

**Emission Inventory and Risk Assessment Guidelines
for Perchloroethylene Dry Cleaners**

Introduction

The purpose of this report is to document the methods used by AQMD staff to estimate cancer risks from the industry-wide source category of perchloroethylene dry cleaners. The methods are consistent with (1) AQMD's risk assessment procedures for Rule 1401 and (2) California Air Pollution Control Officer Association (CAPCOA) risk assessment guidance for perchloroethylene dry cleaners. The methods used to estimate emissions, pollutant concentrations, and cancer risks are covered here. Tables of maximum cancer risks at various locations in the South Coast Air Basin and at various residential and occupational distances are provided. The document concludes with an example calculation using the cancer risk tables.

Perchloroethylene Dry Cleaners

Rule 1421 was initially adopted in 1994, and amended on December 6, 2002. It is designed to reduce perchloroethylene emissions from dry cleaning systems. As part of reporting requirements in the amendments, the AQMD required an initial survey form, due July 1, 2003, to obtain throughput and receptor information for estimating health risks from dry cleaning facilities. The rule also does not allow usage of perchloroethylene after December 31, 2020.

Perchloroethylene emissions from dry cleaners primarily originate from leaks and from the loading door and other maintenance ports. Emissions are estimated by a material mass balance calculation as follows:

$$\text{Perc Emissions} = \text{Perc Consumption} - \text{Perc Waste Credit}$$

where,

$$\text{Perc Consumption} = \text{Perc Purchases} + \text{Initial Perc Inventory} - \text{Final Perc Inventory}$$

and

$$\text{Perc Waste Credit} = (\text{Total Gallons of Still Oil}) \cdot (\% \text{ Perc in Still Oil}) + (\text{No. of Filter Cartridges}) \cdot (\text{Gallons of Perc/Cartridge})$$

Rule 1421 requires that facilities provide the information needed to perform the above calculations. However, if the above information is not available, then emissions can alternately be calculated as follows:

$$\text{Perc Emissions} = (0.56)(\text{Perc Purchases})$$

The 56 percent fraction given in the above equation was developed based on testing of 41 dry cleaners.

Exposure Modeling Methods

Air quality modeling was performed using a U.S. EPA air quality dispersion model, called ISCST3 (Industrial Source Complex – Short Term, Version 3). ISCST3 is a Gaussian plume model capable of estimating pollutant concentrations from a wide variety of sources that are typically present in an industrial source complex. Emission sources are categorized into four basic types: point, area, volume, and open pit sources. ISCST3 estimates hourly concentrations for each source/receptor pair and calculates concentrations for user-specified averaging times, including an average concentration for the complete simulation period.

ISCST3 is executed using the urban dispersion parameters, which is AQMD policy for all permitting in its jurisdiction. The U.S. EPA regulatory defaults options are implemented except that the calm processing option is disabled. The AQMD believes that calm processing is inappropriate for its meteorological data for the following reasons:

- Calm processing was developed by the U.S. EPA to correct problems with preprocessed data in which calm winds are given the speed of 1 m/s and the direction of the last non-calm hour. This results in artificial persistence. Wind data collected by the AQMD is not preprocessed.
- Wind speeds in the AQMD stations are always 1 m/s or greater. Thus, model problems associated with lower wind speeds are not an issue.
- Wind direction is always recorded regardless of the wind speed and the direction is randomized over a 22.5 degree sector. Thus, artificial persistence is not an issue.
- AQMD data is more like on-site data and calm processing is not appropriate for on-site data.
- Given the high frequency of calms at many sites in the South Coast Air Basin and their association with high pollutant concentrations, it would be inappropriate to eliminate that portion of the data.

For these reasons, the AQMD does not require calm processing for permit modeling.

Emissions from perchloroethylene dry cleaners are non-buoyant and ground-based (or nearly ground-based). In addition, the peak impacts from this type of facility occur in close proximity to the source. Under these circumstances the local terrain is relatively unimportant; therefore flat terrain is assumed in the dispersion modeling.

Modeling was performed at all 35 AQMD meteorological stations shown in Figure 1. The locations of each of the sites are given in Table 1. The data are available on the AQMD website (<http://www.aqmd.gov/smog/metdata/ISCST3.html>). A polar receptor grid is assumed at ten degree azimuth increments at the following downwind distances: 25, 30, 40, 50, 60, 70, 80, 90, 100, 125, 150, 175, 200, 250, 300, 350, 400, 450, 500, 600, 700, 800, 900, and 1000 meters.

The peak model-predicted impacts at each downwind distance over the 36 azimuth angles are used to develop the health risk tables for perchloroethylene dry cleaners (see Tables 2 through 4).

Figure 1
Meteorological Monitoring Stations in the South Coast Air Basin

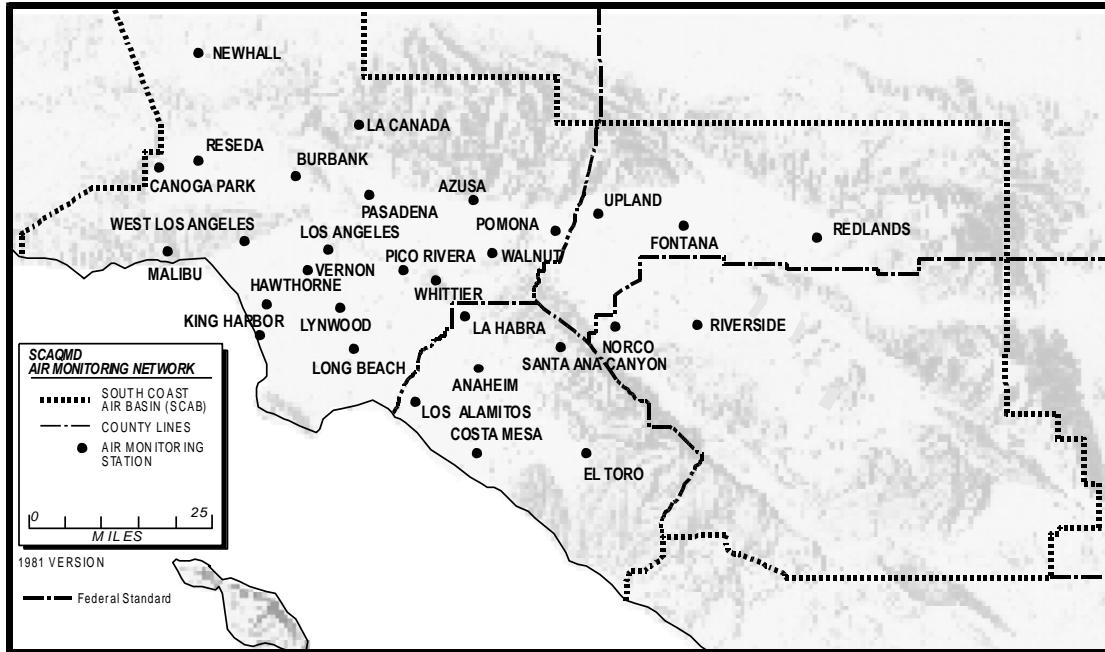


Table 1: Locations of Meteorological Stations

Station name	UTM Coordinates (m)		Lat./Long. Coordinates	
	E-W	N-S	Latitude	Longitude
Anaheim	415.0	3742.5	33°49'16"	117°55'07"
Azusa	414.9	3777.4	34°08'09"	117°55'23"
Banning	510.5	3754.5	33°55'58"	116°53'11"
Burbank	379.5	3783.0	34°10'58"	118°18'27"
Canoga Park	352.9	3786.0	34°12'23"	118°35'48"
Compton	385.5	3750.3	33°53'19"	118°14'17"
Costa Mesa	413.8	3724.2	33°39'21"	117°55'47"
Downtown Los Angeles	386.9	3770.1	34°04'02"	118°13'31"
El Toro	436.0	3720.9	33°37'39"	117°41'25"
Fontana	455.4	3773.9	34°06'24"	117°29'01"
Indio	572.3	3731.0	33°43'06"	116°13'11"
King Harbor	371.2	3744.4	33°50'00"	118°23'30"
La Canada	388.2	3786.1	34°12'42"	118°12'49"
La Habra	412.0	3754.0	33°55'28"	117°57'07"
Lancaster	396.0	3839.5	34°41'38"	118°08'08"
Lennox	373.0	3755.0	33°55'46"	118°22'26"
Long Beach	390.0	3743.0	33°49'24"	118°11'19"
Los Alamitos	404.5	3739.8	33°47'45"	118°01'54"
Lynwood	388.0	3754.0	33°55'20"	118°12'42"
Malibu	344.0	3766.9	34°01'59"	118°41'23"
Newhall	355.5	3805.5	34°22'59"	118°31'02"
Norco	446.8	3749.0	33°52'54"	117°34'31"
Palm Springs	542.5	3742.5	33°49'25"	116°32'27"
Pasadena	396.0	3778.5	34°08'38"	118°07'41"
Pico Rivera	402.3	3764.1	34°00'53"	118°03'29"
Pomona	430.8	3769.6	34°03'60"	117°44'60"
Redlands	486.2	3769.4	34°04'00"	117°09'00"
Reseda	359.0	3785.0	34°11'54"	118°31'49"
Riverside	464.8	3758.6	33°58'10"	117°22'50"
Santa Ana Canyon	431.0	3748.4	33°52'32"	117°44'46"
Upland	440.0	3773.1	34°05'55"	117°39'02"
Vernon	387.4	3762.5	33°59'55"	118°13'10"
Walnut	420.0	3761.7	33°59'41"	117°51'58"
West Los Angeles	372.3	3768.6	34°03'08"	118°23'01"
Whittier	405.3	3754.0	33°55'26"	118°01'28"

As mentioned earlier, CAPCOA has developed industry-wide risk assessment guidelines for perchloroethylene dry cleaners (CAPCOA, 2003). These guidelines were developed to promote consistency throughout the State. However, CAPCOA recognized that many of the districts in the State have developed modeling methods and procedures unique to their situations. To address these differences among districts, CAPCOA allows for a district to deviate from the published guidelines. The modeling performed here followed CAPCOA guidelines unless otherwise noted.

Dry cleaners are modeled as a general ventilation source (CAPCOA, 2003) with one or more large capacity roof fans that ventilate the work place. It is assumed that the vents on the roof are topped by a rain cap or exit horizontally. It is also assumed that 60 percent of the perchloroethylene emissions are captured by the ventilation system and 40 percent of the emissions escape from the building through the doors and windows.

The interior space of the dry cleaner is assumed to be 40 feet (12.2 meters) by 40 feet (12.2 meters) with a ceiling height of 15 feet (4.6 meters). The height of the roof vent is assumed to be 0.5 meters above the roof and the diameter of the vent to be 0.3 meters (12 inches). These dimensions are consistent with assumptions made in the development and amendment of Rule 1421. These building dimensions differ slightly from those assumed by CAPCOA in their modeling guidelines. The building dimensions assumed by CAPCOA are as follows: 15 meters by 15 meters with a height of 6 meters. Building downwash effects are addressed in the modeling with the roof vent located in the center of the building. The facility is assumed to operate the dry cleaning equipment eight hours per day, from 8 a.m. to 4 p.m.; five days per week, from Monday to Friday; and 52 weeks per year.

Beside the building dimensions, CAPCOA modeling guidelines are also not followed for the calculations of the initial vertical dispersion parameter for the volume source. CAPCOA recommends it be estimated as the height of the work space (4.6 meters) divided by 4.3 (i.e., $4.6/4.3 = 1.1$ meters). AQMD follows the ISCST3 guidance for a surface-based volume source, which estimates the initial dispersion parameter by dividing the height of the work space by 2.15 (i.e., $4.6/2.15 = 2.1$ meters). This assumption is consistent with AQMD's permitting practices.

A sample ISCST3 model input file for the generic perchloroethylene dry cleaner described above is given in Exhibit 1.

Exhibit 1: ISCST3 Model Input File for The Generic Perchloroethylene Dry Cleaner

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CO STARTING
  TITLEONE Dry Cleaner - General Ventilation (60/40) Scenario from R1421
  TITLETWO 100 gal/yr Perc emissions; West Los Angeles meteorology
  MODELOPT NOCALM URBAN CONC
  AVERTIME 1 PERIOD
  POLLUTID Perc
  RUNORNOT RUN

  ERRORFIL ERRORS.OUT
CO FINISHED

SO STARTING

** Assume 100 gal/yr of perc emissions
** Assume 60% general ventilation
** Volume source emissions = 100(gal/yr)*40%(%Volume)*13.5 lb/gal*(454/(8*5*52*3600))
** Point source emissions = 100(gal/yr)*60%(%Point) *13.5 lb/gal*(454/(5*8*52*3600))

** Building dimension of 40'x40'x15'(W x L x H)
** Volume source: Sy = 40ft/4.3 ; Sz = 15ft/2.15
** Point source: HS=bulding height+0.5 m; VS=0 m/s(horizontal flow); DS=0.3 m

  LOCATION 1 POINT 0.0 0.0 0.00

** point source QS HS TS VS DS
  SRCPARAM 1 4.907E-2 5.07 293. 0.0 0.30

  LOCATION 2 VOLUME 0.0 0.0 0.0

** Volume Source QS HS SYINIT SZINIT
  SRCPARAM 2 3.271E-2 2.29 2.84 2.13

  BUILDHGT 1 4.57 4.57 4.57 4.57 4.57 4.57
  BUILDHGT 1 4.57 4.57 4.57 4.57 4.57 4.57
  BUILDHGT 1 4.57 4.57 4.57 4.57 4.57 4.57
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  BUILDHGT 1 4.57 4.57 4.57 4.57 4.57 4.57
  BUILDHGT 1 4.57 4.57 4.57 4.57 4.57 4.57
  BUILDWID 1 14.13 15.64 16.67 17.19 17.19 16.67
  BUILDWID 1 15.64 14.13 12.20 14.13 15.64 16.67
  BUILDWID 1 17.19 17.19 16.67 15.64 14.13 12.20
  BUILDWID 1 14.13 15.64 16.67 17.19 17.19 16.67
  BUILDWID 1 15.64 14.13 12.20 14.13 15.64 16.67
  BUILDWID 1 17.19 17.19 16.67 15.64 14.13 12.20

  EMISFACT 1 HROFDY 8*0.0 8*1.0 8*0.0
  EMISFACT 2 HROFDY 8*0.0 8*1.0 8*0.0

  SRCGROUP ALL
SO FINISHED

RE STARTING
  GRIDPOLR POL1 STA
  ORIG 0.0 0.0
  DIST 25 30 40 50 60 70 80 90 100 125 150 175 200
  DIST 250 300 350 400 450 500 600 700 800 900 1000
  GDIR 36 10.0 10.0
  GRIDPOLR POL1 END
RE FINISHED

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Exhibit 1: continued.

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ME STARTING
INPUTFIL  c:\metdata\ascii\wla.asc
ANEMHGHT  10 METERS
SURFDATA  52158 1981
UAIRDATA  91919 1981

DAYRANGE  1  2      5  6  7  8  9      12 13 14 15 16
DAYRANGE  19 20 21  22 23      26 27 28 29 30      33 34 35
DAYRANGE  36 37      40 41 42 43 44      47 48 49 50 51
DAYRANGE  54 55 56  57 58      61 62 63 63 65      68 69 70
DAYRANGE  71 72      75 76 77 78 79      82 83 84 85 86
DAYRANGE  89 90 91  92 93      96 97 98 99 100      103 104 105
DAYRANGE  106 107      110 111 112 113 114      117 118 119 120 121
DAYRANGE  124 125 126 127 128      131 132 133 134 135      138 139 140
DAYRANGE  141 142      145 146 147 148 149      152 153 154 155 156
DAYRANGE  159 160 161 162 163      166 167 168 169 170      173 174 175
DAYRANGE  176 177      180 181 182 183 184      187 188 189 190 191
DAYRANGE  194 195 196 197 198      201 202 203 204 205      208 209 210
DAYRANGE  211 212      215 216 217 218 219      222 223 224 225 226
DAYRANGE  229 230 231 232 233      236 237 238 239 240      243 244 245
DAYRANGE  246 247      250 251 252 253 254      257 258 259 260 261
DAYRANGE  264 265 266 267 268      271 272 273 274 275      278 279 280
DAYRANGE  281 282      285 286 287 288 289      292 293 294 295 296
DAYRANGE  299 300 301 302 303      306 307 308 309 310      313 314 315
DAYRANGE  316 317      320 321 322 323 324      327 328 329 330 331
DAYRANGE  334 335 336 337 338      341 342 343 344 345      348 349 350
DAYRANGE  351 352      355 356 357 358 359      362 363 364 365

ME FINISHED

OU STARTING
RECTABLE  ALLAVE  FIRST

OU FINISHED
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Risk Assessment Methods

The risk assessment methods used in the AQMD's *Risk Assessment Procedures for Rule 1401 and 212 (Version 7.0)* are used to calculate the cancer risks and non-cancer chronic hazard index from perchloroethylene dry cleaners. The cancer risk (CR) is calculated as follows:

$$CR = \text{Cancer Potency (CP)} \cdot \text{Dose-Inhalation (DI)} \cdot \text{Multipathway Factor (MP)}$$

where,

$$DI = C_{\text{air}} \cdot \text{DBR} \cdot \text{EVF} \cdot 10^{-6} \cdot \text{MP}$$

$$C_{\text{air}} = C_{\text{ann}} \cdot \text{AF}_{\text{ann}}$$

Therefore, the equation for calculating cancer risks is:

$$CR = \text{CP} \cdot C_{\text{ann}} \cdot \text{AF}_{\text{ann}} \cdot \text{DBR} \cdot \text{EVF} \cdot 10^{-6} \cdot \text{MP}$$

CP is cancer potency in units of $(\text{mg}/\text{kg}\text{-day})^{-1}$. The cancer potency for perchloroethylene is $0.021 (\text{mg}/\text{kg}\text{-day})^{-1}$. C_{ann} is the model-predicted annual average perchloroethylene concentration in $\mu\text{g}/\text{m}^3$. AF_{ann} is a concentration adjustment factor. It adjusts the model-predicted annual average perchloroethylene concentration, which are 24 hrs/day and 7 days/week averages, to an average for the off-site worker exposure period (i.e., 8 hrs/day and 5 days/week). This is necessary because the worker breathing rate of 149 L/kg-day is only applicable to the work-day and work-week exposure. It is assumed that the worker is only exposed while at work. Since the generic perc dry cleaner is assumed to operate 8 hrs/day and 5 days/week, AF_{ann} is assumed to be 4.2 (i.e., $24/8 \cdot 7/5$) for the worker receptors. AF_{ann} is 1 for residential receptors.

DBR is the daily breathing rate in units of L/kg-day. The daily breathing rates for workers and residents are 149 L/kg-day and 302 L/kg-day, respectively. EVF is the exposure value factor, which is assumed to be 0.38 for workers and 0.96 for residents. The multi-pathway adjustment factor (MP) is used for substances that may contribute to risk from exposures other than inhalation. Inhalation is the only pathway into the body for perchloroethylene; therefore, the multi-pathway factor is 1.

The following equation is used to calculate the non-cancer chronic hazard index (HI):

$$\text{Chronic HI} = C_{\text{ann}} / \text{REL}_{\text{perc}}$$

C_{ann} is the model-predicted annual average perchloroethylene concentration in $\mu\text{g}/\text{m}^3$ and REL_{perc} is the chronic reference exposure level for perchloroethylene, which is $35 \mu\text{g}/\text{m}^3$.

Risk Tables

In developing the tables for perchloroethylene dry cleaners, AQMD followed CAPCOA's *Draft Perchloroethylene Dry Cleaner Industry-wide Risk Assessment Guidelines (January 2003)*. For perchloroethylene dry cleaners, emissions were calculated based on consumption information as provided by facility operators in their Initial Survey Form and emission factor developed by AQMD based on results of sampling program conducted by the AQMD. To estimate risk for perchloroethylene dry cleaners; emissions, receptor distances and facility location is used in the lookup tables.

Tables 2 and 3 provide the maximum cancer risks and Table 4 provides chronic hazard index for a perchloroethylene dry cleaner with emissions of 10 gal/yr at various residential and occupational distances, respectively. For the modeled facility, it is assumed that 60 percent of perchloroethylene emissions are captured by the ventilation system and 40 percent of the emissions escape from the building through the doors and windows. The calculated emissions are a function of the perchloroethylene usage.

The modeling results indicate that cancer risk for many of dry cleaners (with high level of emissions and close proximity to receptors) may be in excess of the risk reduction levels established by the AQMD. Results also indicate that the chronic Reference Exposure Levels, or "REL" may be exceeded for some facilities. AQMD followed CAPCOA's *Draft Perchloroethylene Dry Cleaner Industry-wide Risk Assessment Guidelines (January 2003)* and did not address acute exposure in detail since modeling indicates that off-site health risks are dominated by the cancer risk.

Cancer risk and chronic hazard index from a typical perchloroethylene dry cleaner can be estimated from Tables 2, 3, and 4 as follows: First, determine which of the 35 locations in these tables is closest to the dry cleaner or best represents the facility. AQMD staff made use of location information that is available in the AQMD's permit database. The South Coast AQMD is broken up into 38 source/receptor areas as shown in Figure 2. The source/receptor area is provided for each facility in AQMD's permit database. As shown in Table 5, AQMD staff assigned one of the 35 meteorological sites to each source receptor area, which was then used to choose a meteorological site for each drycleaner.

Next, determine the distance from the dry cleaner to the nearest residential and occupational location. Using the above information, pick the cancer risk and chronic hazard index from the appropriate cell in Tables 2, 3, and 4, respectively. Lastly, scale the cancer risk and chronic hazard index by the actual perchloroethylene emissions of the dry cleaner. An example of a risk calculation for a hypothetical perchloroethylene dry cleaner is provided in a subsequent section.

Table 2: Residential Cancer Risks (in one million) for Perchloroethylene Dry Cleaner (Emitting 10 gal/yr)

Downwind Distance (meters)

Location	25	30	40	50	60	70	80	90	100	125	150	175	200
Anaheim	14.63	11.57	7.59	5.24	3.80	2.87	2.24	1.80	1.47	0.96	0.67	0.50	0.38
Azusa	13.39	10.66	7.00	4.82	3.50	2.65	2.07	1.66	1.36	0.88	0.62	0.46	0.35
Banning	8.20	6.69	4.53	3.18	2.33	1.77	1.39	1.12	0.92	0.60	0.42	0.31	0.24
Burbank	10.22	8.01	5.22	3.59	2.61	1.97	1.54	1.23	1.01	0.66	0.46	0.34	0.26
Canoga Park	12.07	9.43	6.08	4.17	3.02	2.28	1.77	1.42	1.16	0.75	0.53	0.39	0.30
Compton	10.07	8.12	5.47	3.82	2.80	2.13	1.68	1.35	1.11	0.73	0.51	0.38	0.29
Costa Mesa	12.25	9.71	6.34	4.36	3.16	2.39	1.86	1.49	1.22	0.79	0.56	0.41	0.32
Downtown LA	8.02	6.51	4.40	3.09	2.26	1.72	1.35	1.09	0.89	0.58	0.41	0.31	0.24
El Toro	11.71	9.17	5.90	4.04	2.92	2.20	1.72	1.37	1.12	0.73	0.51	0.38	0.29
Fontana	13.22	10.54	6.92	4.80	3.50	2.65	2.07	1.66	1.36	0.89	0.62	0.46	0.35
Indio	11.97	9.50	6.24	4.32	3.14	2.38	1.86	1.49	1.22	0.80	0.56	0.41	0.32
King Harbor	9.85	7.97	5.33	3.71	2.71	2.06	1.61	1.29	1.06	0.69	0.49	0.36	0.28
La Canada	12.98	10.25	6.67	4.59	3.32	2.51	1.96	1.57	1.28	0.83	0.58	0.43	0.33
La Habra	13.79	10.87	7.09	4.88	3.54	2.68	2.09	1.67	1.37	0.89	0.62	0.46	0.35
Lancaster	8.20	6.47	4.25	2.94	2.14	1.63	1.27	1.02	0.84	0.55	0.38	0.29	0.22
Lennox	10.87	8.71	5.81	4.05	2.96	2.25	1.76	1.42	1.16	0.76	0.54	0.40	0.31
Long Beach	10.58	8.29	5.36	3.67	2.66	2.01	1.57	1.25	1.03	0.67	0.47	0.35	0.27
Los Alamitos	10.52	8.36	5.50	3.80	2.76	2.09	1.63	1.31	1.07	0.70	0.49	0.36	0.28
Lynwood	10.31	8.16	5.31	3.66	2.65	2.00	1.56	1.25	1.02	0.67	0.47	0.35	0.27
Malibu	15.06	11.90	7.75	5.33	3.86	2.92	2.27	1.82	1.49	0.97	0.68	0.50	0.38
Newhall	8.58	6.86	4.53	3.14	2.29	1.73	1.35	1.09	0.89	0.58	0.41	0.30	0.23
Norco	12.60	10.00	6.59	4.56	3.32	2.52	1.97	1.58	1.29	0.84	0.59	0.44	0.34
Palm Springs	10.26	8.06	5.19	3.55	2.56	1.93	1.50	1.20	0.98	0.64	0.44	0.33	0.25
Pasadena	13.55	10.57	6.82	4.67	3.38	2.55	1.99	1.59	1.30	0.85	0.59	0.44	0.34
Pico Rivera	11.62	9.34	6.21	4.31	3.14	2.38	1.86	1.49	1.22	0.80	0.56	0.42	0.32
Pomona	15.32	12.06	7.85	5.41	3.93	2.97	2.31	1.85	1.52	0.99	0.69	0.51	0.39
Redlands	15.48	12.17	7.91	5.45	3.96	2.99	2.33	1.87	1.53	0.99	0.70	0.51	0.39
Reseda	12.60	9.90	6.37	4.35	3.14	2.37	1.84	1.47	1.20	0.78	0.54	0.40	0.31
Riverside	13.12	10.63	7.11	4.98	3.64	2.76	2.16	1.74	1.43	0.93	0.66	0.49	0.38
Santa Ana Canyon	15.79	12.52	8.14	5.61	4.07	3.07	2.40	1.92	1.57	1.02	0.72	0.53	0.41
Upland	10.37	8.23	5.42	3.75	2.72	2.06	1.61	1.29	1.06	0.69	0.48	0.36	0.27
Vernon	8.27	6.73	4.59	3.23	2.37	1.81	1.42	1.15	0.94	0.62	0.44	0.33	0.25
Walnut	10.63	8.37	5.46	3.77	2.74	2.07	1.61	1.29	1.06	0.69	0.48	0.36	0.27
West LA	17.35	13.83	9.07	6.25	4.53	3.43	2.67	2.14	1.75	1.14	0.80	0.59	0.46
Whittier	11.76	9.17	5.91	4.05	2.93	2.21	1.72	1.38	1.12	0.73	0.51	0.38	0.29

Table 2(Cont.): Residential Cancer Risks (in one million) for Perchloroethylene Dry Cleaner (Emitting 10 gal/yr)

Downwind Distance (meters)

Location	250	300	350	400	450	500	600	700	800	900	1000
Anaheim	0.24	0.17	0.12	0.10	0.08	0.06	0.04	0.03	0.02	0.02	0.02
Azusa	0.23	0.16	0.12	0.09	0.07	0.06	0.04	0.03	0.02	0.02	0.01
Banning	0.16	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Burbank	0.17	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Canoga Park	0.19	0.13	0.10	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01
Compton	0.19	0.13	0.10	0.08	0.06	0.05	0.03	0.03	0.02	0.02	0.01
Costa Mesa	0.20	0.14	0.10	0.08	0.06	0.05	0.03	0.03	0.02	0.02	0.01
Downtown LA	0.15	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01
El Toro	0.19	0.13	0.09	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01
Fontana	0.23	0.16	0.12	0.09	0.07	0.06	0.04	0.03	0.02	0.02	0.01
Indio	0.21	0.14	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01
King Harbor	0.18	0.13	0.09	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01
La Canada	0.21	0.15	0.11	0.08	0.07	0.05	0.04	0.03	0.02	0.02	0.01
La Habra	0.23	0.16	0.12	0.09	0.07	0.06	0.04	0.03	0.02	0.02	0.01
Lancaster	0.14	0.10	0.07	0.06	0.04	0.04	0.03	0.02	0.01	0.01	0.01
Lennox	0.20	0.14	0.10	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01
Long Beach	0.17	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Los Alamitos	0.18	0.12	0.09	0.07	0.06	0.04	0.03	0.02	0.02	0.01	0.01
Lynwood	0.17	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Malibu	0.25	0.17	0.13	0.10	0.08	0.06	0.04	0.03	0.02	0.02	0.02
Newhall	0.15	0.10	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01
Norco	0.22	0.15	0.11	0.09	0.07	0.06	0.04	0.03	0.02	0.02	0.01
Palm Springs	0.16	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Pasadena	0.22	0.15	0.11	0.08	0.07	0.05	0.04	0.03	0.02	0.02	0.01
Pico Rivera	0.21	0.14	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01
Pomona	0.25	0.17	0.13	0.10	0.08	0.06	0.04	0.03	0.02	0.02	0.02
Redlands	0.25	0.18	0.13	0.10	0.08	0.06	0.04	0.03	0.02	0.02	0.02
Reseda	0.20	0.14	0.10	0.08	0.06	0.05	0.03	0.02	0.02	0.01	0.01
Riverside	0.24	0.17	0.13	0.10	0.08	0.06	0.04	0.03	0.02	0.02	0.02
Santa Ana Canyon	0.26	0.18	0.13	0.10	0.08	0.06	0.04	0.03	0.03	0.02	0.02
Upland	0.18	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Vernon	0.16	0.11	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Walnut	0.18	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
West LA	0.29	0.20	0.15	0.11	0.09	0.07	0.05	0.04	0.03	0.02	0.02
Whittier	0.19	0.13	0.09	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01

Table 3: Occupational Cancer Risks (in one million) for Perchloroethylene Dry Cleaner (Emitting 10 gal/yr)

Downwind Distance (meters)

Location	25	30	40	50	60	70	80	90	100	125	150	175	200
Anaheim	12.13	9.59	6.29	4.34	3.15	2.38	1.86	1.49	1.22	0.79	0.56	0.41	0.32
Azusa	11.10	8.83	5.80	4.00	2.90	2.19	1.71	1.37	1.12	0.73	0.51	0.38	0.29
Banning	6.80	5.54	3.76	2.63	1.93	1.47	1.15	0.93	0.76	0.50	0.35	0.26	0.20
Burbank	8.47	6.64	4.32	2.97	2.16	1.63	1.28	1.02	0.84	0.55	0.38	0.28	0.22
Canoga Park	10.01	7.82	5.04	3.46	2.50	1.89	1.47	1.18	0.96	0.62	0.44	0.32	0.25
Compton	8.35	6.73	4.53	3.17	2.32	1.77	1.39	1.12	0.92	0.60	0.42	0.32	0.24
Costa Mesa	10.16	8.05	5.25	3.62	2.62	1.98	1.54	1.24	1.01	0.66	0.46	0.34	0.26
Downtown LA	6.65	5.39	3.65	2.56	1.88	1.43	1.12	0.90	0.74	0.48	0.34	0.25	0.20
El Toro	9.71	7.60	4.89	3.35	2.42	1.83	1.42	1.14	0.93	0.60	0.42	0.31	0.24
Fontana	10.95	8.73	5.74	3.98	2.90	2.19	1.72	1.38	1.13	0.73	0.52	0.38	0.29
Indio	9.92	7.87	5.17	3.58	2.61	1.97	1.54	1.24	1.01	0.66	0.46	0.34	0.26
King Harbor	8.17	6.61	4.42	3.07	2.24	1.70	1.33	1.07	0.88	0.57	0.40	0.30	0.23
La Canada	10.76	8.49	5.53	3.80	2.75	2.08	1.62	1.30	1.06	0.69	0.48	0.36	0.27
La Habra	11.43	9.01	5.88	4.05	2.94	2.22	1.73	1.39	1.14	0.74	0.52	0.38	0.29
Lancaster	6.80	5.36	3.52	2.43	1.78	1.35	1.05	0.85	0.69	0.45	0.32	0.24	0.18
Lennox	9.01	7.22	4.82	3.35	2.45	1.86	1.46	1.17	0.96	0.63	0.45	0.33	0.25
Long Beach	8.77	6.87	4.44	3.04	2.20	1.66	1.30	1.04	0.85	0.55	0.39	0.29	0.22
Los Alamitos	8.72	6.93	4.56	3.15	2.29	1.73	1.35	1.08	0.89	0.58	0.41	0.30	0.23
Lynwood	8.55	6.76	4.40	3.03	2.20	1.66	1.30	1.04	0.85	0.55	0.39	0.29	0.22
Malibu	12.48	9.86	6.43	4.42	3.20	2.42	1.88	1.51	1.23	0.80	0.56	0.41	0.32
Newhall	7.11	5.68	3.76	2.60	1.90	1.44	1.12	0.90	0.74	0.48	0.34	0.25	0.19
Norco	10.45	8.29	5.46	3.78	2.75	2.09	1.63	1.31	1.07	0.70	0.49	0.36	0.28
Palm Springs	8.50	6.68	4.30	2.94	2.12	1.60	1.25	1.00	0.81	0.53	0.37	0.27	0.21
Pasadena	11.23	8.76	5.65	3.87	2.80	2.11	1.65	1.32	1.08	0.70	0.49	0.36	0.28
Pico Rivera	9.63	7.74	5.15	3.57	2.60	1.97	1.54	1.24	1.01	0.66	0.47	0.34	0.27
Pomona	12.70	9.99	6.50	4.48	3.25	2.46	1.92	1.54	1.26	0.82	0.57	0.42	0.32
Redlands	12.83	10.09	6.56	4.52	3.28	2.48	1.93	1.55	1.27	0.82	0.58	0.43	0.33
Reseda	10.44	8.20	5.28	3.61	2.61	1.96	1.53	1.22	1.00	0.65	0.45	0.33	0.25
Riverside	10.87	8.81	5.90	4.12	3.01	2.29	1.79	1.44	1.18	0.77	0.55	0.40	0.31
Santa Ana Canyon	13.09	10.38	6.74	4.65	3.37	2.55	1.99	1.59	1.30	0.85	0.59	0.44	0.34
Upland	8.59	6.82	4.49	3.11	2.26	1.71	1.33	1.07	0.88	0.57	0.40	0.30	0.23
Vernon	6.86	5.58	3.80	2.67	1.97	1.50	1.18	0.95	0.78	0.51	0.36	0.27	0.21
Walnut	8.81	6.94	4.53	3.12	2.27	1.71	1.34	1.07	0.88	0.57	0.40	0.30	0.23
West LA	14.38	11.47	7.52	5.18	3.76	2.84	2.22	1.78	1.45	0.95	0.66	0.49	0.38
Whittier	9.74	7.60	4.89	3.36	2.43	1.83	1.43	1.14	0.93	0.61	0.42	0.31	0.24

Table 3(Cont.): Occupational Cancer Risks (in one million) for Perchloroethylene Dry Cleaner (Emitting 10 gal/yr)

Downwind Distance (meters)

Location	250	300	350	400	450	500	600	700	800	900	1000
Anaheim	0.20	0.14	0.10	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01
Azusa	0.19	0.13	0.10	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01
Banning	0.13	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01
Burbank	0.14	0.10	0.07	0.05	0.04	0.04	0.02	0.02	0.01	0.01	0.01
Canoga Park	0.16	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01
Compton	0.16	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Costa Mesa	0.17	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Downtown LA	0.13	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01
El Toro	0.15	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01
Fontana	0.19	0.13	0.10	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01
Indio	0.17	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
King Harbor	0.15	0.10	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01
La Canada	0.18	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
La Habra	0.19	0.13	0.10	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01
Lancaster	0.12	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01
Lennox	0.17	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Long Beach	0.14	0.10	0.07	0.06	0.04	0.04	0.02	0.02	0.01	0.01	0.01
Los Alamitos	0.15	0.10	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01
Lynwood	0.14	0.10	0.07	0.06	0.04	0.04	0.02	0.02	0.01	0.01	0.01
Malibu	0.20	0.14	0.10	0.08	0.06	0.05	0.03	0.03	0.02	0.02	0.01
Newhall	0.12	0.09	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01
Norco	0.18	0.13	0.09	0.07	0.06	0.05	0.03	0.02	0.02	0.01	0.01
Palm Springs	0.13	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01	0.01
Pasadena	0.18	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Pico Rivera	0.17	0.12	0.09	0.07	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Pomona	0.21	0.14	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01
Redlands	0.21	0.15	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01
Reseda	0.16	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01	0.01
Riverside	0.20	0.14	0.10	0.08	0.06	0.05	0.04	0.03	0.02	0.02	0.01
Santa Ana Canyon	0.22	0.15	0.11	0.08	0.07	0.05	0.04	0.03	0.02	0.02	0.01
Upland	0.15	0.10	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01
Vernon	0.14	0.10	0.07	0.05	0.04	0.04	0.02	0.02	0.01	0.01	0.01
Walnut	0.15	0.10	0.07	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01
West LA	0.24	0.17	0.12	0.09	0.07	0.06	0.04	0.03	0.02	0.02	0.02
Whittier	0.15	0.11	0.08	0.06	0.05	0.04	0.03	0.02	0.01	0.01	0.01

Table 4: Chronic Hazard Index for Perchloroethylene Dry Cleaner (Emitting 10 gal/yr)

Downwind Distance (meters)

Location	25	30	40	50	60	70	80	90	100	125	150	175	200
Anaheim	0.069	0.054	0.036	0.025	0.018	0.013	0.011	0.008	0.007	0.004	0.003	0.002	0.002
Azusa	0.063	0.050	0.033	0.023	0.016	0.012	0.010	0.008	0.006	0.004	0.003	0.002	0.002
Banning	0.039	0.031	0.021	0.015	0.011	0.008	0.007	0.005	0.004	0.003	0.002	0.001	0.001
Burbank	0.048	0.038	0.025	0.017	0.012	0.009	0.007	0.006	0.005	0.003	0.002	0.002	0.001
Canoga Park	0.057	0.044	0.029	0.020	0.014	0.011	0.008	0.007	0.005	0.004	0.002	0.002	0.001
Compton	0.047	0.038	0.026	0.018	0.013	0.010	0.008	0.006	0.005	0.003	0.002	0.002	0.001
Costa Mesa	0.058	0.046	0.030	0.020	0.015	0.011	0.009	0.007	0.006	0.004	0.003	0.002	0.001
Downtown LA	0.038	0.031	0.021	0.015	0.011	0.008	0.006	0.005	0.004	0.003	0.002	0.001	0.001
El Toro	0.055	0.043	0.028	0.019	0.014	0.010	0.008	0.006	0.005	0.003	0.002	0.002	0.001
Fontana	0.062	0.049	0.033	0.023	0.016	0.012	0.010	0.008	0.006	0.004	0.003	0.002	0.002
Indio	0.056	0.045	0.029	0.020	0.015	0.011	0.009	0.007	0.006	0.004	0.003	0.002	0.001
King Harbor	0.046	0.037	0.025	0.017	0.013	0.010	0.008	0.006	0.005	0.003	0.002	0.002	0.001
La Canada	0.061	0.048	0.031	0.022	0.016	0.012	0.009	0.007	0.006	0.004	0.003	0.002	0.002
La Habra	0.065	0.051	0.033	0.023	0.017	0.013	0.010	0.008	0.006	0.004	0.003	0.002	0.002
Lancaster	0.039	0.030	0.020	0.014	0.010	0.008	0.006	0.005	0.004	0.003	0.002	0.001	0.001
Lennox	0.051	0.041	0.027	0.019	0.014	0.011	0.008	0.007	0.005	0.004	0.003	0.002	0.001
Long Beach	0.050	0.039	0.025	0.017	0.012	0.009	0.007	0.006	0.005	0.003	0.002	0.002	0.001
Los Alamitos	0.049	0.039	0.026	0.018	0.013	0.010	0.008	0.006	0.005	0.003	0.002	0.002	0.001
Lynwood	0.048	0.038	0.025	0.017	0.012	0.009	0.007	0.006	0.005	0.003	0.002	0.002	0.001
Malibu	0.071	0.056	0.036	0.025	0.018	0.014	0.011	0.009	0.007	0.005	0.003	0.002	0.002
Newhall	0.040	0.032	0.021	0.015	0.011	0.008	0.006	0.005	0.004	0.003	0.002	0.001	0.001
Norco	0.059	0.047	0.031	0.021	0.016	0.012	0.009	0.007	0.006	0.004	0.003	0.002	0.002
Palm Springs	0.048	0.038	0.024	0.017	0.012	0.009	0.007	0.006	0.005	0.003	0.002	0.002	0.001
Pasadena	0.064	0.050	0.032	0.022	0.016	0.012	0.009	0.007	0.006	0.004	0.003	0.002	0.002
Pico Rivera	0.055	0.044	0.029	0.020	0.015	0.011	0.009	0.007	0.006	0.004	0.003	0.002	0.002
Pomona	0.072	0.057	0.037	0.025	0.018	0.014	0.011	0.009	0.007	0.005	0.003	0.002	0.002
Redlands	0.073	0.057	0.037	0.026	0.019	0.014	0.011	0.009	0.007	0.005	0.003	0.002	0.002
Reseda	0.059	0.047	0.030	0.020	0.015	0.011	0.009	0.007	0.006	0.004	0.003	0.002	0.001
Riverside	0.062	0.050	0.033	0.023	0.017	0.013	0.010	0.008	0.007	0.004	0.003	0.002	0.002
Santa Ana Canyon	0.074	0.059	0.038	0.026	0.019	0.014	0.011	0.009	0.007	0.005	0.003	0.002	0.002
Upland	0.049	0.039	0.025	0.018	0.013	0.010	0.008	0.006	0.005	0.003	0.002	0.002	0.001
Vernon	0.039	0.032	0.022	0.015	0.011	0.009	0.007	0.005	0.004	0.003	0.002	0.002	0.001
Walnut	0.050	0.039	0.026	0.018	0.013	0.010	0.008	0.006	0.005	0.003	0.002	0.002	0.001
West LA	0.082	0.065	0.043	0.029	0.021	0.016	0.013	0.010	0.008	0.005	0.004	0.003	0.002
Whittier	0.055	0.043	0.028	0.019	0.014	0.010	0.008	0.006	0.005	0.003	0.002	0.002	0.001

Table 4(Cont.): Chronic Hazard Index for Perchloroethylene Dry Cleaner (Emitting 10 gal/yr)

Downwind Distance (meters)

Location	250	300	350	400	450	500	600	700	800	900	1000
Anaheim	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Azusa	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Banning	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Burbank	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Canoga Park	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Compton	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Costa Mesa	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Downtown LA	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
El Toro	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Fontana	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Indio	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
King Harbor	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
La Canada	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
La Habra	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lancaster	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lennox	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Long Beach	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Los Alamitos	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Lynwood	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Malibu	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Newhall	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Norco	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Palm Springs	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pasadena	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pico Rivera	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Pomona	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Redlands	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Reseda	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Riverside	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Santa Ana Canyon	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Upland	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Vernon	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Walnut	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
West LA	0.001	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Whittier	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

**Figure 2
Source/Receptor Areas**

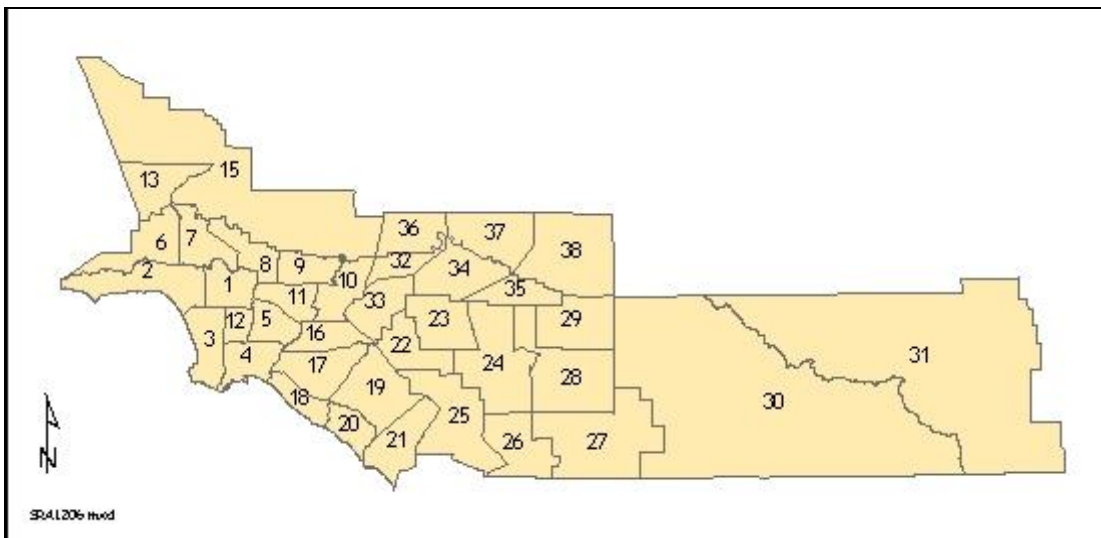


Table 5. Meteorological Stations for Each Source/Receptor Area.

Meteorological Station	Source/ Receptor Area	Meteorological Station	Source/ Receptor Area
Anaheim	17	Newhall	13, 15
Azusa	9	Palm Springs	30, 31
Banning	29	Pasadena	8
Burbank	7	Pico Rivera	11
Costa Mesa	18, 20	Pomona	10
Downtown Los Angeles	1	Redlands	35, 38
El Toro	19, 21	Reseda	6
Fontana	34, 37	Riverside	22-28
La Habra	16	Upland	32, 33, 36
Lennox	3	West Los Angeles	2
Long Beach	4	Whittier	5
Lynwood	12		

Example Calculations

The following example demonstrates how the AQMD staff plans to assign health risk values for perchloroethylene dry cleaning based on information received and using Tables 2 through 4.

The calculation steps are as follows:

1. **Cancer Risk (CR):** The AQMD will assign cancer risk values to each perchloroethylene dry cleaning facility based on facility location, process information, and receptor proximity.
 - a. Residential CR: Use the facility location and the distance to the nearest resident to identify the risk. The residential CRs for perchloroethylene dry cleaning are contained in Table 2.
 - b. Occupational CR: Use the facility location and the distance to the nearest worker to identify the risk. The occupational CRs for perchloroethylene dry cleaning are contained in Table 3.
 - c. Maximum Individual CR (MICR): Select the greater CR between the residential and occupational CRs (as identified above).

2. **Non-Cancer Risk or Hazard Index (HI):** The AQMD will assign non-cancer risk values to each perchloroethylene dry cleaner based on facility location, process information, and receptor proximity. The base chronic hazard indices (CHIs) for perchloroethylene dry cleaning are contained in Table 4.
 - a. Residential HI: Use the facility location and the distance to the nearest resident to identify the risk.
 - b. Occupational HI: Use the facility location and the distance to the nearest worker to identify the risk.
 - c. Highest HI: Select the greater HI between the residential and occupational HIs (as identified above).

Please note the following when calculating risk values for perchloroethylene dry cleaning facilities:

- The perchloroethylene dry cleaning risk tables (Tables 2 thru 4) are based on perchloroethylene emissions of 10 gal/yr. Actual facility perchloroethylene emissions should be multiplied by the values contained in the perchloroethylene dry cleaning risk tables to calculate the appropriate facility risk.
- The AQMD maintains 35 meteorological stations as shown in Figure 1. If there are no meteorological stations in the city of the facility, the closest meteorological station to the facility should be used.
- The perchloroethylene dry cleaning risk tables (Tables 2 thru 4) are based on discrete downwind distances. If the actual downwind distance is not listed in the tables, then linear interpolation between distance cells is acceptable.

Example: A perchloroethylene dry cleaning facility submits the following information: 60 gal/yr perchloroethylene emitted, located in Costa Mesa, nearest

residential receptor 250 meters away, and nearest occupational receptor 25 meters away.

In this example the actual downwind distances are in the tables. However, if the actual downwind distances are not in the table, then linear interpolation between distance cells is acceptable to obtain cancer risks for the actual downwind distances.

1. Cancer Risk (CR):

- a. Residential CR: Using Table 2, the base residential cancer risk is 0.20 in one million (250 meters and Costa Mesa) for 10 gal/yr. Since the facility's perchloroethylene emission for this example is 60 gal/yr, the corresponding residential cancer risk is 1.20 in one million.

$$\text{Residential CR (DC)} = \frac{0.20 \text{ in one million}}{(10 \text{ gal/yr})} \times (60 \text{ gal/yr})$$

Residential CR (DC) = 1.2 in one million

- b. Occupational CR: Using Table 3, the base occupational cancer risk is 10.16 in one million (25 meters and Costa Mesa) for 10 gal/yr. Since the facility's perchloroethylene emission for this example is 60 gal/yr, the corresponding occupational cancer risk is 60.96 in one million.

$$\text{Occupational CR (DC)} = \frac{10.16 \text{ in one million}}{(10 \text{ gal/yr})} \times (60 \text{ gal/yr})$$

Occupational CR (DC) = 61.0 in one million

- c. MICR: The MICR for this perchloroethylene dry cleaner is **61.0** in one million (occupational receptor).

2. Hazard Index (HI):

- a. Residential HI: Using Table 4, the base residential CHI is 0.001 (250 meters and Costa Mesa) for 10 gal/yr. Since the facility's perchloroethylene emission for this example is 60 gal/yr, the corresponding chronic hazard index is 0.006.

$$\text{Residential CHI (DC)} = \frac{0.001}{(10 \text{ gal/yr})} \times (60 \text{ gal/yr})$$

Residential CHI (DC) = 0.006

- b. Occupational HI: Using Table 4, the base occupational CHI is 0.058 (25 meters and Costa Mesa) for 10 gal/yr. Since the facility's perchloroethylene emission for this example is 60 gal/yr, the corresponding chronic hazard index is 0.35.

$$\text{Occupational CHI (DC)} = \frac{0.058}{(10 \text{ gal/yr})} \times (60 \text{ gal/yr})$$

$$\text{Occupational CHI (DC)} = 0.35$$

- c. Highest HI: The **highest** chronic hazard index is **0.35** (occupational receptor).