference Sources
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.35 [1]	0.35	TL 9
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.31 (Cr^{6+}); 0.62 Tot (Cr) [1]	0.31	TL 11
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: **Coke oven emissions (#12)** **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]			
Bus - In vehicle / 2		1.0 [3]			
Truck - In vehicle / 3		1.0 [3]			
Other - In vehicle / 4		1.0 [3]			
Public garage - Indoors / 5		1.0 [3]			
Parking lot/garage - Outdoors / 6		1.0 [3]			
Near road - Outdoors / 7		1.0 [3]			
Motorcycle - Outdoors / 8		1.0 [3]			
Service station - Indoors / 9		1.0 [3]			
Service station - Outdoors / 10		1.0 [3]			
Residential garage - Indoors / 11		1.0 [3]			
Other repair shop - Indoors / 12		1.0 [3]			
Residence (no CO source) - Indoors/13		1.0 [3]			
Residence (gas stove) - Indoors / 14		1.0 [3]			
Residence (attached garage) - Indoors/15		1.0 [3]			
Residence (stove and garage)- Indoors/16		1.0 [3]			
Office - Indoors / 17		1.0 [3]			
Store - Indoors / 18		1.0 [3]			
Restaurant - Indoors / 19		1.0 [3]			
Manufacturing facility - Indoors / 20		1.0 [3]			
School - Indoors / 21		1.0 [3]			
Church- Indoors / 22		1.0 [3]			
Shopping mall - Indoors / 23		1.0 [3]			
Auditorium - Indoors / 24		1.0 [3]			
Health care facility - Indoors / 25		1.0 [3]			
Other public building - Indoors / 26		1.0 [3]			
Other location - Indoors / 27		1.0 [3]			
Not specified - Indoors / 28		1.0 [3]			
Construction site - Outdoors / 29		1.0 [3]			
Residential grounds - Outdoors / 30		1.0 [3]			
School grounds - Outdoors / 31		1.0 [3]			
Sports arena - Outdoors / 32		1.0 [3]			
Park/golf course - Outdoors / 33		1.0 [3]			
Other location - Outdoors / 34		1.0 [3]			
Not specified - Outdoors / 35		1.0 [3]			
Train/subway - In vehicle / 36		1.0 [3]			
Airplane - In vehicle / 37		0.0 [3]			

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: 1,2-dichloroethane (ethylene dichloride) (#13) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	1.0 [1]	1	MZ 38
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: 1,3-dichloropropene (#14) HAPEM ME / Number	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.90 [2]	0.9	
Bus - In vehicle / 2		1.0 [3]	0.90 [2]	0.9	
Truck - In vehicle / 3		1.0 [3]	0.90 [2]	0.9	
Other - In vehicle / 4		1.0 [3]	0.90 [2]	0.9	
Public garage - Indoors / 5		1.0 [3]	0.80 [2]	0.8	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.80 [2]	0.8	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.81 [2]	0.81	
Other repair shop - Indoors / 12		1.0 [3]	0.80 [2]	0.8	
Residence (no CO source) - Indoors/13		1.0 [3]	0.81 [1]	0.81	TL 3
Residence (gas stove) - Indoors / 14		1.0 [3]	0.81 [2]	0.81	
Residence (attached garage) - Indoors/15		1.0 [3]	0.81 [2]	0.81	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.81 [2]	0.81	
Office - Indoors / 17		1.0 [3]	0.80 [2]	0.8	
Store - Indoors / 18		1.0 [3]	0.80 [2]	0.8	
Restaurant - Indoors / 19		1.0 [3]	0.80 [2]	0.8	
Manufacturing facility - Indoors / 20		1.0 [3]	0.80 [2]	0.8	
School - Indoors / 21		1.0 [3]	0.80 [2]	0.8	
Church- Indoors / 22		1.0 [3]	0.80 [2]	0.8	
Shopping mall - Indoors / 23		1.0 [3]	0.80 [2]	0.8	
Auditorium - Indoors / 24		1.0 [3]	0.80 [2]	0.8	
Health care facility - Indoors / 25		1.0 [3]	0.80 [2]	0.8	
Other public building - Indoors / 26		1.0 [3]	0.80 [2]	0.8	
Other location - Indoors / 27		1.0 [3]	0.80 [2]	0.8	
Not specified - Indoors / 28		1.0 [3]	0.80 [2]	0.8	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.90 [2]	0.9	
Airplane - In vehicle / 37		0.0 [3]	0.90 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: <u>Ethylene dibromide (dibromoethane)</u> (#15) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Ethylene oxide (#16) **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle ⁄ 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle ⁄ 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle ⁄ 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors ⁄ 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors ⁄ 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors ⁄ 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors ⁄ 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors ⁄ 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors ⁄ 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors ⁄ 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors ⁄ 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Formaldehyde (#17) HAPEM ME / Number	ADD ($\mu g/m^3$)	PROX [Data Code] [a]		PEN [Data Code] [a]	MULT = PROX × PEN		Reference Sources
		Onroad [b]	Major, area, and nonroad [c]		Onroad [d]	Major, area, and nonroad [d]	
Car - In vehicle/1		3.5 [2]	1.0 [3]	0.88 [2]	3.08	0.88	
Bus - In vehicle/2		3.5 [2]	1.0 [3]	0.88 [2]	3.08	0.88	
Truck - In vehicle/3		3.5 [2]	1.0 [3]	0.88 [2]	3.08	0.88	
Other - In vehicle/4		3.5 [2]	1.0 [3]	0.88 [2]	3.08	0.88	
Public garage - Indoors/5		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Parking lot/garage - Outdoors/ 6		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Near road - Outdoors/7		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Motorcycle - Outdoors/ 8		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Service station - Indoors/9		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Service station - Outdoors/10		2.7 [2]	1.0 [3]	1.0 [3]	2.7	1	
Residential garage - Indoors/11		1.0 [3]	1.0 [3]	0.72 [2]	0.72	0.72	
Other repair shop - Indoors/12		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Residence (no CO source) - Indoors/13		1.0 [3]	1.0 [3]	0.5 [1]	0.5	0.5	MZ 15
Residence (gas stove) - Indoors/14		1.0 [3]	1.0 [3]	0.72 [2]	0.72	0.72	
Residence (attached garage) - Indoors/15		1.0 [3]	1.0 [3]	0.72 [2]	0.72	0.72	
Residence (stove and garage)- Indoors/16		1.0 [3]	1.0 [3]	0.72 [2]	0.72	0.72	
Office - Indoors / 17		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Store - Indoors / 18		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Restaurant - Indoors / 19		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Manufacturing facility - Indoors / 20		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
School - Indoors / 21		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Church- Indoors/22		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Shopping mall - Indoors/23		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Auditorium - Indoors / 24		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Health care facility - Indoors/25		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Other public building - Indoors/26		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Other location - Indoors/27		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Not specified - Indoors/28		1.0 [3]	1.0 [3]	0.81 [2]	0.81	0.81	
Construction site - Outdoors/29		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Residential grounds - Outdoors/30		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
School grounds - Outdoors/31		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Sports arena - Outdoors/32		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Park/golf course - Outdoors/33		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Other location - Outdoors/34		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Not specified - Outdoors/35		1.0 [3]	1.0 [3]	1.0 [3]	1	1	
Train/subway - In vehicle/36		3.5 [2]	1.0 [3]	0.88 [2]	3.08	0.88	
Airplane - In vehicle/37		0.0 [3]	0.0 [3]	0.88 [2]	0	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] Onroad vehicle source category (see text).
[c] Major, area, and nonroad-mobile source categories (see text).
[d] The MULT factor is the product of the PROX factor and the PEN factor for the onroad vehicle source category and for the major, area, and nonroad-mobile source categories for this pollutant.

Formula: Microenvironmental concentration, $\mu g/m^3$ = ADD + (PROX)(PEN)(monitor concentration, $\mu g/m^3$).

Abbreviations: ADD = additive factor; PROX = proximity factor; PEN = penetration factor; MULT = PROX × PEN.

Pollutant: Hexachlorobenzene (#18) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.82 [1]	0.82	TL 3
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Hydrazine (#19) **HAPEM ME / Number**	**ADD (µg/m³)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.90 [2]	0.9	
Bus - In vehicle / 2		1.0 [3]	0.90 [2]	0.9	
Truck - In vehicle / 3		1.0 [3]	0.90 [2]	0.9	
Other - In vehicle / 4		1.0 [3]	0.90 [2]	0.9	
Public garage - Indoors / 5		1.0 [3]	0.80 [2]	0.8	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.80 [2]	0.8	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.81 [2]	0.81	
Other repair shop - Indoors / 12		1.0 [3]	0.80 [2]	0.8	
Residence (no CO source) - Indoors/13		1.0 [3]	0.81 [2]	0.81	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.81 [2]	0.81	
Residence (attached garage) - Indoors/15		1.0 [3]	0.81 [2]	0.81	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.81 [2]	0.81	
Office - Indoors / 17		1.0 [3]	0.80 [2]	0.8	
Store - Indoors / 18		1.0 [3]	0.80 [2]	0.8	
Restaurant - Indoors / 19		1.0 [3]	0.80 [2]	0.8	
Manufacturing facility - Indoors / 20		1.0 [3]	0.80 [2]	0.8	
School - Indoors / 21		1.0 [3]	0.80 [2]	0.8	
Church- Indoors / 22		1.0 [3]	0.80 [2]	0.8	
Shopping mall - Indoors / 23		1.0 [3]	0.80 [2]	0.8	
Auditorium - Indoors / 24		1.0 [3]	0.80 [2]	0.8	
Health care facility - Indoors / 25		1.0 [3]	0.80 [2]	0.8	
Other public building - Indoors / 26		1.0 [3]	0.80 [2]	0.8	
Other location - Indoors / 27		1.0 [3]	0.80 [2]	0.8	
Not specified - Indoors / 28		1.0 [3]	0.80 [2]	0.8	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.90 [2]	0.9	
Airplane - In vehicle / 37		0.0 [3]	0.90 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Lead compounds - organic (#20) **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle ⁄ 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle ⁄ 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle ⁄ 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors ⁄ 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors ⁄ 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors ⁄ 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors ⁄ 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors ⁄ 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors ⁄ 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors ⁄ 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors ⁄ 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: <u>Lead compounds - inorganic</u> (#21) HAPEM ME / Number	ADD ($\mu g/m^3$)	PROX [Data Code] [a, b]	PEN [Data Code] [a]	MULT	Reference Sources
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.91[c] [1]	0.91	RA 29, TL12
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.86 [1]	0.86	TL 8
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.63 [1]	0.63	TL 12
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.
[c] Average of values from RA 29 and TL12.

Pollutant: **<u>Manganese cmpds</u> (#22)** **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.61 [1]	0.61	MZ 6, MZ 7
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: **Mercury compounds** **(#23)** **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code]** [a, b]	**PEN [Data Code]** [a]	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle ⁄ 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle ⁄ 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle ⁄ 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors ⁄ 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors ⁄ 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors ⁄ 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors ⁄ 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors ⁄ 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors ⁄ 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors ⁄ 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors ⁄ 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Methylene chloride (dichloromethane) (#24) **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle ⁄ 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle ⁄ 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle ⁄ 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors ⁄ 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors ⁄ 17		1.0 [3]	1.0 [1]	1	MZ 39, TL 10
Store - Indoors ⁄ 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors ⁄ 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors ⁄ 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors ⁄ 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors ⁄ 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors ⁄ 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Nickel compounds (#25) HAPEM ME / Number	ADD (µg/m^3)	PROX [Data Code] [a, b]	PEN [Data Code] [a]	MULT	Reference Sources
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: 7-PAH : (Lower and upper bound) (#26) **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle ⁄ 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle ⁄ 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle ⁄ 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors ⁄ 5		1.0 [3]	0.81 [2]	0.81	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.81 [2]	0.81	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.72 [2]	0.72	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.81 [2]	0.81	
Residence (no CO source) - Indoors/13		1.0 [3]	0.7 [1]	0.7	MZ 17
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.72 [2]	0.72	
Residence (attached garage) - Indoors/15		1.0 [3]	0.72 [2]	0.72	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.72 [2]	0.72	
Office - Indoors ⁄ 17		1.0 [3]	0.81 [2]	0.81	
Store - Indoors ⁄ 18		1.0 [3]	0.81 [2]	0.81	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.81 [2]	0.81	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.81 [2]	0.81	
School - Indoors ⁄ 21		1.0 [3]	0.81 [2]	0.81	
Church- Indoors ⁄ 22		1.0 [3]	0.81 [2]	0.81	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.81 [2]	0.81	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.81 [2]	0.81	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.81 [2]	0.81	
Other public building - Indoors ⁄ 26		1.0 [3]	0.81 [2]	0.81	
Other location - Indoors ⁄ 27		1.0 [3]	0.81 [2]	0.81	
Not specified - Indoors ⁄ 28		1.0 [3]	0.81 [2]	0.81	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: <u>Polychlorinated biphenyls</u> (#27) HAPEM ME / Number	ADD ($\mu g/m^3$)	PROX [Data Code] [a, b]	PEN [Data Code] [a]	MULT	Reference Sources
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Propylene dichloride (1,2-dichloropropane) (#28) **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle ⁄ 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle ⁄ 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle ⁄ 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors ⁄ 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors ⁄ 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors ⁄ 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors ⁄ 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors ⁄ 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors ⁄ 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors ⁄ 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors ⁄ 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Quinoline (#29) **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle ⁄ 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle ⁄ 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle ⁄ 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors ⁄ 5		1.0 [3]	0.81 [2]	0.81	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.81 [2]	0.81	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.72 [2]	0.72	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.81 [2]	0.81	
Residence (no CO source) - Indoors/13		1.0 [3]	0.72 [2]	0.72	
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.72 [2]	0.72	
Residence (attached garage) - Indoors/15		1.0 [3]	0.72 [2]	0.72	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.72 [2]	0.72	
Office - Indoors ⁄ 17		1.0 [3]	0.81 [2]	0.81	
Store - Indoors ⁄ 18		1.0 [3]	0.81 [2]	0.81	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.81 [2]	0.81	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.81 [2]	0.81	
School - Indoors ⁄ 21		1.0 [3]	0.81 [2]	0.81	
Church- Indoors ⁄ 22		1.0 [3]	0.81 [2]	0.81	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.81 [2]	0.81	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.81 [2]	0.81	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.81 [2]	0.81	
Other public building - Indoors ⁄ 26		1.0 [3]	0.81 [2]	0.81	
Other location - Indoors ⁄ 27		1.0 [3]	0.81 [2]	0.81	
Not specified - Indoors ⁄ 28		1.0 [3]	0.81 [2]	0.81	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Styrene (#30) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.90 [2]	0.9	
Bus - In vehicle / 2		1.0 [3]	0.90 [2]	0.9	
Truck - In vehicle / 3		1.0 [3]	0.90 [2]	0.9	
Other - In vehicle / 4		1.0 [3]	0.90 [2]	0.9	
Public garage - Indoors / 5		1.0 [3]	0.80 [2]	0.8	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.80 [2]	0.8	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.81 [2]	0.81	
Other repair shop - Indoors / 12		1.0 [3]	0.80 [2]	0.8	
Residence (no CO source) - Indoors/13		1.0 [3]	0.95 [1]	0.95	MZ 38
Residence (gas stove) - Indoors / 14		1.0 [3]	0.81 [2]	0.81	
Residence (attached garage) - Indoors/15		1.0 [3]	0.81 [2]	0.81	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.81 [2]	0.81	
Office - Indoors / 17		1.0 [3]	0.85 [1]	0.85	MZ 39
Store - Indoors / 18		1.0 [3]	0.80 [2]	0.8	
Restaurant - Indoors / 19		1.0 [3]	0.80 [2]	0.8	
Manufacturing facility - Indoors / 20		1.0 [3]	0.80 [2]	0.8	
School - Indoors / 21		1.0 [3]	0.80 [2]	0.8	
Church- Indoors / 22		1.0 [3]	0.80 [2]	0.8	
Shopping mall - Indoors / 23		1.0 [3]	0.80 [2]	0.8	
Auditorium - Indoors / 24		1.0 [3]	0.80 [2]	0.8	
Health care facility - Indoors / 25		1.0 [3]	0.80 [2]	0.8	
Other public building - Indoors / 26		1.0 [3]	0.80 [2]	0.8	
Other location - Indoors / 27		1.0 [3]	0.80 [2]	0.8	
Not specified - Indoors / 28		1.0 [3]	0.80 [2]	0.8	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.90 [2]	0.9	
Airplane - In vehicle / 37		0.0 [3]	0.90 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: 2,3,7,8-TCDD: (Lower and upper bound) (#31) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.81 [2]	0.81	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.81 [2]	0.81	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.72 [2]	0.72	
Other repair shop - Indoors / 12		1.0 [3]	0.81 [2]	0.81	
Residence (no CO source) - Indoors/13		1.0 [3]	0.72 [2]	0.72	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.72 [2]	0.72	
Residence (attached garage) - Indoors/15		1.0 [3]	0.72 [2]	0.72	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.72 [2]	0.72	
Office - Indoors / 17		1.0 [3]	0.81 [2]	0.81	
Store - Indoors / 18		1.0 [3]	0.81 [2]	0.81	
Restaurant - Indoors / 19		1.0 [3]	0.81 [2]	0.81	
Manufacturing facility - Indoors / 20		1.0 [3]	0.81 [2]	0.81	
School - Indoors / 21		1.0 [3]	0.81 [2]	0.81	
Church- Indoors / 22		1.0 [3]	0.81 [2]	0.81	
Shopping mall - Indoors / 23		1.0 [3]	0.81 [2]	0.81	
Auditorium - Indoors / 24		1.0 [3]	0.81 [2]	0.81	
Health care facility - Indoors / 25		1.0 [3]	0.81 [2]	0.81	
Other public building - Indoors / 26		1.0 [3]	0.81 [2]	0.81	
Other location - Indoors / 27		1.0 [3]	0.81 [2]	0.81	
Not specified - Indoors / 28		1.0 [3]	0.81 [2]	0.81	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: 1,1,2,2-tetrachloroethane (#32) HAPEM ME / Number	ADD ($\mu g/m^3$)	PROX [Data Code] [a, b]	PEN [Data Code] [a]	MULT	Reference Sources
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.77 [2]	0.77	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.87 [1]	0.87	MZ 39
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Tetrachloroethylene (perchloroethylene) (#33) **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.65 [1]	0.65	MZ 27
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.65 [1]	0.65	MZ 1
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.9[c] [1]	0.9	MZ 32
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.
[c] Museum

Pollutant: **<u>Trichloroethylene</u>** **(#34)** **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code]** [a, b]	**PEN [Data Code]** [a]	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.78 [2]	0.78	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.78 [2]	0.78	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.77 [2]	0.77	
Other repair shop - Indoors / 12		1.0 [3]	0.78 [2]	0.78	
Residence (no CO source) - Indoors/13		1.0 [3]	0.9 [1]	0.9	MZ 27
Residence (gas stove) - Indoors / 14		1.0 [3]	0.77 [2]	0.77	
Residence (attached garage) - Indoors/15		1.0 [3]	0.77 [2]	0.77	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.77 [2]	0.77	
Office - Indoors / 17		1.0 [3]	0.78 [2]	0.78	
Store - Indoors / 18		1.0 [3]	0.78 [2]	0.78	
Restaurant - Indoors / 19		1.0 [3]	0.78 [2]	0.78	
Manufacturing facility - Indoors / 20		1.0 [3]	0.78 [2]	0.78	
School - Indoors / 21		1.0 [3]	0.78 [2]	0.78	
Church- Indoors / 22		1.0 [3]	0.78 [2]	0.78	
Shopping mall - Indoors / 23		1.0 [3]	0.78 [2]	0.78	
Auditorium - Indoors / 24		1.0 [3]	0.78 [2]	0.78	
Health care facility - Indoors / 25		1.0 [3]	0.78 [2]	0.78	
Other public building - Indoors / 26		1.0 [3]	0.78 [2]	0.78	
Other location - Indoors / 27		1.0 [3]	0.78 [2]	0.78	
Not specified - Indoors / 28		1.0 [3]	0.78 [2]	0.78	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: <u>Vinyl chloride</u> **(#35)** **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [2]	0.88	
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.81 [2]	0.81	
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.81 [2]	0.81	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.72 [2]	0.72	
Other repair shop - Indoors / 12		1.0 [3]	0.81 [2]	0.81	
Residence (no CO source) - Indoors/13		1.0 [3]	0.72 [2]	0.72	
Residence (gas stove) - Indoors / 14		1.0 [3]	0.72 [2]	0.72	
Residence (attached garage) - Indoors/15		1.0 [3]	0.72 [2]	0.72	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.72 [2]	0.72	
Office - Indoors / 17		1.0 [3]	0.81 [2]	0.81	
Store - Indoors / 18		1.0 [3]	0.81 [2]	0.81	
Restaurant - Indoors / 19		1.0 [3]	0.81 [2]	0.81	
Manufacturing facility - Indoors / 20		1.0 [3]	0.81 [2]	0.81	
School - Indoors / 21		1.0 [3]	0.81 [2]	0.81	
Church- Indoors / 22		1.0 [3]	0.81 [2]	0.81	
Shopping mall - Indoors / 23		1.0 [3]	0.81 [2]	0.81	
Auditorium - Indoors / 24		1.0 [3]	0.81 [2]	0.81	
Health care facility - Indoors / 25		1.0 [3]	0.81 [2]	0.81	
Other public building - Indoors / 26		1.0 [3]	0.81 [2]	0.81	
Other location - Indoors / 27		1.0 [3]	0.81 [2]	0.81	
Not specified - Indoors / 28		1.0 [3]	0.81 [2]	0.81	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] <u>Data Code</u>: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Ethylbenzene **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.8 [1]	0.8	MZ 28
Bus - In vehicle ⁄ 2		1.0 [3]	0.90 [2]	0.9	
Truck - In vehicle ⁄ 3		1.0 [3]	0.90 [2]	0.9	
Other - In vehicle ⁄ 4		1.0 [3]	0.90 [2]	0.9	
Public garage - Indoors ⁄ 5		1.0 [3]	0.79 [1]	0.79	RA 24
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.80 [2]	0.8	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.81 [2]	0.81	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.80 [2]	0.8	
Residence (no CO source) - Indoors⁄13		1.0 [3]	0.85 [1]	0.85	MZ 27
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.81 [2]	0.81	
Residence (attached garage) - Indoors⁄15		1.0 [3]	0.81 [2]	0.81	
Residence (stove and garage)- Indoors⁄16		1.0 [3]	0.81 [2]	0.81	
Office - Indoors ⁄ 17		1.0 [3]	0.74 [1]	0.74	MZ 39
Store - Indoors ⁄ 18		1.0 [3]	0.80 [2]	0.8	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.80 [2]	0.8	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.80 [2]	0.8	
School - Indoors ⁄ 21		1.0 [3]	0.80 [2]	0.8	
Church- Indoors ⁄ 22		1.0 [3]	0.80 [2]	0.8	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.80 [2]	0.8	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.80 [2]	0.8	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.80 [2]	0.8	
Other public building - Indoors ⁄ 26		1.0 [3]	0.80 [2]	0.8	
Other location - Indoors ⁄ 27		1.0 [3]	0.80 [2]	0.8	
Not specified - Indoors ⁄ 28		1.0 [3]	0.80 [2]	0.8	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.90 [2]	0.9	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.90 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Hexane **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]	0.93 [1]	0.93	MZ 28
Bus - In vehicle ⁄ 2		1.0 [3]	0.90 [2]	0.9	
Truck - In vehicle ⁄ 3		1.0 [3]	0.90 [2]	0.9	
Other - In vehicle ⁄ 4		1.0 [3]	0.90 [2]	0.9	
Public garage - Indoors ⁄ 5		1.0 [3]	0.80 [2]	0.8	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors ⁄ 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors ⁄ 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors ⁄ 9		1.0 [3]	0.80 [2]	0.8	
Service station - Outdoors ⁄ 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors ⁄ 11		1.0 [3]	0.81 [2]	0.81	
Other repair shop - Indoors ⁄ 12		1.0 [3]	0.80 [2]	0.8	
Residence (no CO source) - Indoors⁄13		1.0 [3]	0.65 [1]	0.65	MZ 27
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]	0.81 [2]	0.81	
Residence (attached garage) - Indoors⁄15		1.0 [3]	0.81 [2]	0.81	
Residence (stove and garage)- Indoors⁄16		1.0 [3]	0.81 [2]	0.81	
Office - Indoors ⁄ 17		1.0 [3]	0.80 [2]	0.8	
Store - Indoors ⁄ 18		1.0 [3]	0.80 [2]	0.8	
Restaurant - Indoors ⁄ 19		1.0 [3]	0.80 [2]	0.8	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]	0.80 [2]	0.8	
School - Indoors ⁄ 21		1.0 [3]	0.80 [2]	0.8	
Church- Indoors ⁄ 22		1.0 [3]	0.80 [2]	0.8	
Shopping mall - Indoors ⁄ 23		1.0 [3]	0.80 [2]	0.8	
Auditorium - Indoors ⁄ 24		1.0 [3]	0.80 [2]	0.8	
Health care facility - Indoors ⁄ 25		1.0 [3]	0.80 [2]	0.8	
Other public building - Indoors ⁄ 26		1.0 [3]	0.80 [2]	0.8	
Other location - Indoors ⁄ 27		1.0 [3]	0.80 [2]	0.8	
Not specified - Indoors ⁄ 28		1.0 [3]	0.80 [2]	0.8	
Construction site - Outdoors ⁄ 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors ⁄ 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors ⁄ 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors ⁄ 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors ⁄ 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors ⁄ 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors ⁄ 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle ⁄ 36		1.0 [3]	0.90 [2]	0.9	
Airplane - In vehicle ⁄ 37		0.0 [3]	0.90 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: MTBE **HAPEM ME ⁄ Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle ⁄ 1		1.0 [3]		0	
Bus - In vehicle ⁄ 2		1.0 [3]	1.0 [1]	1	MZ 14
Truck - In vehicle ⁄ 3		1.0 [3]		0	
Other - In vehicle ⁄ 4		1.0 [3]		0	
Public garage - Indoors ⁄ 5		1.0 [3]		0	
Parking lot/garage - Outdoors ⁄ 6		1.0 [3]		0	
Near road - Outdoors ⁄ 7		1.0 [3]		0	
Motorcycle - Outdoors ⁄ 8		1.0 [3]		0	
Service station - Indoors ⁄ 9		1.0 [3]		0	
Service station - Outdoors ⁄ 10		1.0 [3]		0	
Residential garage - Indoors ⁄ 11		1.0 [3]		0	
Other repair shop - Indoors ⁄ 12		1.0 [3]		0	
Residence (no CO source) - Indoors⁄13		1.0 [3]		0	
Residence (gas stove) - Indoors ⁄ 14		1.0 [3]		0	
Residence (attached garage) - Indoors⁄15		1.0 [3]		0	
Residence (stove and garage)- Indoors⁄16		1.0 [3]		0	
Office - Indoors ⁄ 17		1.0 [3]		0	
Store - Indoors ⁄ 18		1.0 [3]		0	
Restaurant - Indoors ⁄ 19		1.0 [3]		0	
Manufacturing facility - Indoors ⁄ 20		1.0 [3]		0	
School - Indoors ⁄ 21		1.0 [3]		0	
Church- Indoors ⁄ 22		1.0 [3]		0	
Shopping mall - Indoors ⁄ 23		1.0 [3]		0	
Auditorium - Indoors ⁄ 24		1.0 [3]		0	
Health care facility - Indoors ⁄ 25		1.0 [3]		0	
Other public building - Indoors ⁄ 26		1.0 [3]		0	
Other location - Indoors ⁄ 27		1.0 [3]		0	
Not specified - Indoors ⁄ 28		1.0 [3]		0	
Construction site - Outdoors ⁄ 29		1.0 [3]		0	
Residential grounds - Outdoors ⁄ 30		1.0 [3]		0	
School grounds - Outdoors ⁄ 31		1.0 [3]		0	
Sports arena - Outdoors ⁄ 32		1.0 [3]		0	
Park/golf course - Outdoors ⁄ 33		1.0 [3]		0	
Other location - Outdoors ⁄ 34		1.0 [3]		0	
Not specified - Outdoors ⁄ 35		1.0 [3]		0	
Train/subway - In vehicle ⁄ 36		1.0 [3]		0	
Airplane - In vehicle ⁄ 37		0.0 [3]		0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Toluene HAPEM ME / Number	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [1]	0.88	MZ 28
Bus - In vehicle / 2		1.0 [3]	0.88 [2]	0.88	
Truck - In vehicle / 3		1.0 [3]	0.88 [2]	0.88	
Other - In vehicle / 4		1.0 [3]	0.88 [2]	0.88	
Public garage - Indoors / 5		1.0 [3]	0.80 [1]	0.8	RA 24
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.81 [2]	0.81	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.72 [2]	0.72	
Other repair shop - Indoors / 12		1.0 [3]	0.81 [2]	0.81	
Residence (no CO source) - Indoors/13		1.0 [3]	0.95 [1]	0.95	MZ 27
Residence (gas stove) - Indoors / 14		1.0 [3]	0.72 [2]	0.72	
Residence (attached garage) - Indoors/15		1.0 [3]	0.72 [2]	0.72	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.72 [2]	0.72	
Office - Indoors / 17		1.0 [3]	0.82 [1]	0.82	MZ 39
Store - Indoors / 18		1.0 [3]	0.81 [2]	0.81	
Restaurant - Indoors / 19		1.0 [3]	0.81 [2]	0.81	
Manufacturing facility - Indoors / 20		1.0 [3]	0.81 [2]	0.81	
School - Indoors / 21		1.0 [3]	0.81 [2]	0.81	
Church- Indoors / 22		1.0 [3]	0.81 [2]	0.81	
Shopping mall - Indoors / 23		1.0 [3]	0.81 [2]	0.81	
Auditorium - Indoors / 24		1.0 [3]	0.81 [2]	0.81	
Health care facility - Indoors / 25		1.0 [3]	0.81 [2]	0.81	
Other public building - Indoors / 26		1.0 [3]	0.81 [2]	0.81	
Other location - Indoors / 27		1.0 [3]	0.81 [2]	0.81	
Not specified - Indoors / 28		1.0 [3]	0.81 [2]	0.81	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.88 [2]	0.88	
Airplane - In vehicle / 37		0.0 [3]	0.88 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.

Pollutant: Xylenes **HAPEM ME / Number**	**ADD ($\mu g/m^3$)**	**PROX [Data Code] [a, b]**	**PEN [Data Code] [a]**	**MULT**	**Reference Sources**
Car - In vehicle / 1		1.0 [3]	0.88 [1]	0.88	MZ 28
Bus - In vehicle / 2		1.0 [3]	0.90 [2]	0.9	
Truck - In vehicle / 3		1.0 [3]	0.90 [2]	0.9	
Other - In vehicle / 4		1.0 [3]	0.90 [2]	0.9	
Public garage - Indoors / 5		1.0 [3]	0.94 [1]	0.94	RA 24
Parking lot/garage - Outdoors / 6		1.0 [3]	1.0 [3]	1	
Near road - Outdoors / 7		1.0 [3]	1.0 [3]	1	
Motorcycle - Outdoors / 8		1.0 [3]	1.0 [3]	1	
Service station - Indoors / 9		1.0 [3]	0.80 [2]	0.8	
Service station - Outdoors / 10		1.0 [3]	1.0 [3]	1	
Residential garage - Indoors / 11		1.0 [3]	0.81 [2]	0.81	
Other repair shop - Indoors / 12		1.0 [3]	0.80 [2]	0.8	
Residence (no CO source) - Indoors/13		1.0 [3]	0.85 [1]	0.85	MZ 27
Residence (gas stove) - Indoors / 14		1.0 [3]	0.81 [2]	0.81	
Residence (attached garage) - Indoors/15		1.0 [3]	0.81 [2]	0.81	
Residence (stove and garage)- Indoors/16		1.0 [3]	0.81 [2]	0.81	
Office - Indoors / 17		1.0 [3]	0.74 [1]	0.74	MZ 39
Store - Indoors / 18		1.0 [3]	0.80 [2]	0.8	
Restaurant - Indoors / 19		1.0 [3]	0.80 [2]	0.8	
Manufacturing facility - Indoors / 20		1.0 [3]	0.80 [2]	0.8	
School - Indoors / 21		1.0 [3]	0.80 [2]	0.8	
Church- Indoors / 22		1.0 [3]	0.80 [2]	0.8	
Shopping mall - Indoors / 23		1.0 [3]	0.80 [2]	0.8	
Auditorium - Indoors / 24		1.0 [3]	0.80 [2]	0.8	
Health care facility - Indoors / 25		1.0 [3]	0.80 [2]	0.8	
Other public building - Indoors / 26		1.0 [3]	0.80 [2]	0.8	
Other location - Indoors / 27		1.0 [3]	1.0[c] [1]	1	MZ 29
Not specified - Indoors / 28		1.0 [3]	0.80 [2]	0.8	
Construction site - Outdoors / 29		1.0 [3]	1.0 [3]	1	
Residential grounds - Outdoors / 30		1.0 [3]	1.0 [3]	1	
School grounds - Outdoors / 31		1.0 [3]	1.0 [3]	1	
Sports arena - Outdoors / 32		1.0 [3]	1.0 [3]	1	
Park/golf course - Outdoors / 33		1.0 [3]	1.0 [3]	1	
Other location - Outdoors / 34		1.0 [3]	1.0 [3]	1	
Not specified - Outdoors / 35		1.0 [3]	1.0 [3]	1	
Train/subway - In vehicle / 36		1.0 [3]	0.90 [2]	0.9	
Airplane - In vehicle / 37		0.0 [3]	0.90 [2]	0	

[a] Data Code: 1 = value obtained from literature; 2 = value obtained using grouping scheme; 3 = default value.
[b] The PROX factor is assumed to be the same for each source category for this pollutant.
[c] Telephone switching center