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ACROSS NORTH AMERICA TRACER EXPERIMENT (ANATEX)
VOLUME III: SAMPLING AT TOWER AND REMOTE SITES

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Abstract. The Across North America Tracer Experiment (ANATEX) was designed to provide a comprehensive data base for assessing the performance of long-range transport and diffusion models. Three distinct perfluorocarbon tracers (PMCH, oPDCH, and PTCH) were released simultaneously for a 3-h duration every 2 1/2 days from 2 sites; PTCH from Glasgow, Montana, and oPDCH and PMCH (every fifth day) from St. Cloud, Minnesota for the 84-day period January 5, 1987 through March 29, 1987. Daily (24-h) average ground-level tracer measurements were taken at 77 "primary" sampling sites located about 500 to 3000 km from Glasgow. In addition, 6-h measurements were taken at the base and top of 5 tall towers (~200 m) and 24-h measurements were taken at the tower tops along the ANATEX 1600 km arc to investigate the vertical tracer distributions with respect to nearby ground-level sample collections. The ANATEX sampling program also included weekly average measurements at 12 "remote" sites in the western Atlantic, the west coast of Europe, and the west coast of North America to investigate very long-range plumes and hemispheric tracer background.

This report describes the experimental design of the sampling programs at the tower and remote sites, discusses the measured data and how they were analyzed and quality assured, summarizes data characteristics, discusses data use, and presents complete data tables for both tower and remote sites. The report also describes the characteristics, format, and accessibility of data sets created from the data analysis.

1. SAMPLING AT TOWER SITES

1.1 Introduction

Samplers were placed on 5 tall towers (~200 m) along the ANATEX 1600-km arc to investigate the vertical tracer distribution with respect to the primary site ground-level sample collections along the arc. Tower site locations (site #) are shown in Fig. 1-1 in relation to the 77 primary sites (+). The tower sites and sampler elevations are given in Table 1-1. Three samplers were installed at each site, one at the tower base (lower elevation in the table) taking 6-h samples, and two near the top (upper elevation), one taking 6-h samples and the other 24-h samples.

Samples were scheduled for 86 days starting January 5, 1987 and ending March 31, 1987. The 24-h samples at the tower top started at 15 GMT, closely corresponding (within one hour) to the timing of the primary site ground-level samples; the 6-h samples at the tower base and top started at 03, 09, 15, and 21 GMT. Thus, four sequential 6-h samples at the tower top starting 15 GMT could be compared directly to a 24-h sample at the tower top for purposes of data quality assurance.

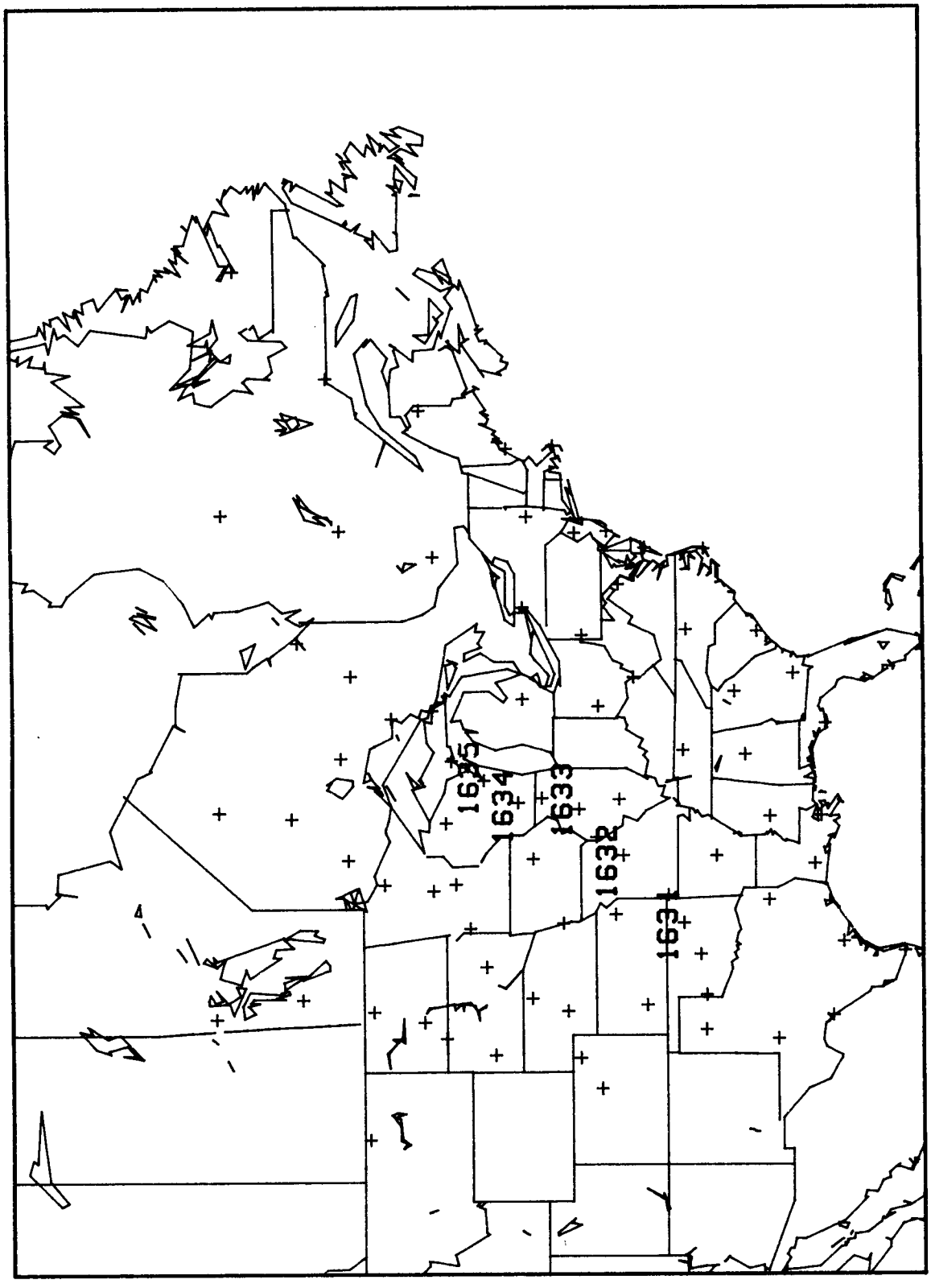

Figure 1-1. Tower site locations (site #) in relation to the 77 primary sites (+).

The tower sampling program had problems with data recovery. The percent of missing or unusable samples is given in Fig. 1-2 by site. Most unusable samples were attributed to flow rate problems. It is unfortunate that about 40% to 50% of the samples for sites 1631, 1632, and 1633 were either missing or unusable. Sampler malfunctions accounted for most of the missing data at sites 1631 and 1633, while a combination of sampler malfunction and operator unreliability plagued data collection at site 1632.

Table 1-1. ANATEX Tower Sites and Sampler Elevations

Site #	Site Name	State	Lat. °N	Lon. °W	Sampler Elevations m (msl)	
					(tower base)	
1631	Tulsa	OK	36.15	96.00	198	404
1632	Columbia	MO	38.77	92.55	246	450
1633	Peoria	IL	40.65	89.18	298	502
1634	Madison	WI	43.05	89.53	344	553
1635	Green Bay	WI	44.40	88.00	271	475

1.2 Sampling Systems

The perfluorocarbons used as tracers in ANATEX are extremely stable, non-toxic compounds, and are measurable at very low concentrations by gas chromatography and electron capture detection. Samples were collected in glass tubes packed with an adsorbent. A controlled stream of ambient air was drawn through each sample tube and the PFTs (along with other materials) were trapped. The sampling tubes were about 5 cm long and 4 mm in diameter. The center third of the tubes were packed with Ambersorb, a material which readily traps the PFTs. The tracer was recovered from a sampling tube by thermal desorption prior to chromatographic separation and electron capture counting.

The sampling systems used at the tower sites and at the remote locations were generally similar to one another. The tower samplers were an adaptation of Environmental Measurement, Inc., AQS-III samplers. To meet the requirements of the ANATEX program it was necessary to make modifications to the samplers. The modified samplers consisted of an easy to carry aluminum instrument case that looked like a briefcase. The sampler instrument cases were aluminum models manufactured by zero-Haliburton. The case was 21"x14"x7" with a suitcase handle on top, water tight o-ring gasket and a security lock. Inside of the case the sampler, battery and battery charger were held in place by special hinged brackets and protected during shipping and field use with form fitting foam pads.

Modifications were made to place sample tubes on the intake side of the 12 air pumps. The inlets to the EMI pumps were routed through the top of the sampler chassis and equipped with air tight fittings that slipped inside the sample tubes. On the inlet end of the tubes another fitting slipped inside

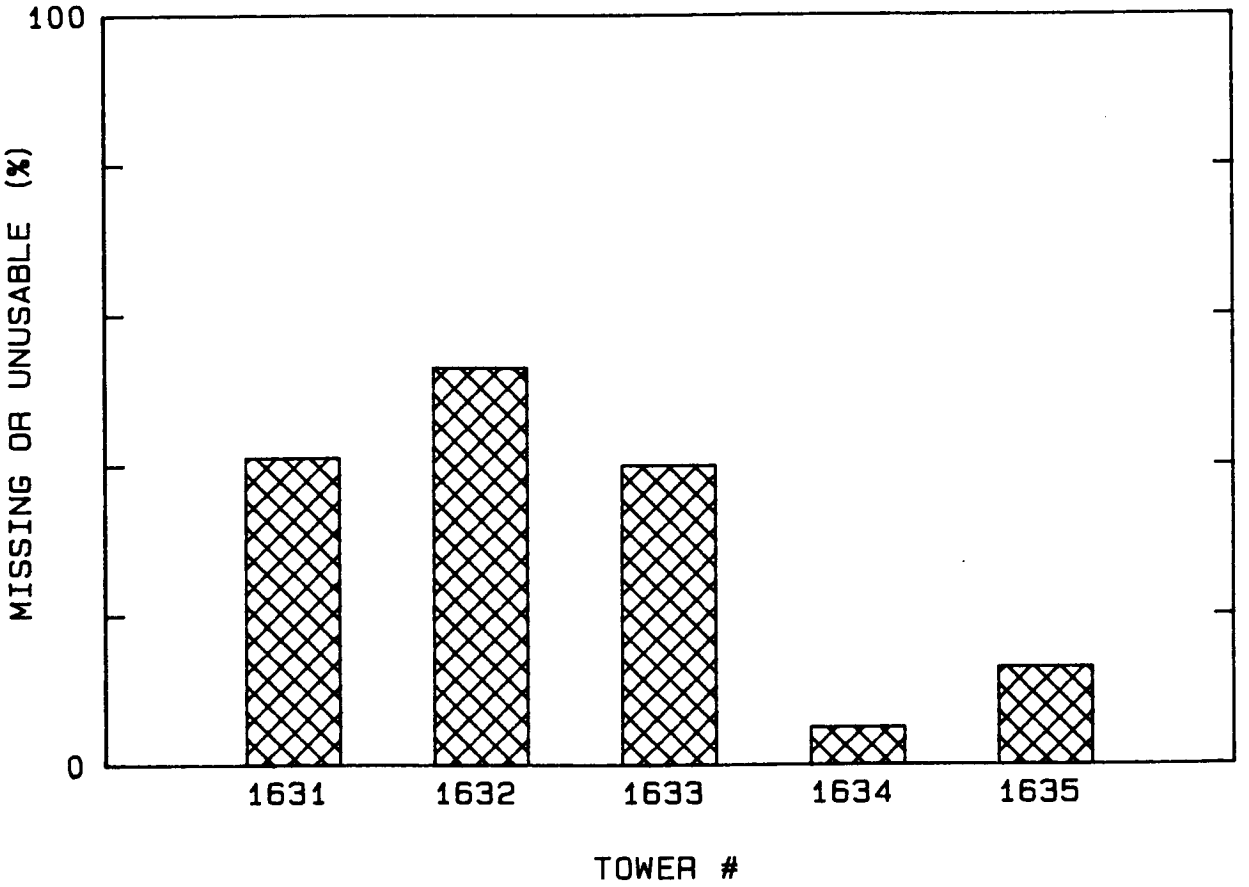

Figure 1-2. Percent of missing or unusable samples by tower site.

the tubes, connected to a one-way valve and then into a common manifold for all sample tubes. The inlet for that common manifold extended into the ambient air.

Heaters and thermostats were mounted inside each sampler to keep the internal temperature in the 60 to 70 degree F range. Regulating the temperature helped reduce variations in the pumping rates, and even more important, helped keep the pumps from quitting at below freezing temperatures.

Because of the internal heaters and the battery charger, 120 volt AC power was required to operate the samplers. Power was brought into the samplers via a 6 foot power cord extending from the base of the instrument case. Total power required to operate the sampler heater and battery charger was 35 volt-amperes, with the sampler operating. Towers were therefore required to install AC power with ground fault interrupt breakers to protect sampler operators.

Sample strings about 18 inches Long, with slots for the 12 sample tubes, were manufactured to hold the tubes, keep them in order and ensure correct installation by the sampler operator. Inventory preparations and audit tracking of laboratory analysis work were also simplified by using the sample tube strings with unique barcode labels.

For tower sampling, design modifications were made to the pump control circuitry to simplify field operation. The modifications disabled operator switch settings and preset circuits and fixed the operation of the pumps at 6 (24) hours per sampling tube. The only operator action required to start sampling was to turn on the power switch. At the end of each 6 (24) hour sampling period, the sampler automatically sequenced to the next pump/sample tube.

Prior to shipping and field usage each sampler was calibrated and checked for leaks. Calibration was made by averaging flow over a one minute period with 12 accumulated pump flow readings. A bubble type flow meter was used to ensure no leakage and very low flow restriction. Leakage in or around the pump was checked by pressurizing both the inlet and outlet ports of the pumps and visual inspection for air flow. Pumps with leaks were sealed with GE silicone seal or replaced with new pumps.

For remote sampling sites, the sampling units were similar in function to the tower samplers but differed in detail. The samplers were adjusted to collect air samples over 7 days for each tube. Each sampler contained only one sampling pump. At the end of the 7-day period the operator was required to change the tube connected to the sampling pump. The completed sample was removed and sealed with the standard end-caps provided with the adsorbent tubes. A new tube was connected to the pump inlet flow path and the operator manually started the sampler for the next 7-day period.

For the remote sampling sites a single string of sampling tubes was used for the entire ANATEX program. For the tower sites the sample tube strings were serviced every 3 days (12 days) for 6-hour (24-hour) samplers. All strings of sampling tubes were returned to Idaho Falls at the completion of

sampling. The samples were inventoried, sorted, and distributed to the analysis laboratories following their return from the field.

1.3 Measured Volumes and Concentrations

Three perfluorocarbons, PMCH, oPDCH, and PTCH were released as tracers. Air samples were analyzed for these and three additional perfluorcarbons, PMCP, mPDCH, and pPDCH as references. Initial inspection of the analyses revealed that many tower samples contained higher than expected levels of mPDCH (contamination), a perfluorocarbon that was often used in previous tracer experiments. The source of the contamination has been attributed to air pumps connected to individual sampling tubes. Hence contamination levels were influenced by sampling tube position (pump number), exposure duration, and airflow. Unfortunately, small fractions of PMCH and oPDCH accompanied the contaminated mPDCH. PTCH released from GGW was unaffected.

1.3.1 oPDCH

It is possible to correct the samples individually for contamination levels because the PDCH isomers (oPDCH, mPDCH, pPDCH) are in different proportions to each other in contaminated samples, pure ANATEX tracer, and in ambient background air. An analyzed air sample will contain a mix of these ratios in fixed proportion to the level of contamination, amount of plume present, and sampled air volume. In order to calculate an excess concentration of oPDCH from the contaminated measurement, a special procedure had to be employed to find the amount of contaminant present, and then eliminate it in the calculation. This procedure is explained below.

The total measured tracer volume M resulting from the GC analysis is composed of the following elements:

$$M = B + T + C$$

where B, T, and C are the volumes due to ambient background, tracer released, and any contaminant present, respectively. Since $B = \beta A$, where β is a known background concentration and A is the sample air volume,

$$M = \beta A + T + C$$

Since oPDCH is one of three isomers of PDCH released simultaneously, the following set of simultaneous equations can be written:

$$M_o = \beta_o A + T_o + C_o \quad \text{for oPDCH} \tag{1}$$

$$M_m = \beta_m A + T_m + C_m \quad \text{for mPDCH} \tag{2}$$

$$M_p = \beta_p A + T_p + C_p \quad \text{for pPDCH} \tag{3}$$

where $\beta_o = 0.4$ femtoliters per liter (fL/L), $\beta_m = 13.0$ fL/L, and $\beta_p = 4.0$ fL/L were obtained from the primary site ground-level samples (Table 6-1, Draxler and Heffter, 1989).

Because the PDCH isomers were always released in the same ratio and these ratios were different from those in contaminated samples, the following ratios and their corresponding values apply:

$$C_{mo} = C_m/C_o = 10.0 \quad (4)$$

$$C_{mp} = C_m/C_p = 15.0 \quad (5)$$

$$T_{om} = T_o/T_m = 4.23 \quad (6)$$

$$T_{op} = T_o/T_p = 107.0 \quad (7)$$

The contamination ratio values for Eqs. 4 and 5 were estimated from scatter diagrams of mPDCH versus oPDCH (Fig. 1-3) and mPDCH versus pPDCH (Fig. 1-4), respectively in tubes where no ambient air was sampled. Therefore, these values truly represent contamination. The numbers (and letters, when applicable; A = 10, etc.) in these diagrams and those that follow are frequencies, that is, they depict the number of comparison occurrences. The slashed diagonal line indicates the one-to-one correspondence line. The solid diagonal line is a reasonable fit to the data point pairs, and its distance from the one-to-one line is a measure of the ratios C_{mo} (Fig. 1-3) and C_{mp} (Fig. 1-4). The ratio values for Eqs. 6 and 7 were taken from analyses of pure tracer (G. Senum, Brookhaven National Laboratory, private communication).

The contamination is also reflected in ambient air samples (measured air volume greater than 0) as shown in Figs. 1-5 and 1-6. For a more complete understanding of the measured volumes, these figures also include the apparent best-fit lines for background ratios ($B_{mo} = \beta_m/\beta_o = 13.0/0.4 = 32.5$, $B_{mp} = \beta_m/\beta_p = 13.0/4.0 = 3.25$) and tracer ratios ($T_{mo} = T_m/T_o = 0.236$ (see Eq. 6), $T_{mp} = T_m/T_p = 25.3$ (see Eqs. 6 and 7)). The scatter about the three lines represents how the ratios vary due to various amounts of released tracer, background, and contamination in each sample. Since each has a unique ratio, the exact amount of all three unknowns can be determined analytically.

Equations 1 through 7 were solved for the 7 unknown volumes A, T_o, T_m, T_p, C_o, C_m, and C_p. Specifically, A and T_o must be determined for calculating an uncontaminated excess oPDCH concentration, X_{PD}. (It should be noted that values reported for A from the laboratories were found to contain large uncertainties (Draxler and Heffter, 1989) and therefore, not used.) The solution gives:

$$A = (F_2\ F_3 + M_m - C_{mp}\ M_p)/(F_1\ F_3 + \beta_m - C_{mp}\ \beta_p)$$

$$T_o = T_{om}\ (F_2 - F_1\ A), \text{ and}$$

$$X_{PD} = T_o/A \quad (8)$$

where $F_1 = \beta_o/T_{op} - \beta_m/(T_{op}\ C_{mo})$

$$F_2 = M_o/T_{op} - M_m/(T_{op}\ C_{mo})$$

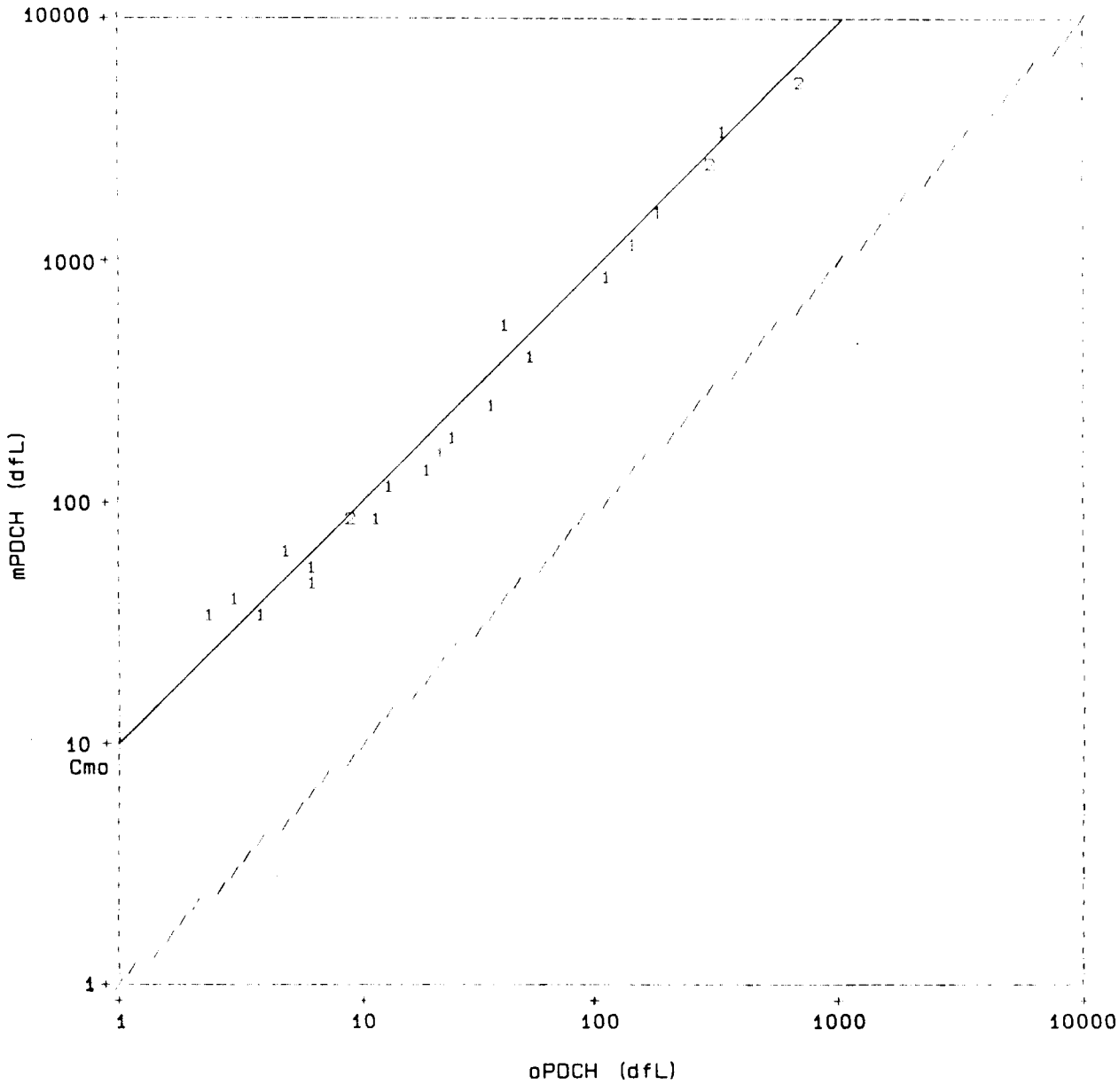

Figure 1-3. mPDCH volumes versus oPDCH volumes for (contaminated) tower samples with air volumes reported as 0. The slashed diagonal line is the one-to-one correspondence line and the numbers (and letters A=10, etc. in subsequent figures) represent frequencies of paired values. The contamination ratio C_{mo} is determined from the solid diagonal line drawn as a reasonable fit to the plotted frequencies.

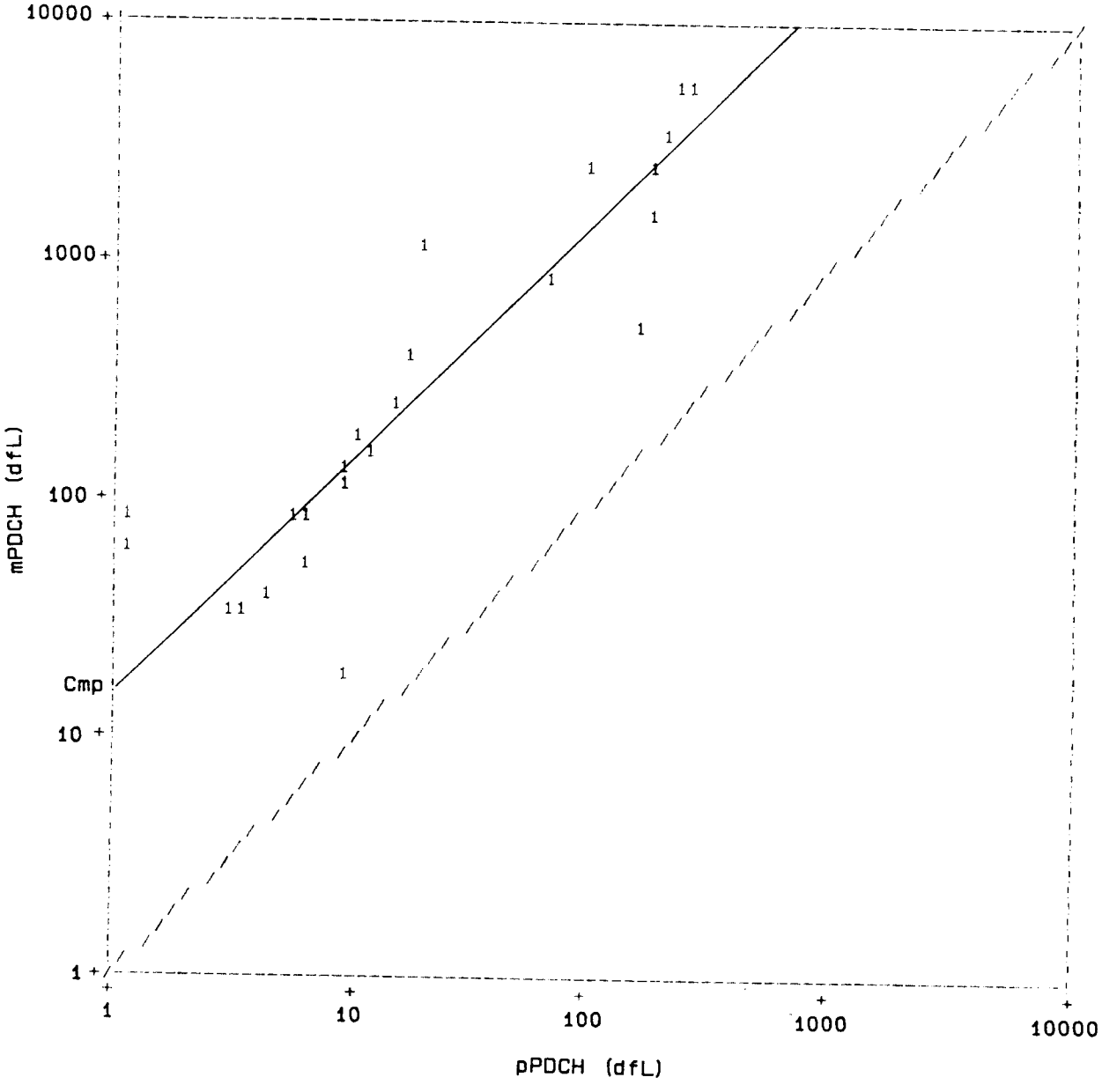

Figure 1-4. Same as Fig. 1-3 for mPDCH versus pPDCH.

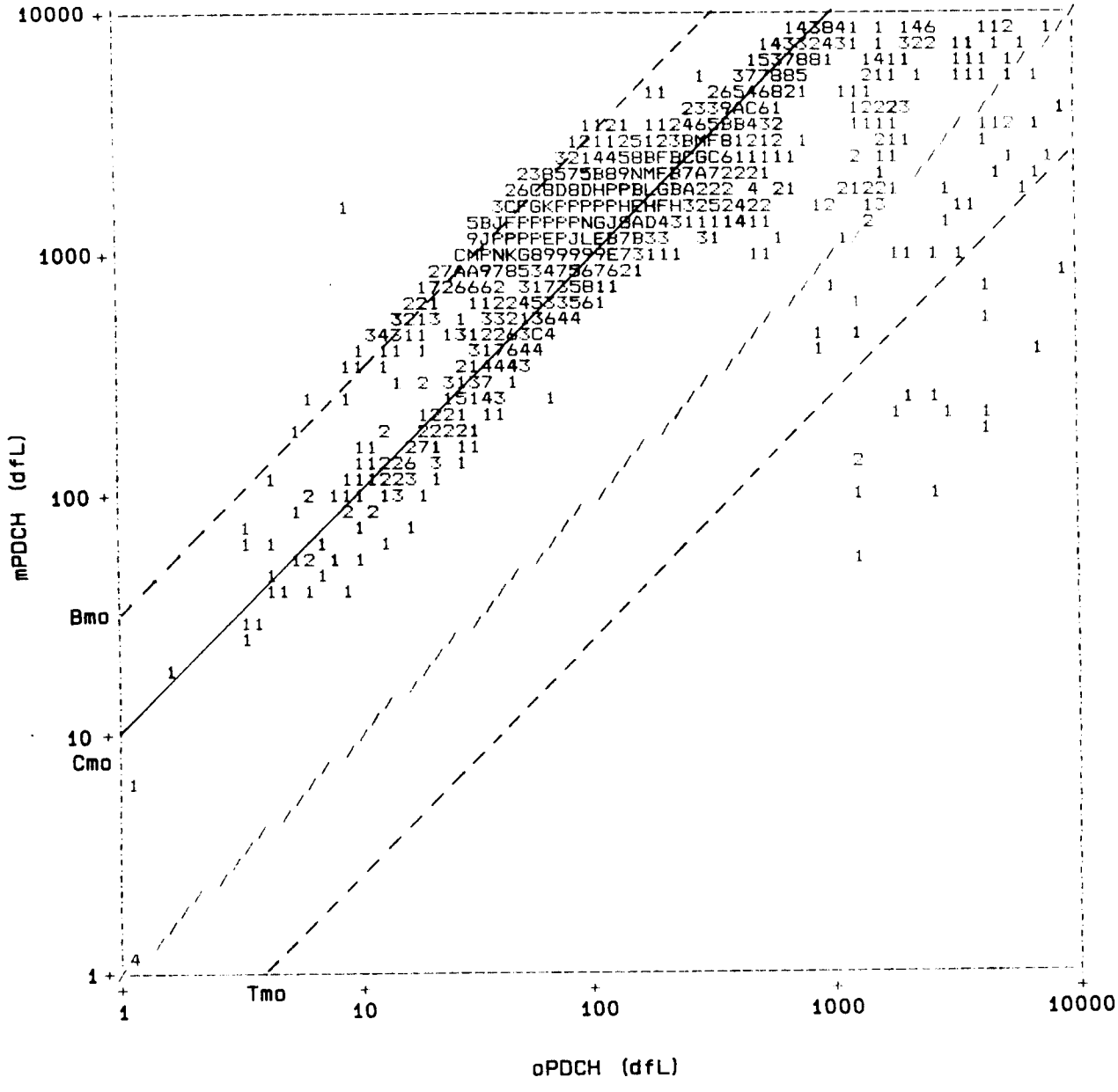

Figure 1-5. Same as Fig. 1-3 for all tower samples. Included are background ratio B_{mo} and tracer ratio T_{mo} dashed diagonal lines.

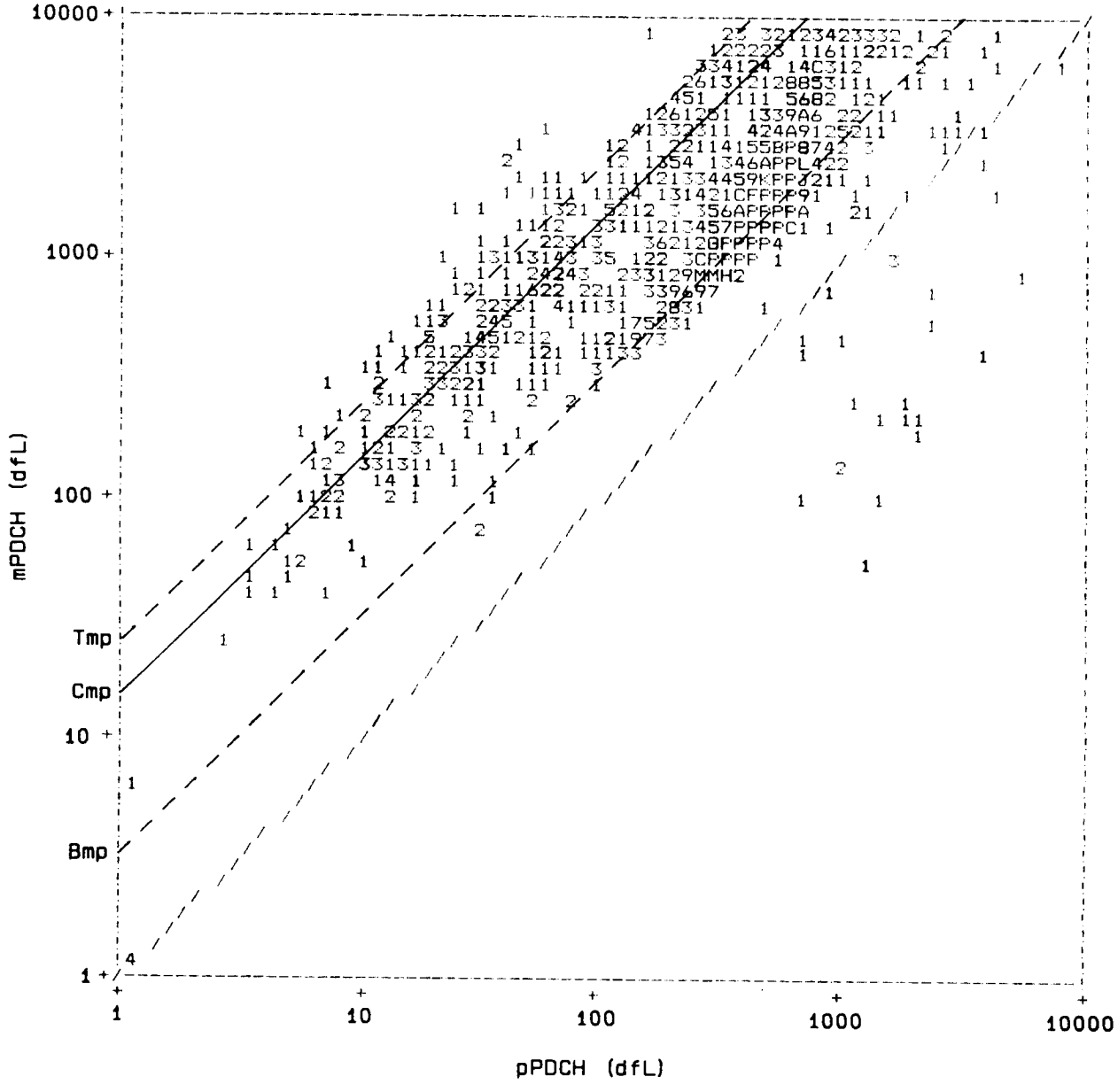

Figure 1-6. Same as Fig. 1-5 for mPDCH versus pPDCH.

$$F_3 = C_{mp} - T_{op}/T_{om}.$$

For data quality assurance purposes, a useful quantity to determine was the ratio of the calculated contaminated volume to the calculated tracer volume, C_o/T_o where

$$C_o = M_o - T_{op}(F_2 - F_1A) - \beta_oA.$$

If C_o/T_o was large, the sample was dominated by contaminate and the calculated excess, X_{PD} (Eq. 8), is probably more uncertain than small C_o/T_o. This quantity will, therefore, be used as a measure of calculation uncertainty.

The analytic procedure used to remove contamination as described by Eqs. 1 to 7 was tested numerically by generating a random log-normal distribution of tracer volumes (oPDCH, mPDCH, pPDCH) to reflect the laboratory analyses. These tracer volumes were then randomly perturbed to account for sample air volume variations of 20 L about a mean of 72 L and with random oPDCH contamination levels uniformly distributed between 0 and 200 fL. The output of the equation set compared with the input, shown in Fig. 1-7a, clearly demonstrates how well this methodology works.

A complicating factor is laboratory analysis uncertainty. That is, the three isomers of PDCH may not be in the correct ratios due to random variations in the GC analysis. This influence was first tested by perturbing the random tracer volume data by a 25% random variation on each isomer, assuming no contamination. This result is shown in Fig. 1-7b with the 25% uncertainty propagated through the equations and with higher uncertainties evidence at lower concentrations.

When contamination and analysis uncertainty are considered, the result, a combination of Figs. 1-7a and 1-7b is shown in Fig. 1-7c. At higher concentrations the residual uncertainty is similar to the analysis uncertainty. However, at low concentrations considerably greater variations are present and, in fact, the results are biased slightly toward the equation set not being able to account for all the contamination. These variations are often referred to in the following discussions.

1.3.2 PMCH

A similar technique was used to calculate an uncontaminated excess PMCH concentration, X_{PM}. From the ground-level samples, $\beta_P = 3.6$ fL/L, and the ratio $C_{mP} = C_m/C_P = 17.0$ was determined from scatter diagrams in the same manner as described earlier. It should be noted that the value of this ratio is far more uncertain than the other ratio values because of the greater degree of scatter in the C_{mp} ratio. Using C_m from the solution of Equations 1 through 7,

$$C_P = C_m/C_{mP}.$$

Therefore, the calculated uncontaminated volume equals the contaminated measured volume M_P minus the contamination C_P, and thus

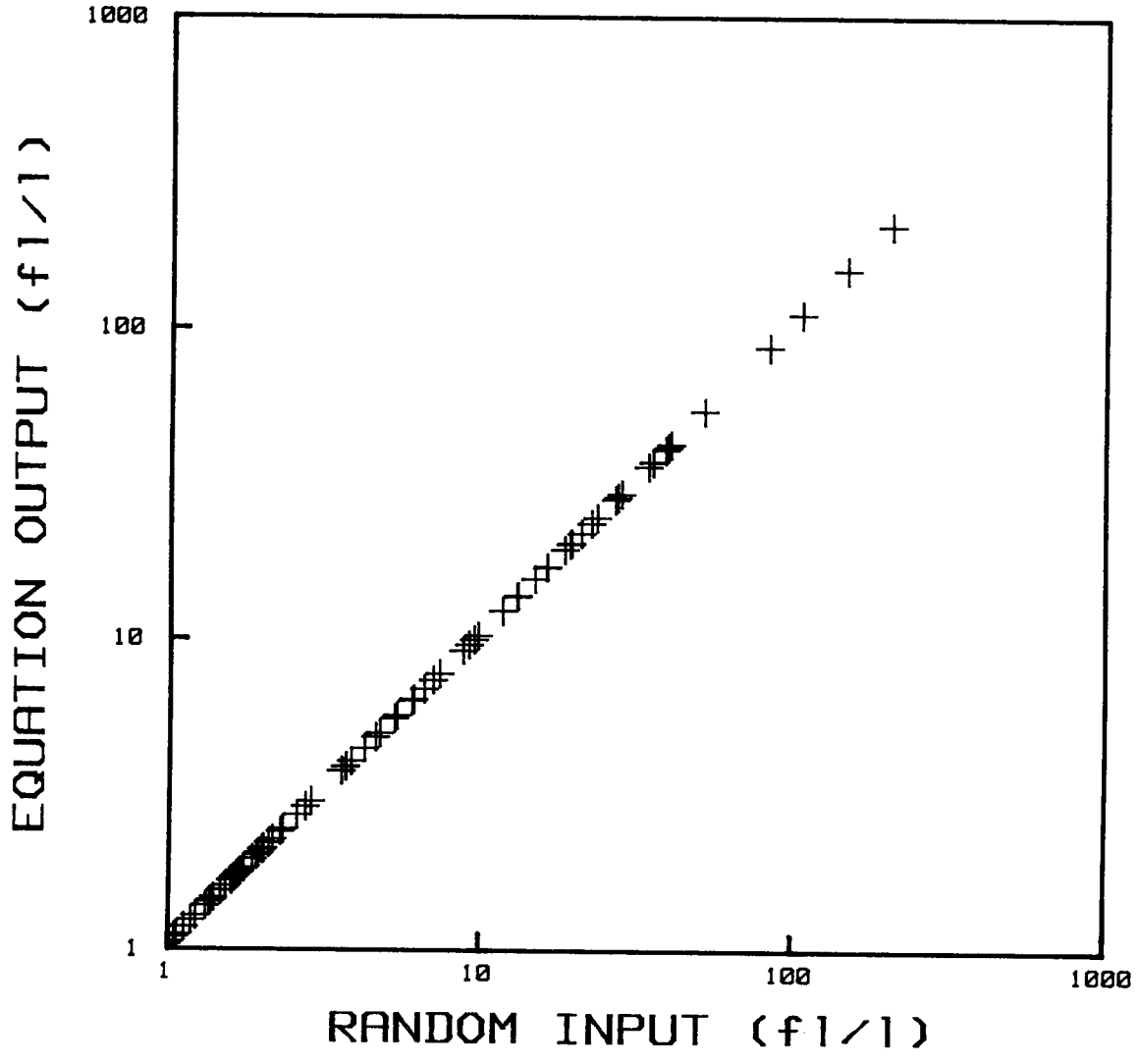

Figure 1-7a. Excess tracer concentration for oPDCH with no analysis uncertainty; oPDCH contamination from 0-200 fL; and flow uncertainty of 72L $\pm$ 20L.

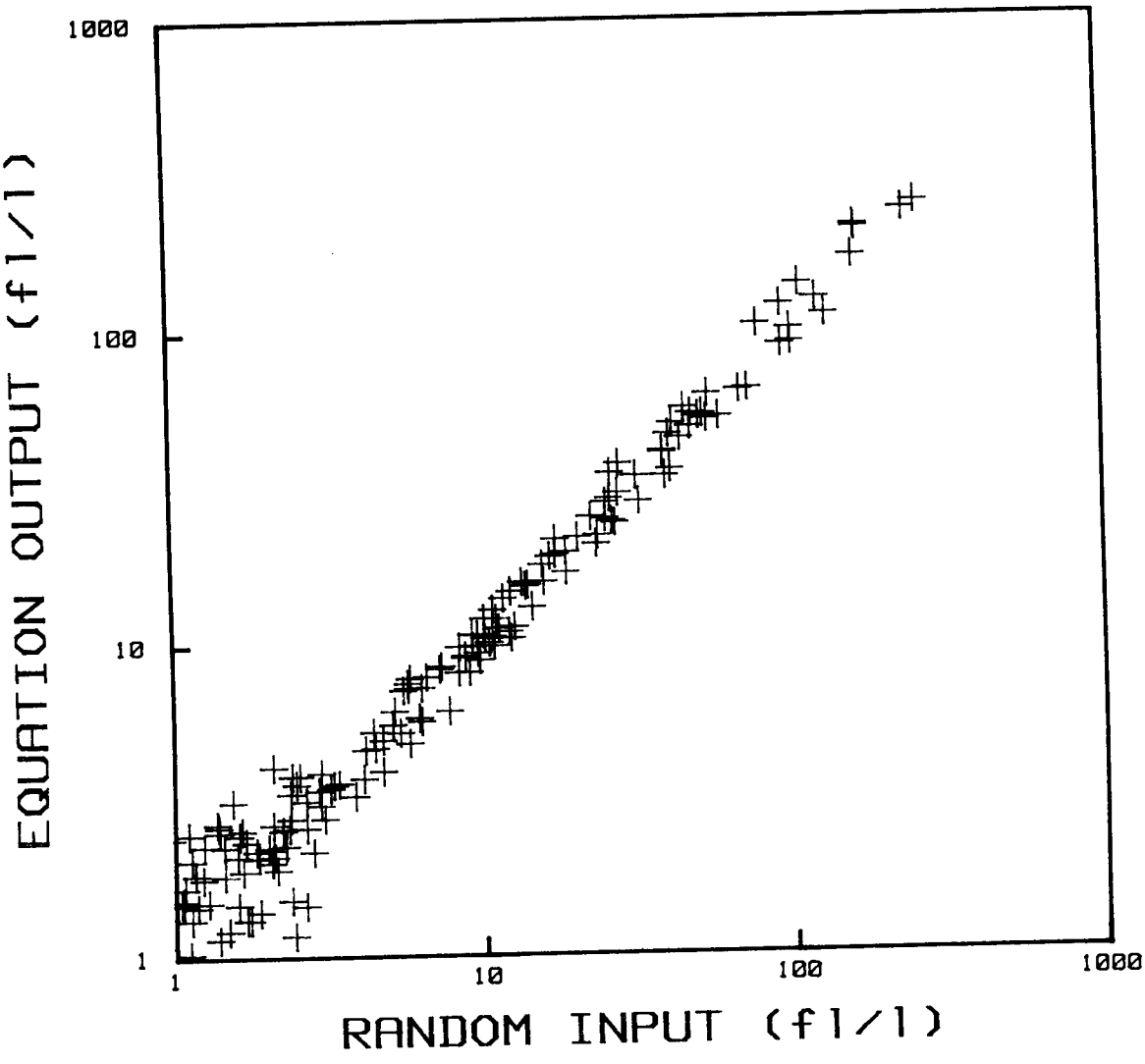

Figure 1-7b. As in Fig. 1-7a except with no contamination and analysis uncertainty of 25%.

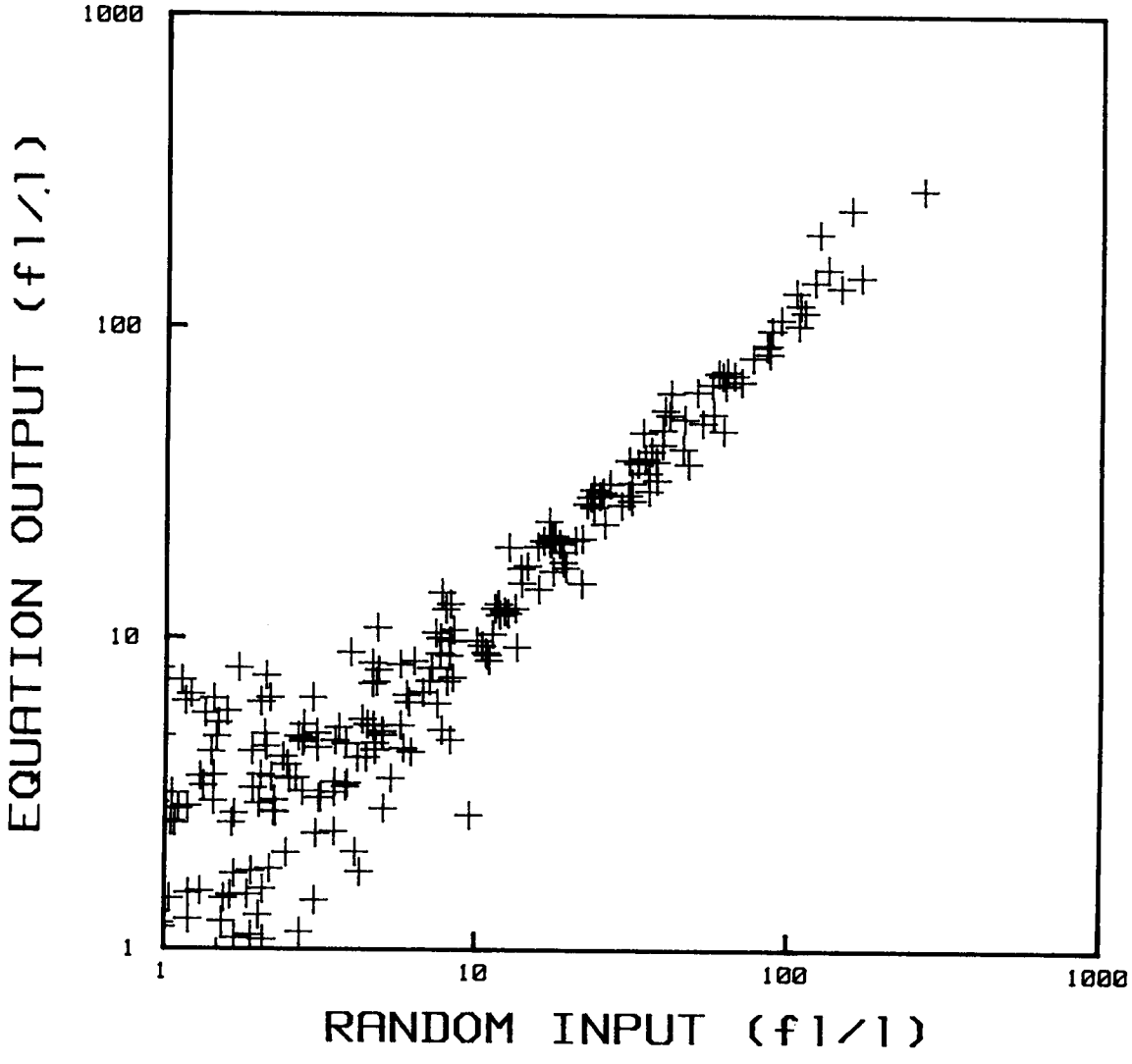

Figure 1-7c. As in Fig. 1-7a except with analysis uncertainty of 25%.

$$X_{PM} = (M_P - C_P)/A - \beta_P. \quad (9)$$

1.3.3 PTCH

Since no contamination was detected in the PTCH measurements, the PTCH excess concentration X_{PT} was calculated in a straight-forward manner as:

$$X_{PT} = T_{PT}/A - \beta_{PT}$$

where T_{PT} is the measured PTCH volume and β_{PT} = .6 fL/L is the PTCH background concentration.

1.4 Calculated Excess Concentration Discussion

1.4.1 oPDCH

Two types of diagrams are frequently used in these sections to describe and compare data; chronologic and scatter. The chronologic diagrams present the data as it was calculated, without any quality assurance interventions. The scatter diagrams, however, reflect the ratio C_o/T_o defined in the previous section (i.e., the ratio of contaminated to tracer volume) by screening out values with reasonably high ratios and thus making a comparison more meaningful.

A distribution of these ratios versus oPDCH tracer excess concentration is shown in Fig. 1-8. A cutoff ratio of 5 (horizontal dashed line) was selected above which concentration values are not presented for comparison in the diagrams that follow. This screens out mostly low excess concentrations (< 5 dfL/L) and a very few (about 8) higher ones which may well be questionable. It should be emphasized that this cutoff value is only used in the comparison presentations. The user may choose any value for incorporation into a working data set.

The ANATEX calculated oPDCH 6-h excess concentrations are shown in Figs. 1-9 and 1-10 chronologically, by tower site, for the tower base and top, respectively. In these figures, an excess concentration of 0 is depicted as a very small tick to distinguish it from a missing value. Also, an upper cut-off of 25 dfL/L was used; one that is well into a tracer plume characterization. One of the most noticeable features is an apparent "baseline" phenomenon at 4 to 5 dfL/L (in particular, see Fig. 1-10, site 1634). Since a background concentration has already been removed in determining the excess, this phenomenon is most likely attributed to uncertainties in both the calculations and the analysis. Thus, it should be emphasized that a tower oPDCH excess concentration from about 1 to 5 dfL/L does not unconditionally indicate the presence of tracer plume. Analysis of nearby values in time and space must be applied when interpreting the lower calculated excess concentrations. A comparison of the 6-h oPDCH excess concentrations at the tower base and top is shown in Fig. 1-11. (Note that frequencies plotted just within the horizontal and vertical axes represent values of 0 or 1.) There is no reason to assume, a-priori, that values must directly correspond (i.e., fall on the diagonal one-to-one correspondence line), since concentration differences in the vertical are expected with

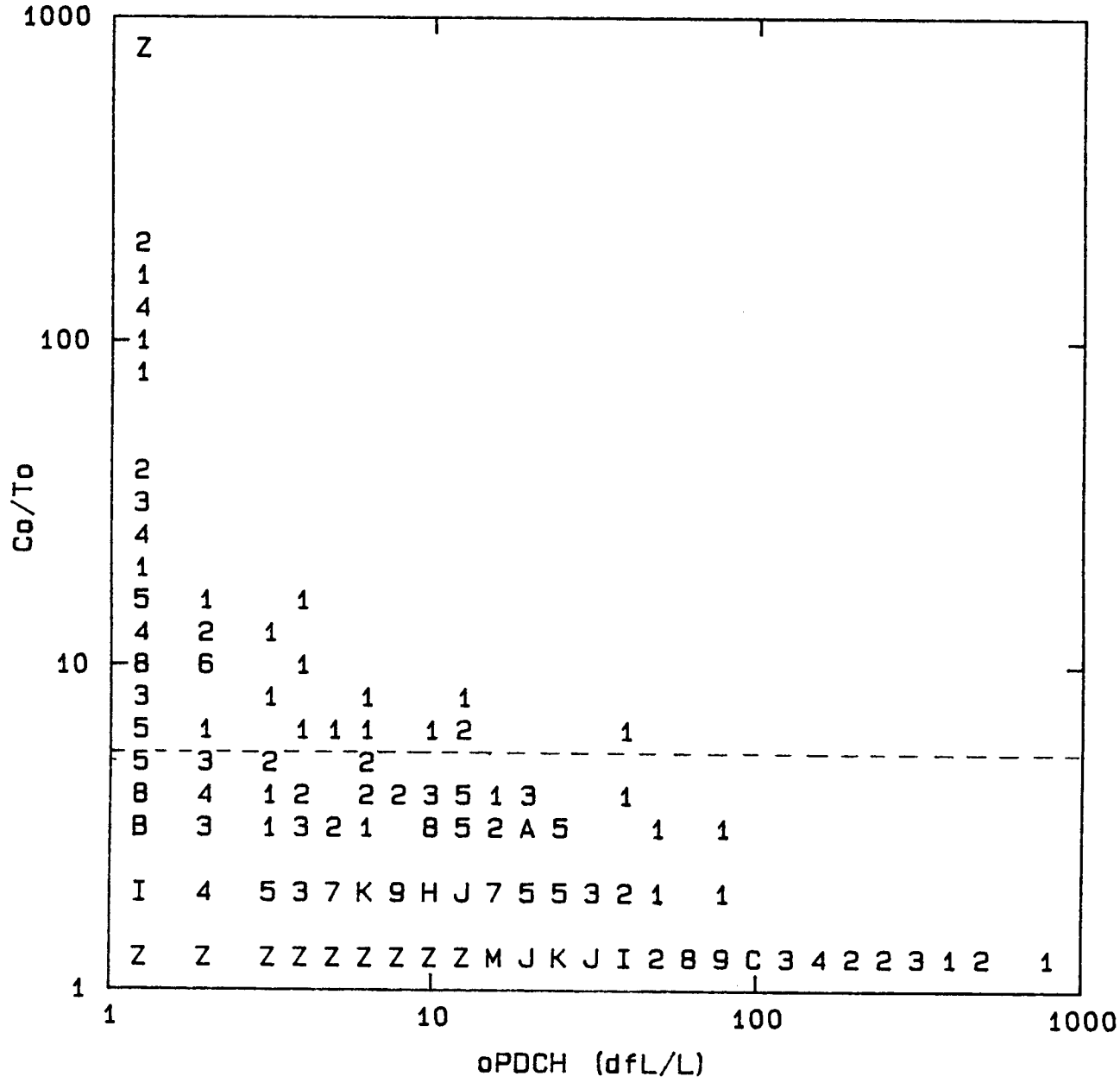

Figure 1-8. C_o/T_o ratio versus calculated oPDCH excess concentration. Concentrations are not presented in subsequent comparison diagrams if the C_o/T_o ratio is above the horizontal dashed line.

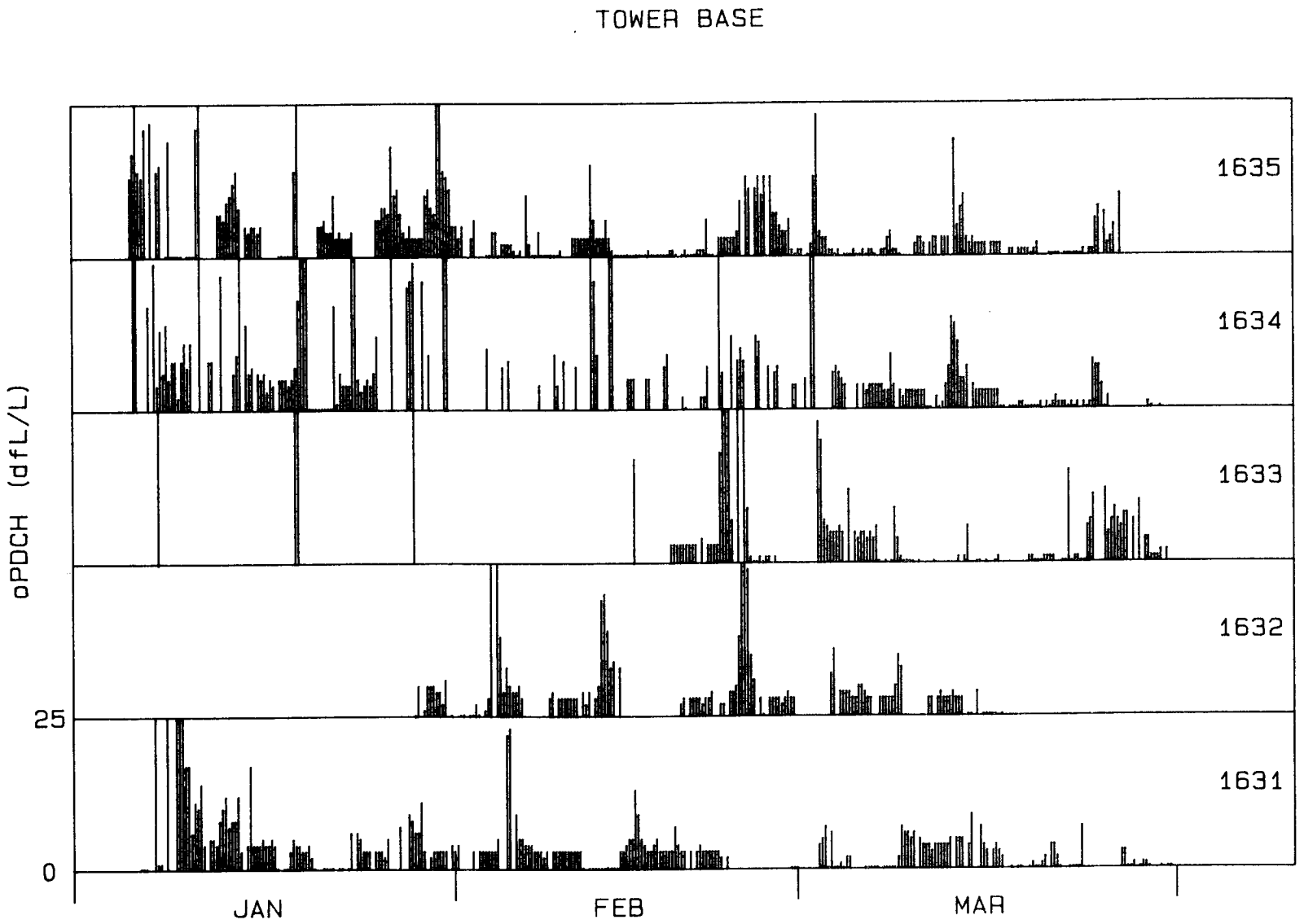

Figure 1-9. Calculated oPDCH 6-h excess concentrations at the tower base for January through March 1987, for the five ANATEX tower sites. 0 concentration is depicted as a very small tick to distinguish it from a missing value. An upper cut-off of 25 dfL/L is used.

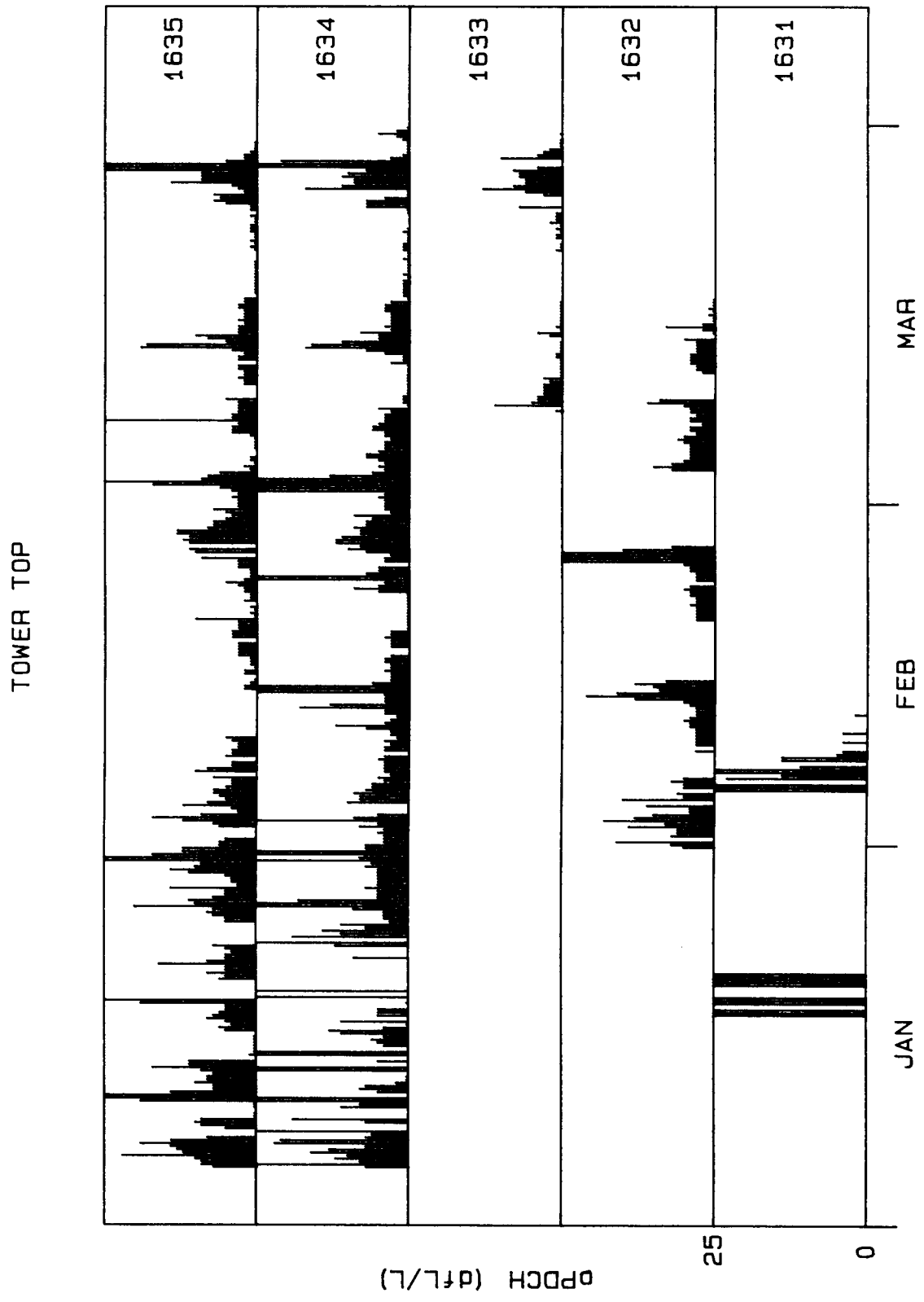

Figure 1-10. Same as Fig. 1-9 for the tower top.

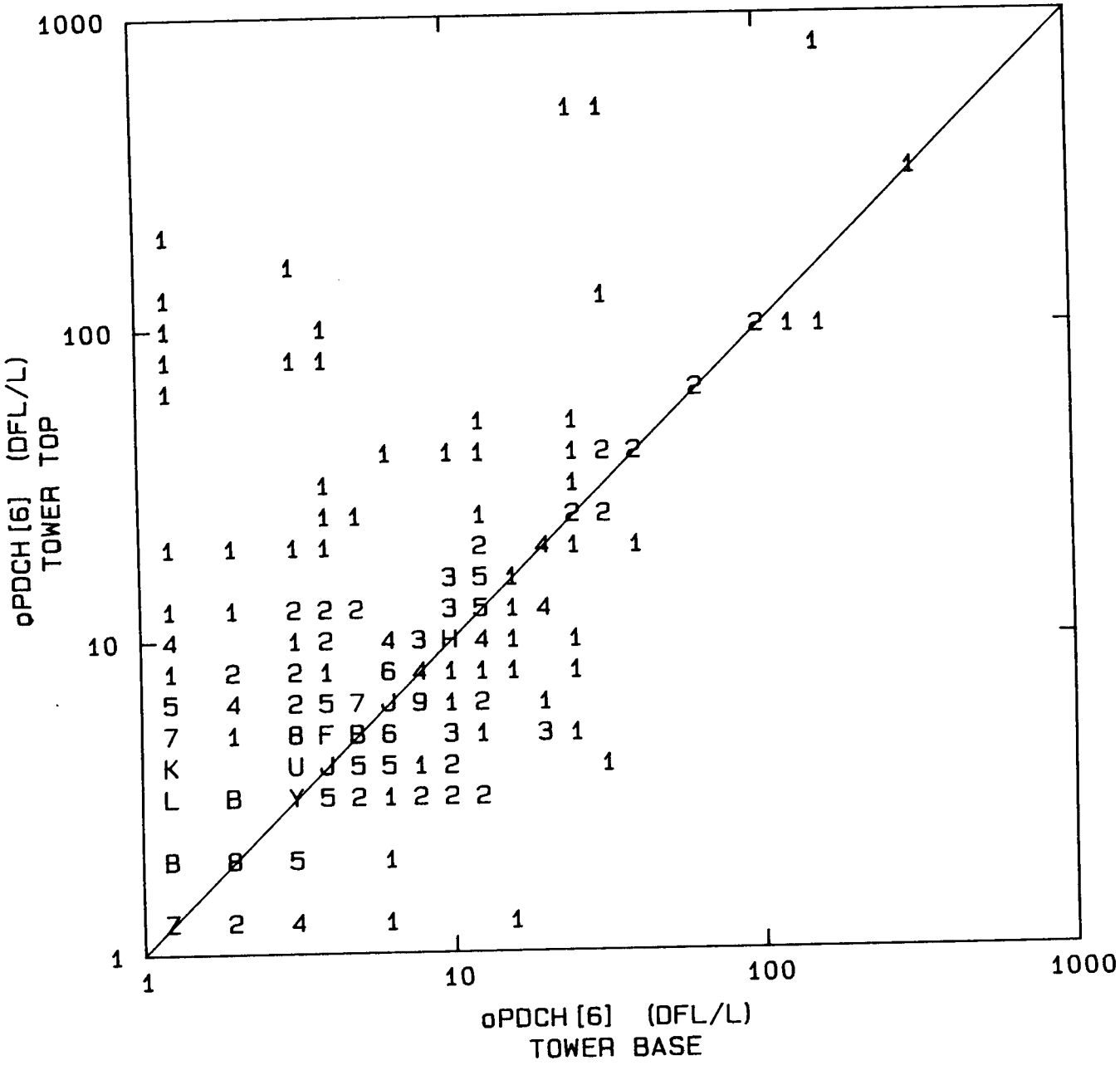

Figure 1-11. Comparison of 6-h oPDCH excess concentrations at the tower base and top.

varying atmospheric stability and mixing conditions. The figure does, however, indicate a fair degree of vertical correspondence, with a slight indication of "overriding", that is, higher concentrations at the top level and significant plumes at the top level only (frequencies above 10 dfL/L near the vertical axis).

It is of interest to compare tower base excess concentrations with those at each nearby primary ground-level sampling site. Fig. 1-12 shows, chronologically, the 24-h average excess values by primary site (see Table A-2, Draxler and Heffter, 1989), and Fig. 1-13 compares those values with four 6-h tower base values, averaged for a 24-h time interval equivalent to the primary site sampling period. An average tower base value is depicted only if all four 6-h values were available for averaging. The higher values in general compare favorably. It should be noted that the figure shows a number of plumes present at the tower sites that are not detected at the primary sites (represented by tower frequencies above about 5 dfL/L near the horizontal axis). This is certainly feasible since the primary and tower sites were not precisely co-located and tower bases were considerably higher than the nearby primary sites (45 to 98 m for the 3 northern most towers at which most of the usable data were obtained).

One definitive test of tower-data quality, anticipated in planning the tower sampling program, compared the side-by-side 6-h and 24-h measurements at the tower top. Fig. 1-14 shows, chronologically, the 24-h excess oPDCH values by tower sampling site. It should be noted that most of the samples started at 15 GMT each day, but many varied by as much as 6-hours. A comparison of these 24-h values versus four 6-h tower top values averaged over the corresponding 24-h interval is shown in Fig. 1-15. This is the one absolute comparison that reflects the tower data quality. Once again, all four 6-h values were required for inclusion (including averages with only three 6-h values did not in any way change results). Data without uncertainties would fall along the one-to-one correspondence line. The data, with the exception of 3 significant outliers, seem to compare reasonably, with a bias toward slightly higher 24-h values which might be due to the difference between the sample air volumes. The two outliers above the averaged oPDCH [6] value of 100 dfL/L are from two consecutive 6-h samples at site 1634 starting January 31, 09 GMT and 15 GMT, thus spread over two 24-h averaging periods. Since the associated tower base samples were 26 and 34 dfL/L, respectively, much more in line with the oPDCH [24] values, these 6-h samples seem suspect. The third outlier at oPDCH [6] = 3 and oPDCH [24] = 31 was from site 1632 starting February 21 at 15 GMT. The consistency of the four 6-h samples used in the average seems to indicate that the 24-h sample is suspect. In summary, if this subset of the data is representative, only about 5% of the calculated oPDCH values (given $C_o/T_o \leq 5$) may be suspect.

1.4.2 PMCH

The tower PMCH data presented problems that, at this time, have not been rectified. This is seen in Fig. 1-16 which compares PMCH versus oPDCH. The comparisons should be near the one-to-one correspondence line, since about equal amounts of PMCH were released with the oPDCH during daytime releases from St. Cloud, MN, or below the line, since PMCH was not used in nighttime

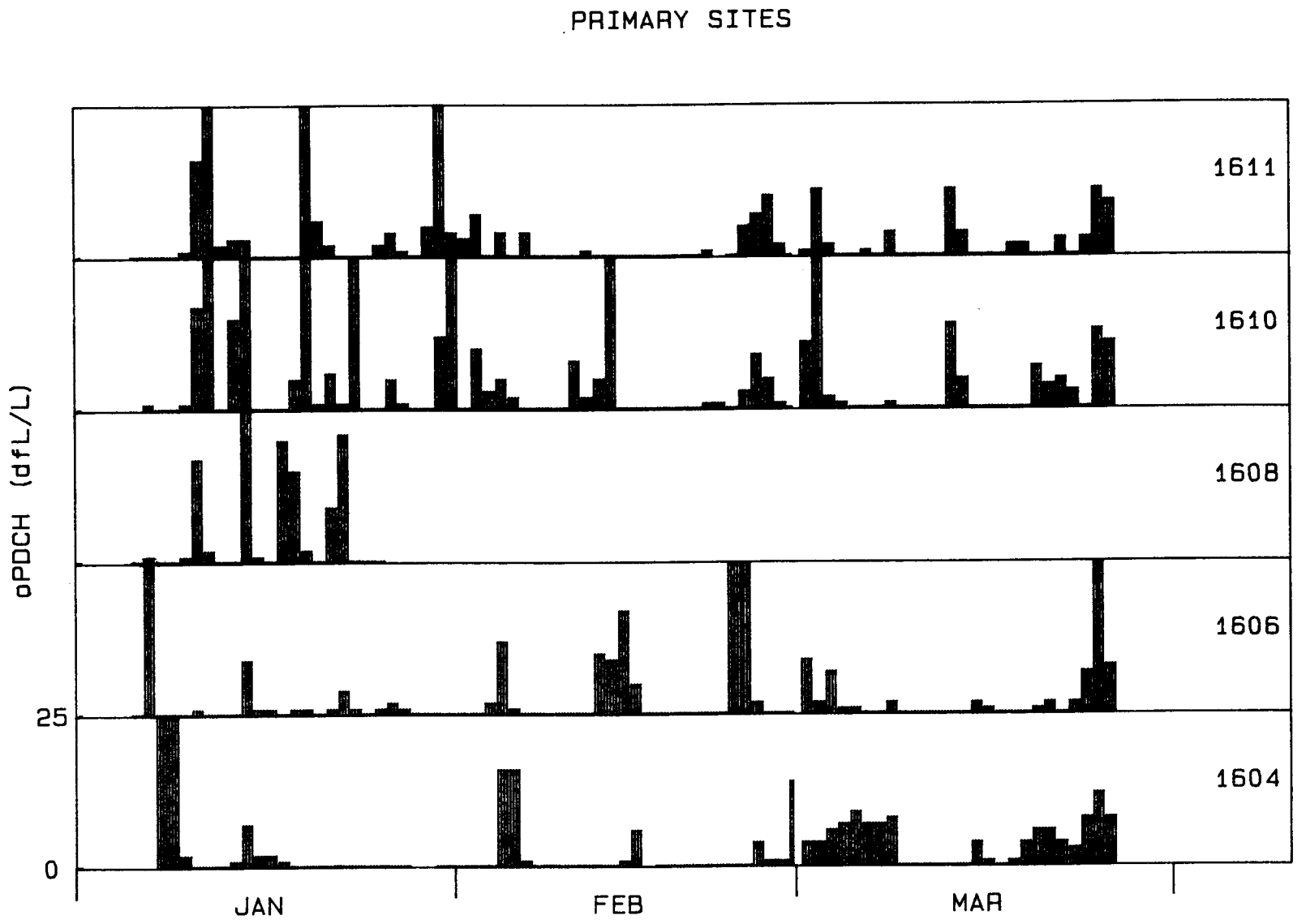

Figure 1-12. Same as Fig. 1-9 for 24-h oPDCH excess concentrations at the nearby ANATEX primary sites (site # shown at right).

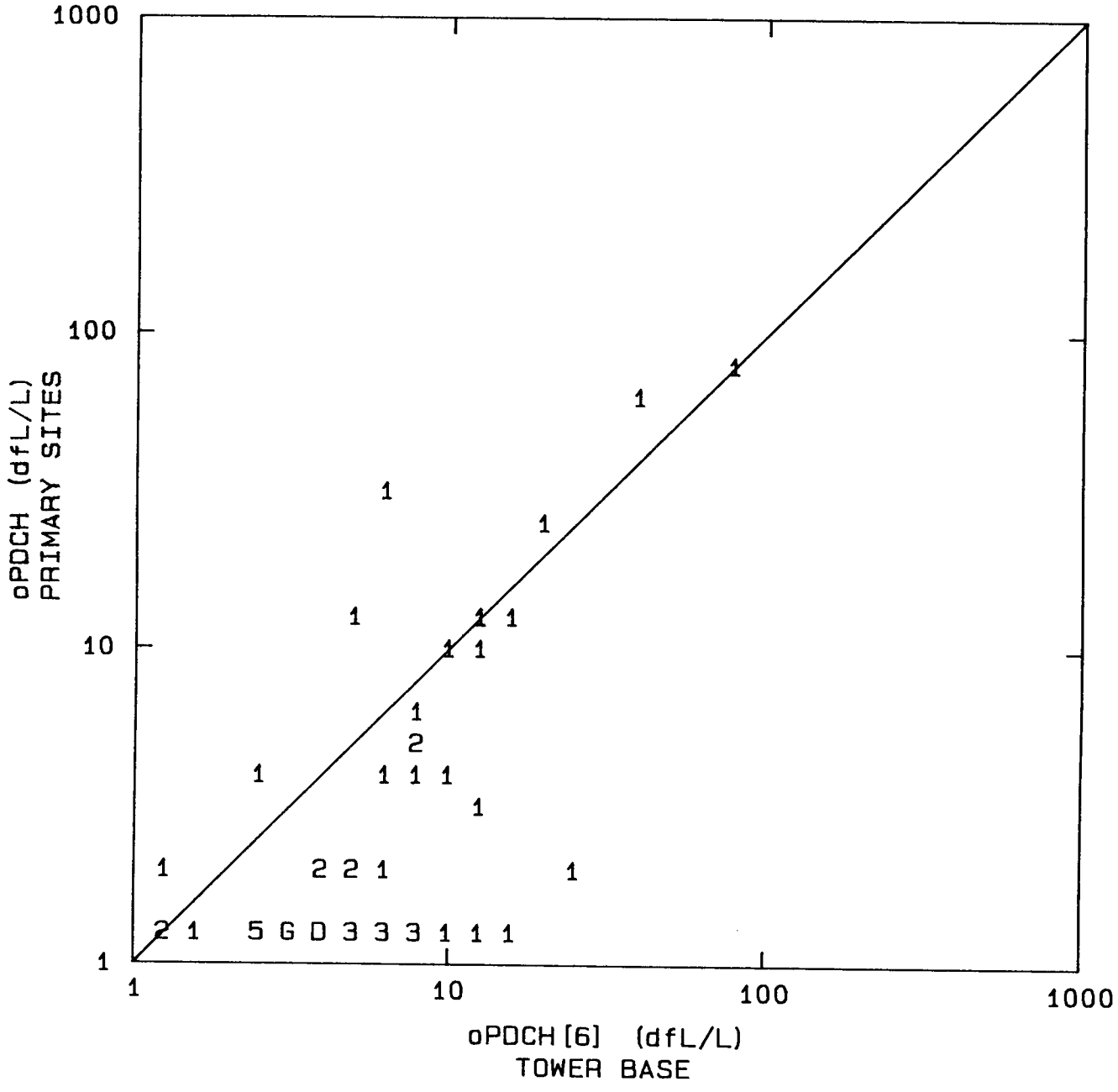

Figure 1-13. Comparisons of 24-h oPDCH excess concentrations at nearby primary sites versus four 6-h tower base excess concentrations averaged over a 24-h time interval (equivalent to the primary site sampling period).

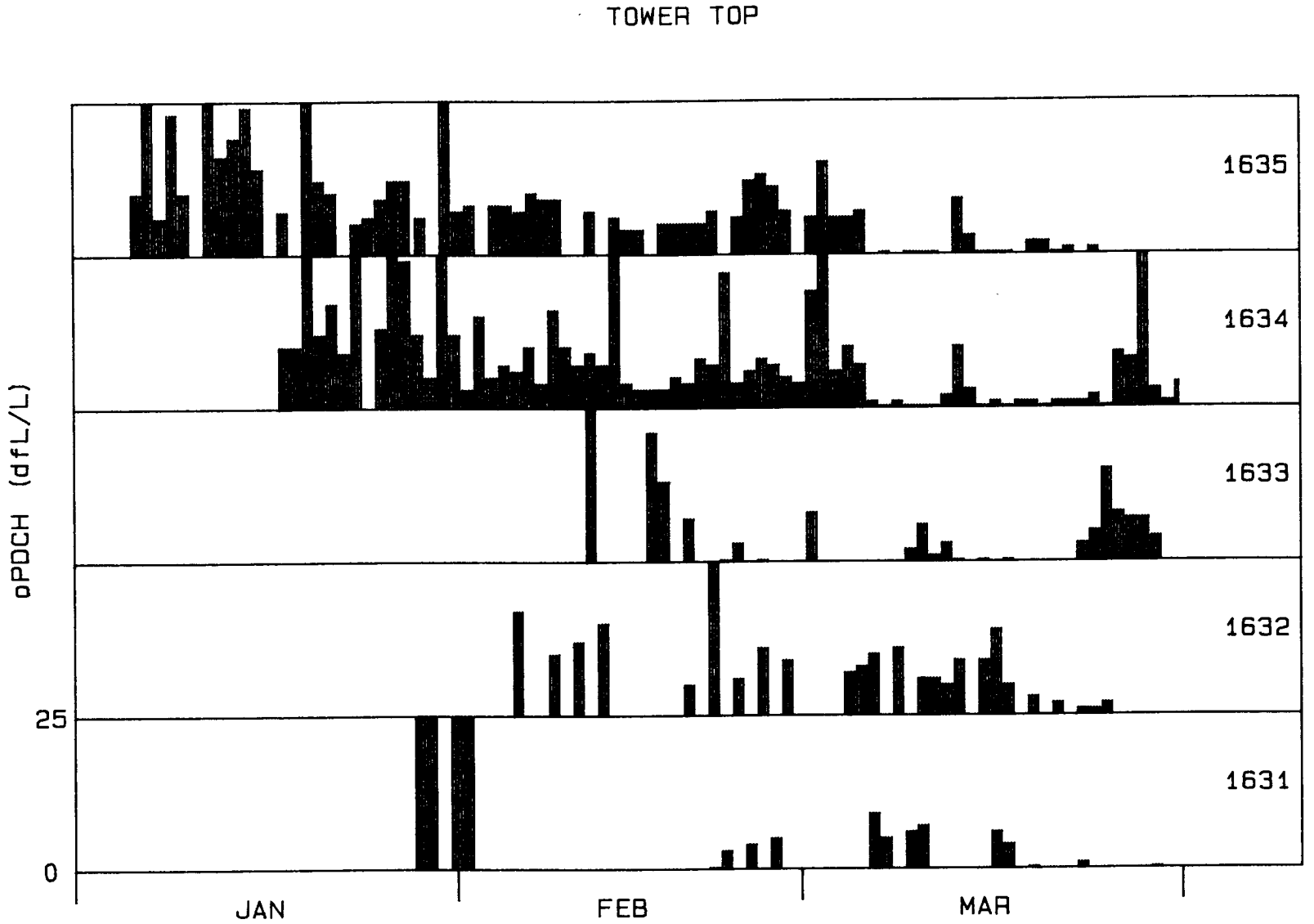

Figure 1-14. Same as Fig. 1-9 for 24-h excess concentrations at the tower top.

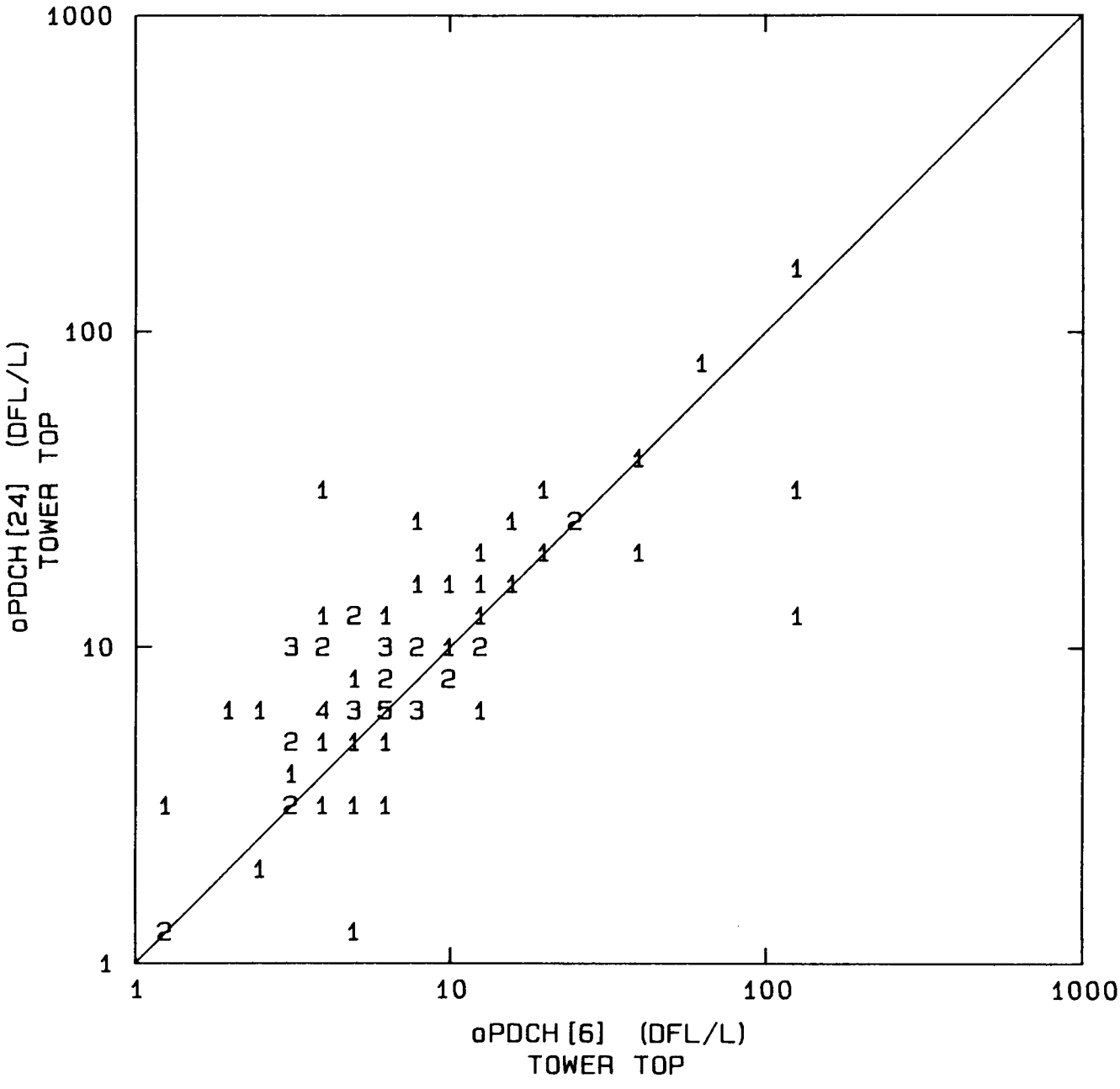

Figure 1-15. Comparison at the tower top of 24-h oPDCH excess concentrations versus four 6-h excess concentrations averaged over the corresponding 24-h intervals.

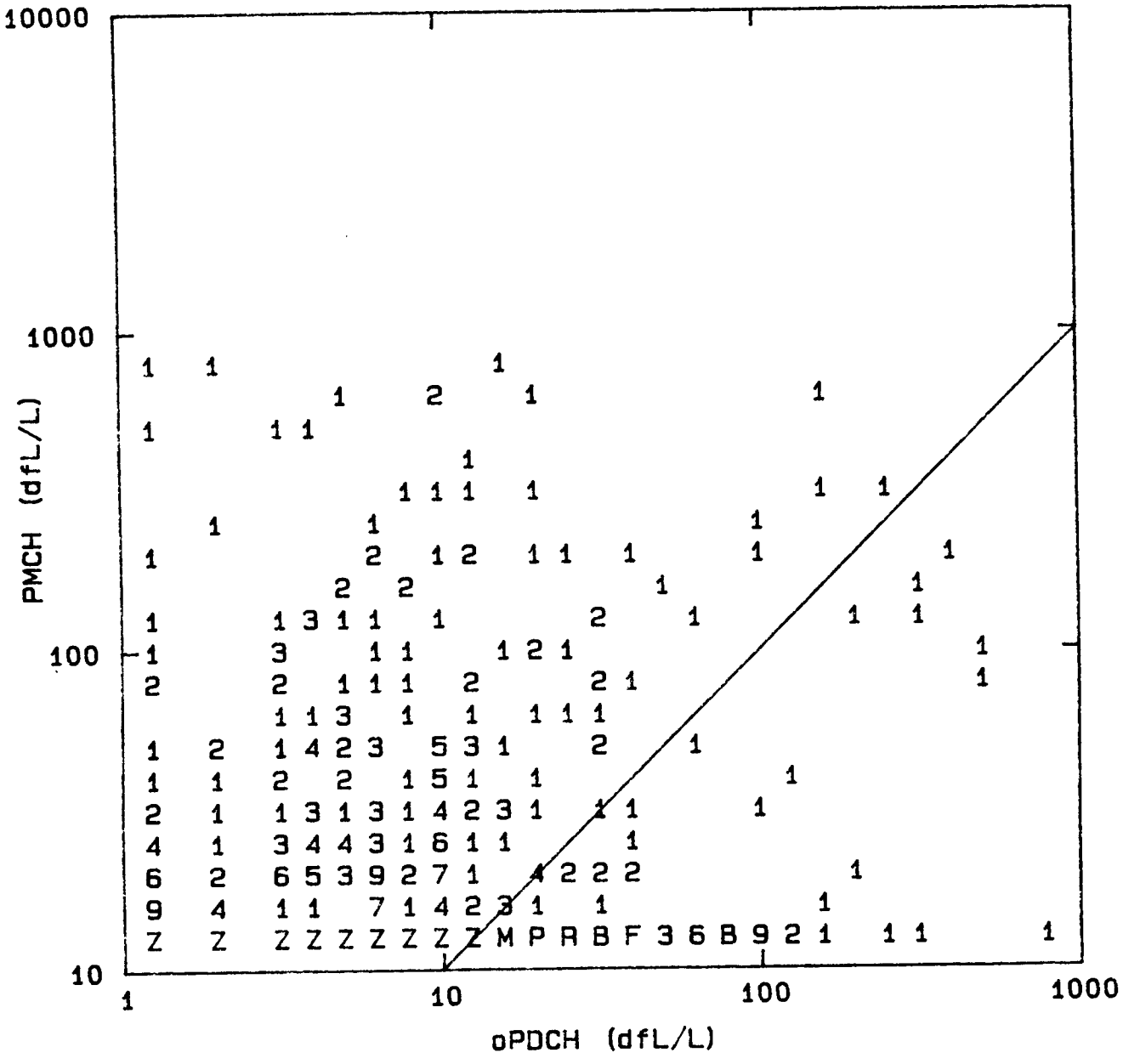

Figure 1-16. Comparison of PMCH versus oPDCH excess concentrations for all tower data.

releases, so oPDCH without PMCH would be expected. However, PMCH values below about 50 dfL/L are probably unreliable due to analysis uncertainties and calculation uncertainties related to eliminating sample contamination (as discussed in an earlier section). This still leaves quite a number of comparisons, well above the one-to-one correspondence line, and above about 50 dfL/L of PMCH that remain unexplained. In view of the frequency of these discrepancies, it is suggested that tower PMCH values not be used at this time pending further investigation.

1.4.3 PTCH

The PTCH dataset characteristics are shown in a series of figures (Figs. 1-16 through 1-22) similar to those given for oPDCH (Figs. 1-9 through 1-15). Since the 1600-km arc is farther from the source (Glasgow, MT), the intensity of concentrations is lower than for the oPDCH. The comparisons of tower base to top values in Fig. 1-19 shows a much greater similarity than the oPDCH values in Fig. 1-10. This could be due to the increased travel distance and time allowing for more vertical mixing to take place and thus a more uniform vertical distribution. The comparison of tower base versus primary site concentrations (Fig. 1-21) acts in the opposite sense of the oPDCH comparisons discussed in Fig. 1-13. A study should be performed to explain the differences between these comparisons.

The quality assurance comparison shown for PTCH in Fig. 1-23 is, in a sense, more favorable than that of oPDCH in Fig. 1-13, mainly because there is less data scatter. This is probably due to the different techniques required to calculate concentrations from contaminated and uncontaminated data. However, several outliers, all from site 1632, are in evidence. The PTCH [6] values at 20 dfL/L along the horizontal axis is composed of four very similar values between 17 and 23 dfL/L; thus the associated PTCH [24] low would seem to be in error. The three outliers along the vertical axis have consistent 6-h low values with some evidence of problems at surrounding times, so in this case there could be large uncertainty in the average values. If this subset of data is representative, it would seem to indicate that about 5% of the calculated PTCH values may be suspect, very similar to the results obtained for the oPDCH.

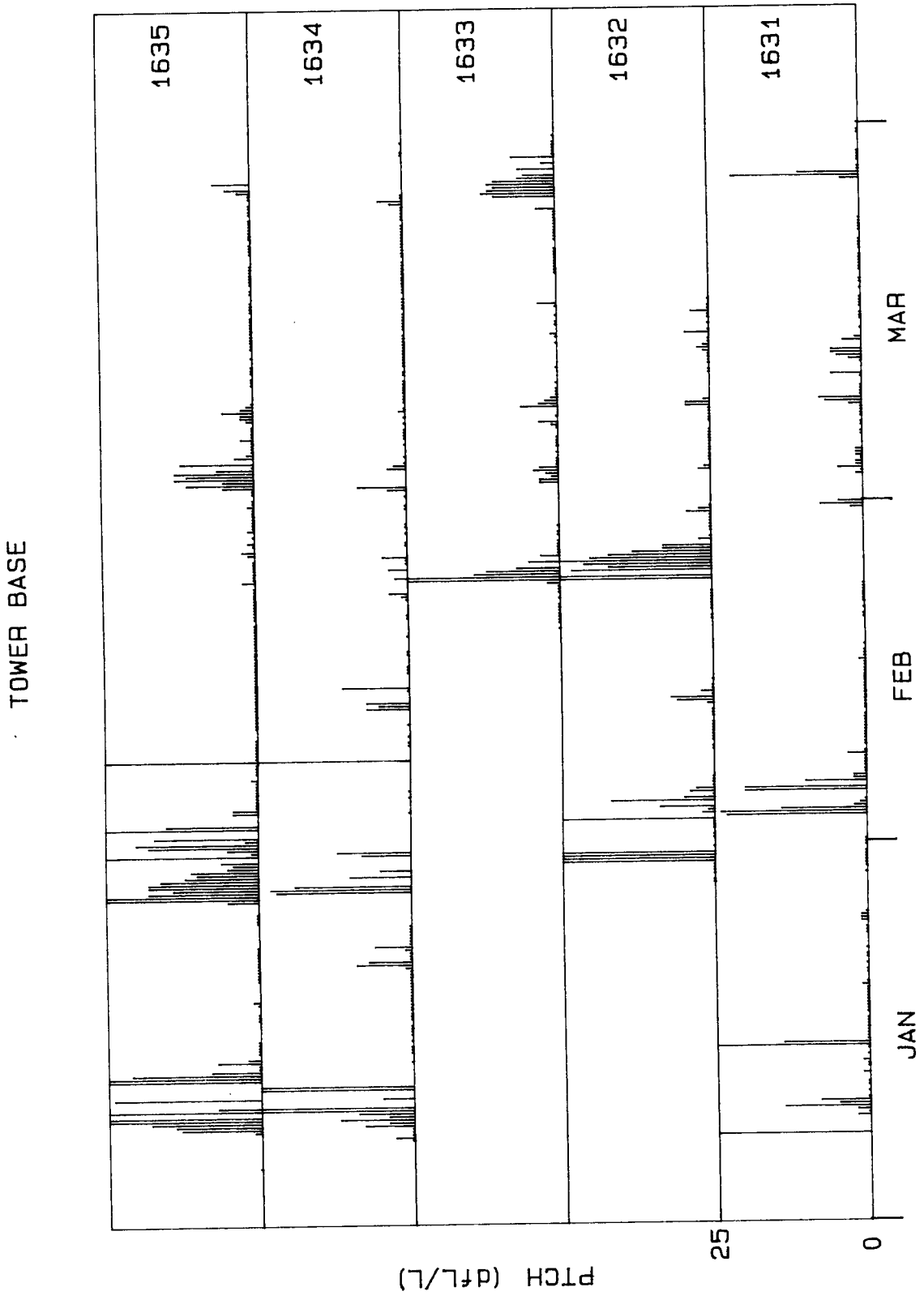

Figure 1-17. Same as Fig. 1-9 for PTCH.

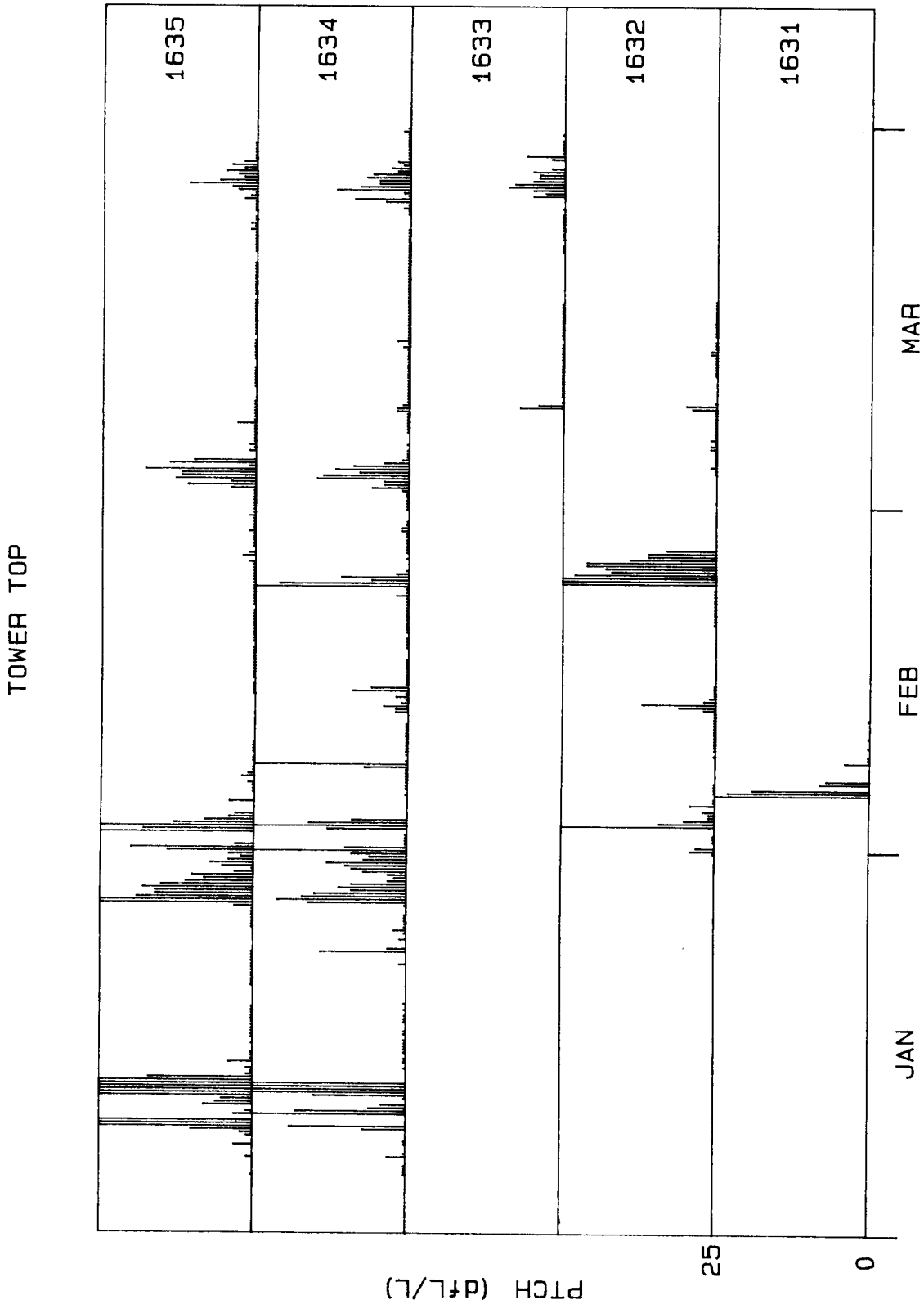

Figure 1-18. Same as Fig. 1-10 for PTCH.

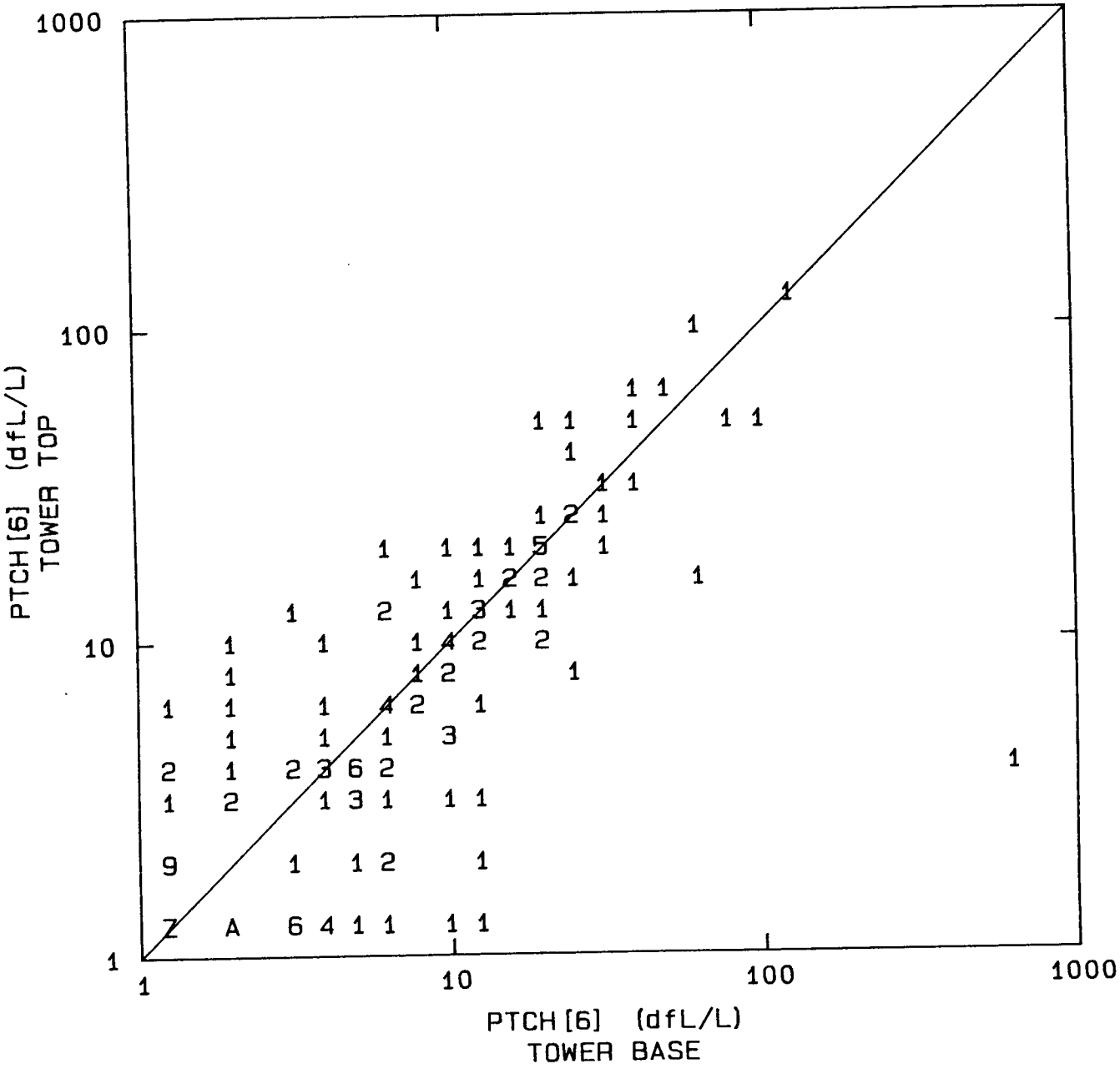

Figure 1-19. Same as Fig. 1-11 for PTCH.

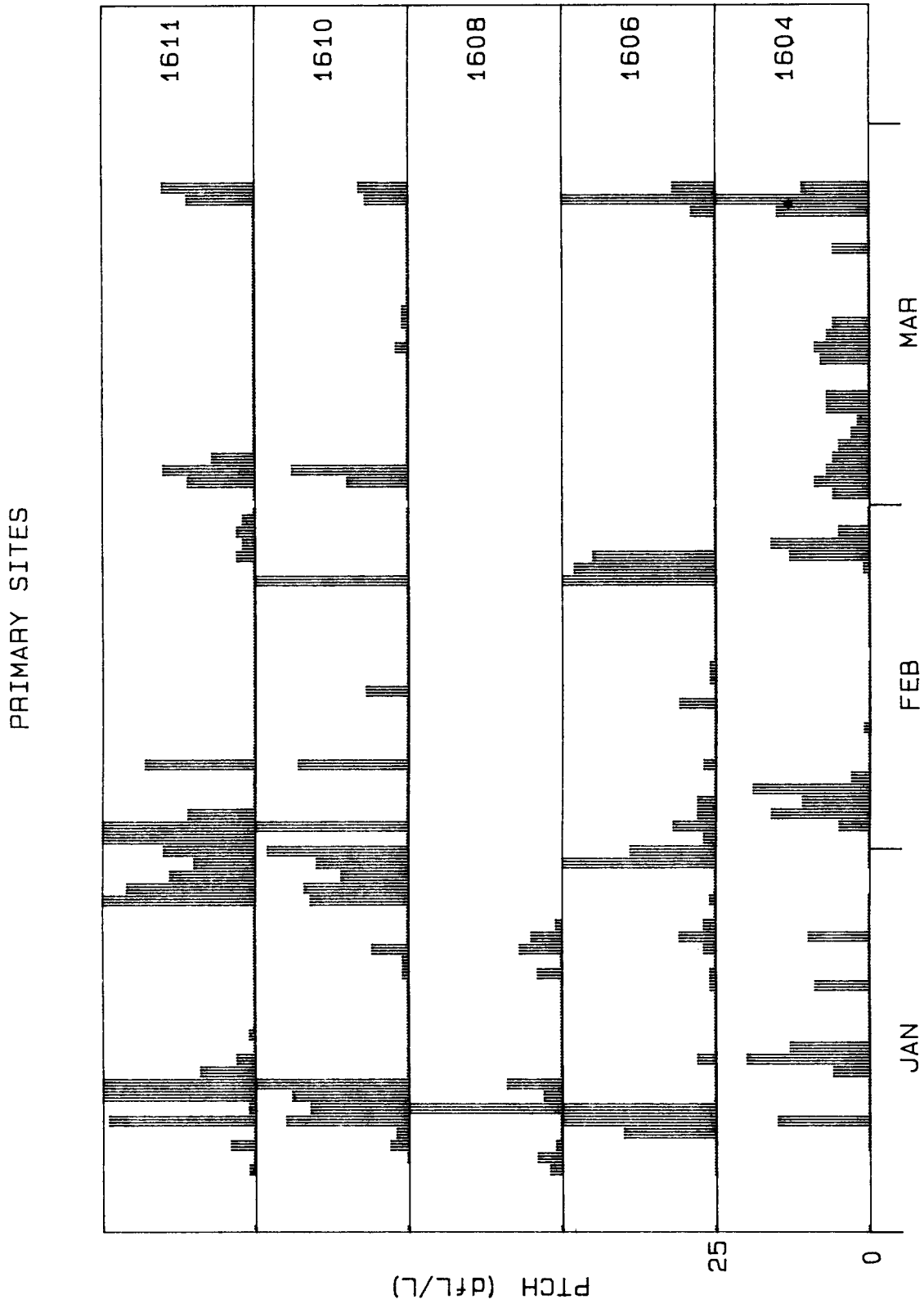

Figure 1-20. Same as Fig. 1-12 for PTCH.

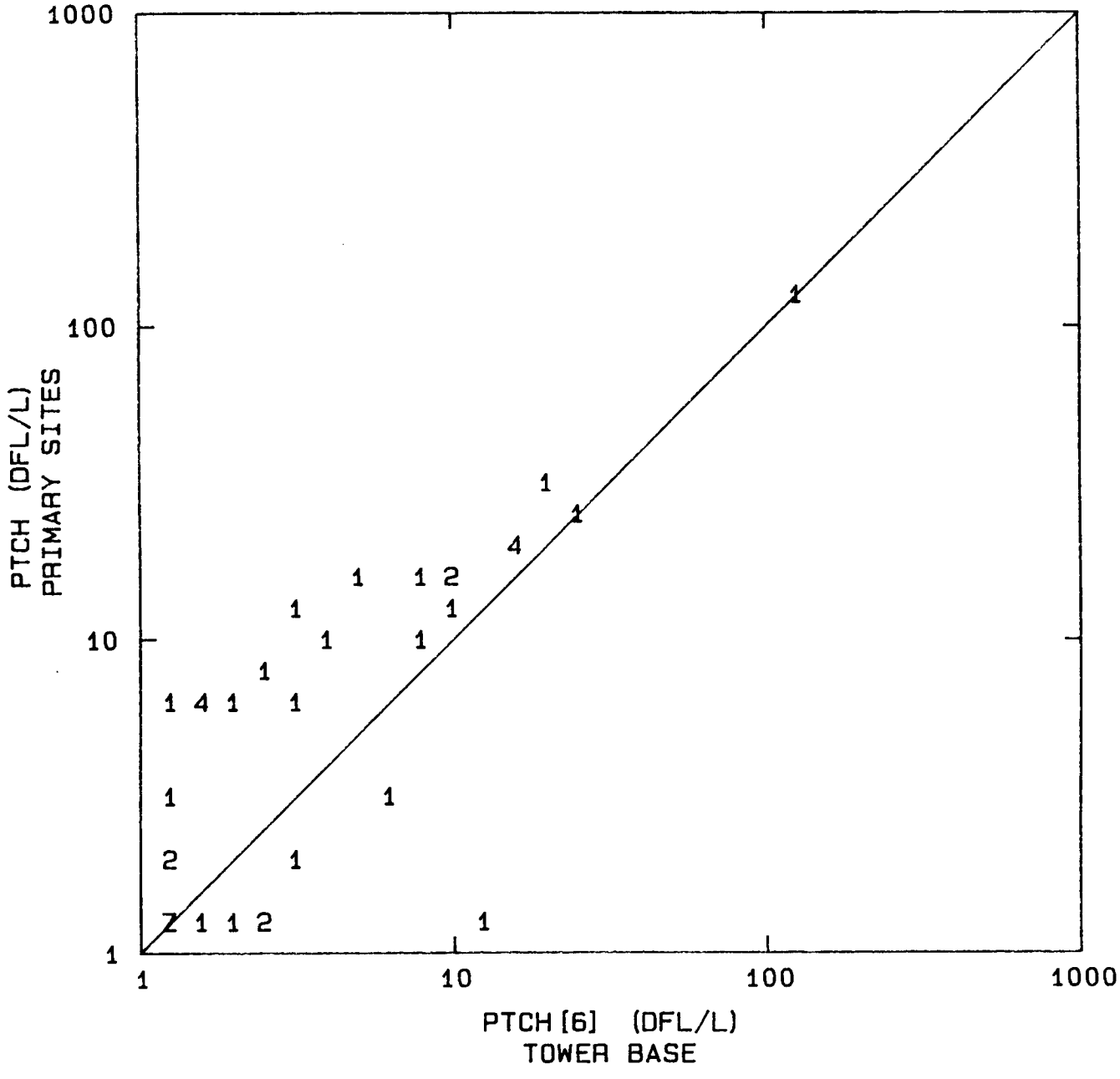

Figure 1-21. Same as Fig. 1-13 for PTCH.

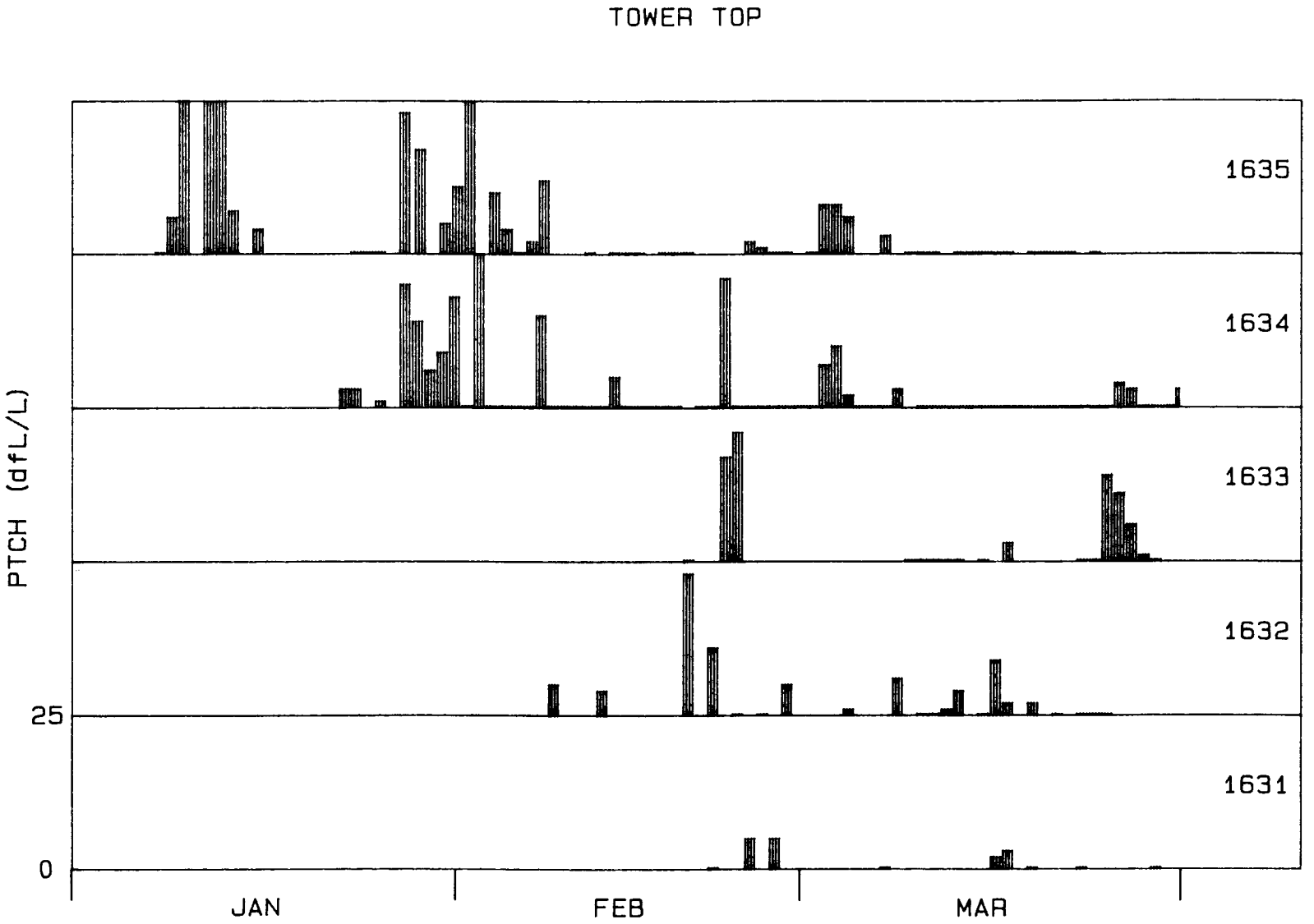

Figure 1-22. Same as Fig. 1-14 for PTCH.

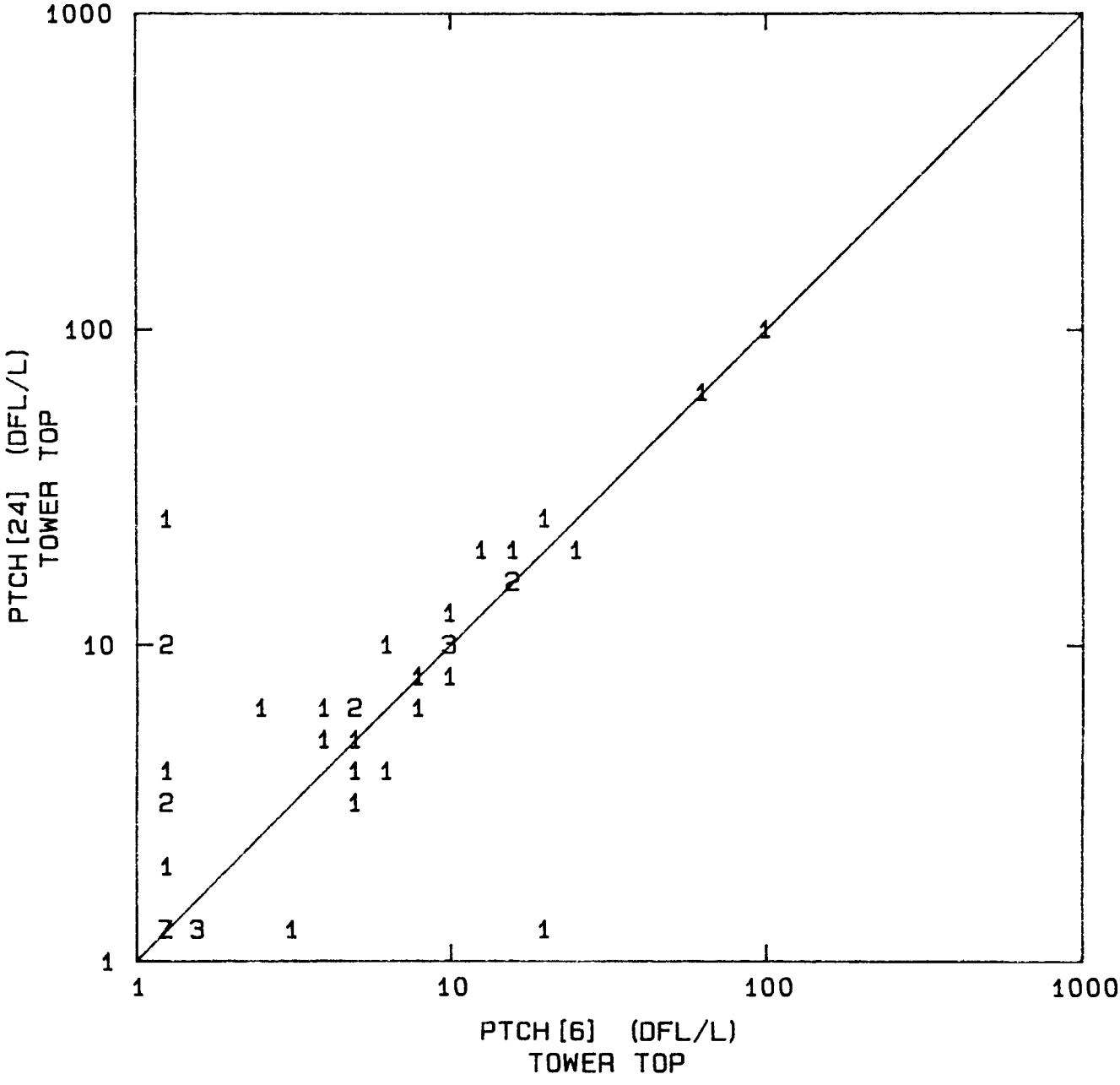

Figure 1-23. Same as Fig. 1-15 for PTCH.

1.5 Calculated Excess Concentration Datasets

The tower data have been written on MS-DOS diskettes in three files:

FILE 1 (BASE.DAT); 6-h data at the tower base
FILE 2 (TOP6.DAT); 6-h data at the tower top
FILE 3 (TOP24.DAT); 24-h data at the tower top

A file is organized chronologically for each tower site starting:

RECORD 1, SITE 1631, JANUARY 1 (1987), 03 GMT

proceeding in 6-h increments with:

RECORD 2, SITE 1631, JANUARY 1 (1987), 09 GMT

.
.
.

RECORD 360, SITE 1631, MARCH 31 (1987), 21 GMT

RECORD 361, SITE 1632, JANUARY 1 (1987), 03 GMT

.
.
.

RECORD 1800, SITE 1635, MARCH 31 (1987), 21 GMT

Record organization is as follows:

SITE #	MONTH	DAY	START HOUR (GMT)	ANAL. LAB.	FLAG (see below)	AIR VOLUME (L)	EXCESS PMCH (dfL/L)	EXCESS oPDCH (dfL/L)	C_o/T_o	EXCESS PTCH (dfL/L)

- Missing data are coded -99
- Bad or unusable data are coded -98
- Flag = 0; sample o.k. Flag = 10 or 11; sample with questionable time/airflow characteristics.

File 3, with 24-h data, has the same number of records as the other two 6-h files with one reported record per day applicable for 24 hours and intermediate 6-h records filled with data coded missing (-99). This organization is useful for programming comparisons between the two different time averages when overlap periods may vary from day to day.

A diskette containing the ANATEX tower data described above can be obtained by written request to:

Terry Clark
NOAA/ARL Atmospheric Sciences
Modeling Division
Environmental Research Center
Research Triangle Park, NC 27711

The tower concentration values are summarized in their entirety in Tables 1-2 through 1-4 for oPDCH (January through March 1987, respectively), and Tables 1-5 through 1-7 for PTCH (January through March 1987, respectively). The table organization is chronological (every 6 h), by sampling site, and the 6 rows for each site are as follows:

site #
---
day (DY)
sampling start hour (HR, GMT)
---
tower top 24-h concentration excess in dfL/L (TP)
tower top 6-h concentration excess in dfL/L (TP)
tower base 6-h concentration excess in dfL/L (BS)

Note that the 24-h samples at the tower top are shown spread over four 6-h time periods for purposes of visual comparison. Missing or unusable data are coded as -99.

Table 1-2. Tower oPDCH excess concentrations (dfL/L) for January 1987.

SITE 1635

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	10	10	10	10	25	25	25	25	6	6	6	6	23	23	23	23	10	10	10	10	-99	-99	-99	-99	148	148	148	148	16	16	16	16	19	19	19	19	24	24
TP	-99	-99	7	9	9	10	22	12	13	14	19	14	8	-99	-99	5	9	10	9	0	0	-99	0	0	19	36	444	14	7	7	10	8	8	7	9	17	11	11	-99	1
BS	-99	-99	13	17	25	14	13	21	-99	22	-99	14	15	-99	0	19	0	0	0	0	-99	0	0	0	21	41	-99	-99	-99	-99	-99	7	7	6	9	10	12	14	8	-99

SITE 1634

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	7	25	8	12	10	16	13	7	22	21	7	6	49	-99	-99	7	19	-99	-99	-99	11	8	33	344	-99	5	8	7	2	0	0	-99	50	33	-99	5	-99	37
BS	-99	-99	-99	31	25	-99	-99	-99	17	-99	24	4	13	6	14	5	8	8	2	8	11	7	11	-99	-99	319	-99	-99	8	8	-99	-99	22	-99	-99	-99	6	9	25	-99

SITE 1633

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	37	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	0	0	0	-99	-99	178	1	1	-99	39	-99	-99	68	32	40	17	17	6	11	10	14	4	-99	5	5	4	8	10	12	7	8	8	12	3	-99

Table 1-2. Con't.

SITE 1635

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	24	24	14	14	14	14	-99	-99	-99	-99	7	7	7	7	-99	-99	-99	-99	28	28	28	28	12	12	12	12	10	10	10	10	-99	-99	-99	-99	5	5	5	5	6	6
TP	0	0	0	0	0	0	-99	5	6	4	5	8	7	6	5	5	19	110	-99	-99	-99	-99	-99	-99	6	5	8	5	5	16	8	5	5	4	5	7	-99	-99	-99	-99
BS	5	4	5	5	4	5	-99	-99	-99	-99	-99	0	0	0	0	0	14	94	-99	-99	-99	-99	-99	-99	5	5	6	4	4	10	3	4	3	3	3	4	-99	-99	-99	-99

SITE 1634

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	10	10	10	10	10	10	10	10	70	70	70	70	12	12	12	12	17	17	17	17	9	9	9	9	85	85	85	85	-99	-99
TP	28	-99	4	5	6	4	11	13	4	0	11	-99	5	5	5	-99	0	-99	56	-99	966	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	9	-99	-99	-99	12	126	-99	19	11
BS	14	6	7	-99	6	5	6	3	5	4	-99	5	5	5	4	5	7	18	25	80	148	0	0	0	0	0	0	0	0	17	1	6	4	4	4	307	33	5	3	4

SITE 1633

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	88	99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	216	131	151	-99	89	101	87	-99	-99	-99	94	75	75	67	78	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	4	17	4	4	4	5	4	4	5	4	0	-99	0	0	3	5	4	4	3	3	4	2	0	-99	-99	0	0	0	0	-99	0	0	-99	0	6	-99	6	5	3	3

Table 1-2. Con't.

SITE 1635

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	6	6	9	9	9	9	12	12	12	12	12	12	12	12	-99	6	6	6	6	-99	-99	-99	-99	25	25	25	25	7
TP	-99	-99	-99	5	5	7	8	7	20	10	11	7	5	5	14	3	4	4	5	11	14	10	9	27	37	17	12	12
BS	-99	-99	-99	6	6	8	8	7	18	10	11	7	4	3	5	3	3	3	3	10	11	8	7	28	37	14	13	11

SITE 1634

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	13	13	13	13	29	29	29	29	24	24	24	24	12	12	12	12	5	5	5	5	30	30	30	30	12	12
TP	14	7	11	3	4	4	4	9	28	32	18	5	5	5	7	5	5	5	5	5	5	7	6	41	8	472	529	7
BS	5	4	6	12	-99	-99	-99	-99	30	-99	-99	-99	-99	20	21	24	-99	-99	21	-99	9	-99	-99	-99	-99	26	34	-99

SITE 1633

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	47	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	5
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	5	-99	1	5	5	5	4	4	2	6	-99	0

SITE 1631

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	74	74	74	74	37	37	37	37	-99	-99	-99	-99	40	40
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	3	-99	3	3	3	2	5	-99	-99	-99	7	-99	-99	9	8	6	6	11	3	-99	2	3	3	3	3	3	-99	4

Table 1-3. Tower oPDCH excess concentrations (dfL/L) for February 1987.

SITE 1635

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	7	7	7	8	8	8	8	-99	-99	-99	-99	8	8	8	8	8	8	8	8	7	7	7	7	10	10	10	10	9	9	9	9	9	9	9	9	-99	-99	-99	-99	-99
TP	6	6	5	-99	-99	-99	6	7	12	17	9	3	4	12	8	5	6	7	7	5	4	4	7	-99	10	8	4	4	-99	5	4	4	3	3	4	5	-99	-99	-99	-99
BS	5	5	3	5	-99	-99	3	6	-99	-99	-99	0	0	4	4	0	2	2	2	2	1	0	1	-99	10	2	0	0	4	0	0	0	0	0	0	1	-99	-99	-99	3

SITE 1634

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	12	12	3	3	3	3	15	15	15	15	5	5	5	5	7	7	7	7	6	6	6	6	10	10	10	10	4	4	4	4	16	16	16	16	10	10	10	10	7	7
TP	7	4	4	4	5	4	8	5	25	9	5	-99	-99	-99	10	8	8	9	7	6	6	4	5	3	4	4	4	4	5	4	-99	4	4	3	4	2	3	3	7	12
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	10	-99	-99	-99	-99	7	-99	8	-99	-99	-99	-99	-99	-99	-99	-99	-99	4	-99	-99	-99	-99	9	4	-99	8	-99	-99	-99

SITE 1633

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	17	17	17	17	-99	-99	-99	-99	-99	-99	-99	-99	10	10	10	10	-99	-99	-99	-99	12	12
TP	7	16	-99	7	6	6	14	8	18	13	10	4	4	11	-99	15	5	6	-99	5	5	7	5	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	-99	3	3	3	3	3	3	4
BS	-99	-99	0	0	-99	0	0	2	0	-99	1	3	33	-99	40	13	4	8	5	4	4	5	3	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	4	-99	3	3	3	3	3	3

SITE 1631

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	40	40	84	84	84	84	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	41	26	39	-99	23	14	29	27	11	-99	14	14	5	4	-99	-99	4	-99	-99	4	-99	-99
BS	3	4	-99	-99	-99	-99	3	-99	3	3	3	3	3	3	5	-99	-99	22	23	-99	9	5	5	4	4	4	3	3	3	2	3	-99	3	3	3	3	3	3	3	3

Table 1-3. Con't.

SITE 1635

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	7	7	7	7	-99	-99	-99	-99	6	6	6	6	4	4	4	4	4	4	4	4	-99	-99	-99	-99	5	5	5	5	5	5	5	5	5	5	5	5	5	5
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	2	2	1	0	-99	2	2	0	1	1	1	3	3	3	3	3	-99	4	4	4	3	3	3	10	0	1	0	1	-99
BS	3	3	3	3	3	15	6	3	3	3	6	3	1	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	1	0	-99	0	1	0	0	0

SITE 1634

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	7	7	9	9	9	9	7	7	7	7	74	74	74	74	4	4	4	4	3	3	3	3	3	3	3	3	3	3	3	3	5	5	5	5	4	4	4	4	8	8
TP	4	3	2	4	4	18	13	4	4	4	33	103	104	6	3	3	3	4	3	3	4	4	3	-99	-99	3	3	3	4	3	3	0	0	0	0	0	0	0	0	0
BS	7	-99	-99	-99	-99	36	21	9	-99	-99	-99	113	159	-99	-99	-99	-99	5	5	5	-99	-99	-99	5	5	-99	-99	-99	-99	7	9	-99	-99	-99	-99	2	0	-99	-99	-99

SITE 1633

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	39	39	39	39	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	21	21	21	21	13	13	13	13	-99	-99	-99	-99	7	7	7	7	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	17	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	3	3	3	3	3	3	3

SITE 1632

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	12	12	-99	-99	-99	-99	15	15	15	15	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	5	5	5	5	-99	-99
TP	4	5	4	3	3	3	4	5	13	21	16	9	10	13	8	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	3	3	3	3	4
BS	3	-99	4	2	4	-99	3	5	19	20	14	8	9	-99	8	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	2	3	-99	3	3	3

SITE 1631

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	2	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	3	3	0	-99	0	0	0	0	0	0	0	0	0	0	3	3	4	5	5	13	9	5	4	3	3	4	5	3	3	3	3	3	7	4	3	3	-99	3	-99	3

Table 1-3. Con't.

SITE 1635

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	5	5	7	7	7	7	-99	-99	-99	-99	6	6	6	6	12	12	12	12	13	13	13	13	11	11	11	11	7	7	7	7	-99	-99
TP	2	1	1	2	2	3	5	2	1	1	1	3	3	3	9	-99	10	11	-99	11	12	11	13	13	8	7	7	5	4	5	7	3
BS	1	1	1	6	0	0	-99	3	3	3	3	3	3	4	9	-99	13	11	-99	11	13	10	13	-99	13	7	7	5	4	4	6	1

SITE 1634

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	8	8	7	7	7	7	22	22	22	22	4	4	4	4	6	6	6	6	8	8	8	8	7	7	7	7	5	5	5	5	4	4
TP	0	0	0	5	9	5	4	104	43	7	5	5	-99	4	4	3	7	10	8	12	12	11	8	8	9	7	7	6	9	3	4	4
BS	-99	2	2	7	-99	-99	-99	90	6	-99	-99	12	-99	8	10	8	-99	-99	-99	12	11	-99	-99	7	-99	6	7	-99	-99	-99	-99	4

SITE 1633

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	0	0	0	0	3	3	3	3	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	4	-99	3	3	3	3	18	237	96	28	7	-99	39	-99	34	9	1	0	0	1	0	1	1	-99	1	-99	-99	-99	-99	-99	-99

SITE 1632

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	31	31	31	31	-99	-99	-99	-99	6	6	6	6	-99	-99	-99	-99	11	11	11	11	-99	-99	-99	-99	9	9	9	9	-99	-99
TP	3	3	4	4	5	4	-99	3	3	3	4	4	5	37	61	67	34	15	7	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	3	2	3	3	4	-99	-99	2	2	-99	4	4	5	13	62	65	24	10	6	-99	3	0	-99	3	3	3	3	2	3	4	3	3

SITE 1631

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	0	0	0	0	3	3	3	3	-99	-99	-99	-99	4	4	4	4	-99	-99	-99	-99	5	5	5	5	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	4	3	3	3	3	3	3	2	-99	2	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0

Table 1-4. Tower oPDCH excess concentrations (dfL/L) for March 1987.

SITE 1635

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	6	6	6	6	15	15	15	15	6	6	6	6	6	6	6	6	7	7	7	7	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	0	0	0	0	0	0
TP	3	3	4	3	4	6	17	26	9	8	6	1	2	0	1	1	-99	-99	0	0	0	0	1	4	4	4	3	93	4	4	3	3	3	3	5	-99	-99	-99	-99	2
BS	0	1	1	-99	0	2	13	23	4	3	3	1	1	0	1	-99	0	0	0	1	0	0	1	0	1	1	0	-99	1	1	3	4	1	1	0	-99	-99	-99	-99	2

SITE 1634

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	4	4	19	19	19	19	25	25	25	25	6	6	6	6	10	10	10	10	7	7	7	7	1	1	1	1	0	0	0	0	1	1	1	1	0	0	0	0	0	0
TP	4	4	5	4	34	39	36	27	30	13	6	4	5	4	5	7	7	5	4	4	4	3	4	4	6	6	5	4	4	4	3	5	0	1	1	1	0	0	0	0
BS	4	-99	-99	5	-99	32	33	-99	-99	-99	-99	-99	6	7	6	5	4	-99	-99	-99	4	-99	4	3	4	4	4	4	4	3	3	9	4	-99	3	2	3	3	3	3

SITE 1633

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	8	8	8	8	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	2	2	2	2	6	6
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	1	-99	11	5	4	4	3	3	3	3
BS	-99	-99	-99	-99	-99	-99	-99	23	20	7	6	5	5	5	6	5	-99	12	-99	5	4	5	5	4	5	4	6	0	-99	0	-99	0	9	4	1	0	0	0	0	-99

SITE 1632

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	7	7	7	7	8	8	8	8	10	10	10	10	-99	-99	-99	-99	11	11	11	11	-99	-99	-99	-99	6	6
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	7	10	7	5	4	4	4	4	4	5	6	5	3	4	4	2	4	4	3	4	4	5	11	9	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	7	11	-99	4	4	4	4	3	3	5	5	4	3	3	-99	-99	3	3	3	3	3	5	10	8	-99	-99	-99	-99	-99	-99

SITE 1631

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	9	9	9	9	5	5	5	5	-99	-99	-99	-99	6	6	6	6	7	7
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	-99	-99	-99	-99	-99	-99	4	5	7	0	6	0	0	1	0	2	2	-99	-99	-99	-99	0	0	0	0	0	-99	0	0	0	0	0	2	7	6	6	5	6	-99

Table 1-4. Con't.

SITE 1635

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	-99	-99	-99	-99	9	9	9	9	3	3	3	3	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	2	2	2	2	2	2
TP	2	3	2	2	3	3	-99	3	3	2	4	19	18	5	8	10	3	3	3	2	3	2	2	2	3	3	2	2	-99	0	0	0	0	0	0	0	0	0	0	0
BS	3	3	2	-99	2	3	3	-99	3	3	3	-99	19	5	8	10	3	2	3	2	2	2	2	-99	2	2	2	2	-99	-99	1	1	-99	1	1	1	1	0	1	2

SITE 1634

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	2	2	2	2	10	10	10	10	3	3	3	3	0	0	0	0	1	1	1	1	0	0	0	0	1	1	1	1	1	1	1	1	0	0
TP	0	0	0	0	0	0	3	1	1	4	7	17	16	11	5	5	8	3	4	3	3	3	3	4	4	4	3	0	1	1	1	1	1	1	0	1	0	0	0	0
BS	3	3	3	0	0	-99	2	0	1	4	7	15	14	11	5	5	7	-99	4	3	3	3	3	3	3	3	3	0	0	-99	0	0	0	1	1	0	0	0	0	0

SITE 1633

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	6	6	1	1	1	1	3	3	3	3	0	0	0	0	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	2	3	0	0	0	0	0	0	1	1	0	0	0	0	-99	2	4	0	1	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	-99	-99	-99	-99	0	-99	-99	-99	-99	-99	-99	-99	1	-99	1	6	-99	-99	0	0	-99	0	-99	-99	0	1	-99	-99	-99	-99	-99	-99	-99	-99	-99	1	1	0	0

SITE 1632

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	6	6	6	6	6	6	5	5	5	5	9	9	9	9	-99	-99	-99	-99	9	9	9	9	14	14	14	14	5	5	5	5	-99	-99	-99	-99	3	3	3	3	-99	-99
TP	-99	-99	-99	2	3	3	4	4	4	4	3	3	3	3	5	-99	0	2	8	2	0	0	1	0	1	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	3	3	-99	3	4	3	3	3	4	3	3	3	-99	0	0	-99	4	-99	0	0	0	0	0	-99	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	7	7	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	6	6	6	6	4	4	4	4	-99	-99	-99	-99	0	0	0	0	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	5	4	4	4	3	4	4	4	4	4	5	-99	5	5	5	-99	4	9	-99	-99	7	4	3	-99	3	4	3	2	-99	-99	0	-99	0	0	-99	-99	0	1	0	0

Table 1-4. Con't.

SITE 1635

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	2	2	0	0	0	0	1	1	1	1	-99	-99	-99	-99	1	1	1	1	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	0	1	0	1	0	0	1	1	1	0	0	1	-99	1	1	5	7	6	7	2	3	4	14	9	9	9	228	69	33	5	2	2	1	0	0	0	-99
BS	-99	-99	-99	0	0	0	0	-99	0	0	0	0	0	0	1	-99	1	1	6	8	-99	7	2	3	5	-99	10	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1634

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	0	0	0	0	9	9	9	9	8	8	8	8	41	41	41	41	3	3	3	3	1	1
TP	1	0	0	1	1	1	0	0	0	1	0	-99	-99	-99	-99	0	0	7	7	7	4	0	0	17	11	9	9	11	10	7	31	110	21	3	1	0	0	0	0	1
BS	1	-99	1	0	1	2	1	1	1	0	1	0	1	-99	1	0	1	8	7	7	4	0	2	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	1	0	-99	-99	0

SITE 1633

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	3	3	3	5	5	5	5	15	15	15	15	8	8	8	8	7	7	7	7	7	7	7	7	4	4	4	4	-99	-99
TP	-99	-99	-99	1	0	0	-99	1	1	0	1	0	2	1	1	1	-99	7	-99	-99	-99	3	6	13	8	6	6	7	7	8	4	-99	-99	10	4	3	2	0	0	0
BS	0	1	1	1	1	-99	-99	0	0	15	0	1	1	0	0	6	7	11	-99	-99	-99	12	5	7	9	7	6	8	8	-99	7	-99	10	-99	4	4	1	1	1	2

SITE 1632

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	2	2	2	2	-99	-99	-99	-99	1	1	1	1	1	1	1	1	2	2	2	2	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	1	1	1	1	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	1	2	-99	4	4	2	0	-99	-99	0	0	0	0	7	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	3	0	0	1	-99	0	1	1	0	-99	-99	-99	0

Table 1-5. Tower PTCH excess concentrations (dfL/L) for January 1987.

SITE 1635

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	6	6	6	6	27	27	27	27	-99	-99	-99	-99	66	66	66	66	98	98	98	98	7	7	7	7	-99	-99
TP	-99	-99	0	-99	-99	-99	-99	-99	1	-99	-99	-99	3	-99	-99	1	2	10	26	35	40	-99	3	1	-99	8	6	5	65	164	147	141	93	52	17	1	0	1	-99	4
BS	-99	-99	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	1	13	14	18	32	44	-99	25	7	-99	-99	24	-99	-99	-99	-99	-99	133	64	21	8	0	0	7	2	-99

SITE 1634

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	0	0	0	0	-99	-99	3	0	-99	-99	0	0	-99	-99	-99	7	19	-99	-99	-99	46	18	6	4	-99	0	15	66	77	56	44	-99	-99	-99	-99	0	-99	0
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	3	0	0	0	8	4	12	4	9	37	39	-99	-99	5	-99	-99	65	42	-99	-99	-99	-99	-99	-99	-99	0	-99	-99

SITE 1633

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	51	-99	-99	-99	-99	-99	2	0	2	14	5	8	0	-99	0	-99	0	0	-99	-99	1	-99	0	0	1	-99	0	-99

Table 1-5. Con't.

SITE 1635

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	4	4	4	4	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	0	0
TP	0	0	0	-99	-99	0	-99	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	-99	-99	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99
BS	0	0	0	0	0	-99	-99	-99	-99	-99	-99	0	0	0	-99	-99	0	1	-99	-99	-99	-99	-99	-99	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99

SITE 1634

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	3	3	3	3	3	3	-99	-99	
TP	0	-99	0	0	0	0	0	-99	0	0	-99	-99	0	0	0	-99	0	-99	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	1	-99	-99	-99	14	3	-99	-99	1
BS	0	0	0	-99	0	-99	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	9	7	0	0	0	1	6	0	0	0	0

SITE 1633

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	47	14	0	0	0	0	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	1	0	-99	-99	0	0	-99	0	-99	0	0	-99	0	-99	-99	-99	-99	0	0

Table 1-5. Con't.

SITE 1635

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	-99	-99	-99	-99	23	23	23	23	-99	17	17	17	17	-99	-99	-99	-99	5	5	5	5	11
TP	-99	-99	-99	0	0	0	0	0	0	0	3	28	33	19	16	16	18	15	11	8	10	3	0	5	7	4	2	4
BS	-99	-99	-99	0	0	0	0	-99	-99	-99	5	27	31	18	14	18	18	16	12	10	11	5	4	6	-99	633	1	5

SITE 1634

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	1	1	1	1	-99	-99	-99	-99	20	20	20	20	14	14	14	14	6	6	6	6	9	9	9	9	18	18
TP	-99	0	2	0	0	0	0	0	-99	-99	0	16	21	17	15	9	11	9	3	2	3	7	9	10	13	7	6	9
BS	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	22	23	19	-99	-99	10	-99	5	-99	-99	-99	-99	8	12	-99

SITE 1633

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	-99	0	0	0	0	128	160	89	82	-99	0

SITE 1631

DY	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30	31	31	31	31
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	-99	1	1	1	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	-99	0	0	0	0	0	0	-99	0

Table 1-6. Tower PTCH excess concentrations (dfL/L) for February 1987.

SITE 1635

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	11	11	11	105	105	105	105	-99	-99	-99	-99	10	10	10	10	4	4	4	4	0	0	0	0	2	2	2	2	12	12	12	12	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	14	20	3	-99	-99	-99	51	18	166	13	8	4	3	-99	-99	-99	4	-99	-99	0	0	0	1	-99	2	1	0	0	-99	0	0	-99	0	0	0	0	-99	-99	-99	-99
BS	18	20	2	17	-99	-99	110	15	-99	-99	-99	4	4	0	0	0	0	0	0	0	0	0	1	-99	0	0	0	0	58	0	0	0	0	0	0	0	-99	-99	-99	0

SITE 1634

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	18	18	0	0	0	0	27	27	27	27	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	15	15	15	0	0	0	0	0	0	0	0	0	0
TP	39	10	0	0	0	0	-99	13	52	16	9	-99	-99	-99	-99	-99	-99	-99	0	-99	0	0	0	0	0	0	0	7	55	0	-99	0	0	0	0	0	0	0	0	0
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	-99	-99	-99	-99	0	-99	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	83	-99	-99	-99	-99	0	0	-99	0	-99	-99	-99

SITE 1633

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1632

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	5	5	5	5	-99	-99	-99	-99	-99
TP	4	3	-99	0	0	0	-99	-99	45	9	5	1	1	2	-99	4	0	0	-99	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	0	-99	0	0	0	0	0	0	0
BS	-99	-99	0	0	-99	0	0	0	25	-99	2	1	9	-99	17	5	0	4	3	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	0	0	-99	0	0	0	0	0	0

SITE 1631

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	27	23	19	-99	8	7	-99	-99	-99	-99	-99	4	0	0	-99	-99	0	-99	-99	0	-99	-99
BS	0	0	-99	-99	-99	-99	-99	-99	-99	23	24	14	2	1	0	-99	-99	20	20	-99	10	2	2	0	0	0	0	0	0	3	0	-99	0	0	0	0	0	0	0	0

Table 1-6. Con't.

SITE 1635

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	0	0	0	0	-99	-99	-99	-99	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	0	0	0	0	0	0	0	0	0	0	0	-99	-99	
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	-99	
BS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	0	0	0	

SITE 1634

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	0	0	0	0	5	5	5	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	0	0
TP	0	0	-99	-99	-99	2	2	4	1	0	2	0	9	6	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	0	0	0	0	0	0	-99	0	0	0	0	0	0
BS	0	-99	-99	-99	-99	7	5	7	-99	-99	-99	0	11	-99	-99	-99	-99	0	0	0	-99	-99	-99	0	0	-99	-99	-99	-99	0	-99	-99	-99	-99	-99	0	0	-99	-99	-99

SITE 1633

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	-99	0	0	0	0	0	0

SITE 1632

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	4	4	4	4	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	23	23	23	23	-99	-99
TP	0	0	0	0	0	0	2	6	12	2	1	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	0	0
BS	0	-99	0	0	0	-99	1	6	7	0	2	0	0	-99	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	-99	0	0	0

SITE 1631

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	-99	0	-99	-99	-99	-99	-99	-99	-99	0	0	-99	0	-99	0	

Table 1-6. Con't.

SITE 1635

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	2	2	2	2	1	1	1	1	0	0	0	0	0	0	0	0	-99	-99
TP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	-99	2	1	-99	0	0	0	0	0	1	0	0	0	0	1	0	0
BS	0	0	0	0	0	0	-99	2	0	0	0	0	0	0	0	-99	1	2	-99	0	1	-99	0	-99	1	0	0	0	0	0	0	0

SITE 1634

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	21	21	21	21	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TP	0	0	0	2	0	0	58	21	6	11	2	0	-99	-99	-99	0	-99	0	0	0	0	0	0	0	1	1	0	0	-99	-99	-99	0
BS	-99	0	1	3	-99	-99	-99	-99	2	-99	-99	3	-99	0	0	4	-99	-99	-99	0	0	-99	-99	0	-99	0	0	-99	-99	-99	-99	0

SITE 1633

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	17	17	17	17	21	21	21	21	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	0	-99	0	0	0	2	40	25	14	12	7	-99	5	-99	3	0	0	0	0	0	-99	0	0	-99	0	-99	-99	-99	-99	-99	-99

SITE 1632

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	11	11	11	11	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	5	5	5	5	-99	-99
TP	0	0	0	0	0	0	0	-99	58	40	41	23	17	18	21	21	14	11	11	8	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	0	0	0	-99	-99	-99	51	28	-99	23	17	21	32	20	17	13	8	8	-99	2	0	-99	0	0	0	0	0	0	4	2	0

SITE 1631

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	5	5	5	5	-99	-99	-99	-99	5	5	5	5	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	0	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	2	7

Table 1-7. Tower PTCH excess concentrations (dfL/L) for March 1987.

SITE 1635

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	0	0	0	0	8	8	8	8	8	8	8	8	6	6	6	6	-99	-99	-99	-99	-99	-99	-99	-99	3	3	3	3	-99	-99	-99	-99	0	0	0	0	0	0
TP	0	0	0	0	0	0	4	11	4	13	12	12	18	1	14	10	-99	-99	1	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	-99	-99	-99	-99	0
BS	1	0	0	-99	0	0	5	11	5	13	11	13	6	0	12	-99	3	1	0	0	0	0	2	0	0	0	0	-99	1	2	2	5	2	1	0	-99	-99	-99	-99	-99

SITE 1634

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	7	7	7	7	10	10	10	10	2	2	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	3	3	-99	-99	-99	-99	0	0
TP	0	0	0	0	0	1	6	4	4	15	14	8	12	9	4	1	0	0	0	-99	0	-99	-99	-99	0	0	0	0	0	0	0	2	2	1	0	0	0	0	0	0
BS	0	-99	-99	0	-99	3	8	-99	-99	-99	-99	-99	3	2	0	-99	0	-99	-99	-99	0	-99	0	0	0	0	-99	0	-99	0	-99	1	0	-99	0	0	0	0	0	0

SITE 1633

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	0	0	0
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	7	4	0	-99	0	0	0	0
BS	-99	-99	-99	-99	-99	-99	-99	3	3	1	2	4	3	0	0	0	-99	0	-99	0	0	0	0	-99	-99	0	1	3	-99	0	-99	-99	6	3	2	1	0	0	0	-99

SITE 1632

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	1	1	1	1	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	6	6	6	6	-99	-99	-99	-99	0	0
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	4	5	0	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	2	1	-99	0	0	0	0	0	0	0	0	0	0	0	-99	-99	0	0	0	0	0	4	4	1	-99	-99	-99	-99	-99

SITE 1631

DY	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	4	-99	-99	-99	-99	-99	-99	-99	-99	1	0	4	1	1	0	1	1	1	-99	-99	-99	-99	0	0	-99	0	0	-99	0	0	0	0	2	6	7	0	0	0	0	-99

Figure 1-7. Con't.

SITE 1635

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	-99	-99	-99	-99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	0	0	0	0	0	0
TP	0	0	0	0	0	0	-99	-99	0	0	0	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	0
BS	0	0	0	-99	0	0	0	-99	-99	0	-99	-99	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	0	0	-99	-99	0	0	-99	0	0	0	0	0	0	0

SITE 1634

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TP	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
BS	0	0	-99	0	0	-99	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	0	0	0	0	-99	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	0

SITE 1633

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	3	3	3	3	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	-99	-99	-99	-99	0	-99	-99	-99	-99	-99	-99	-99	0	-99	0	1	-99	-99	0	0	-99	0	-99	-99	0	3	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0

SITE 1632

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	1	1	1	1	4	4	4	4	-99	-99	-99	-99	0	0	0	0	9	9	9	9	2	2	2	2	-99	-99	-99	-99	2	2	2	2	-99	-99
TP	-99	-99	-99	0	0	0	0	0	0	0	1	1	0	0	0	-99	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	0	0	-99	0	0	0	0	1	2	1	0	0	-99	4	0	-99	0	-99	0	0	3	0	0	-99	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16	16	16	17	17	17	17	18	18	18	18	19	19	19	19	20	20	20	20
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	2	2	2	2	3	3	3	3	-99	-99	-99	-99	0	0	0	0
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	0	5	-99	-99	-99	0	2	4	5	5	-99	-99	3	1	-99	-99	0	-99	-99	0	0	0	-99	0	0	0	0	-99	-99	0	-99	0	0	-99	-99	0	0	0	0

Figure 1-7. Con't.

SITE 1635

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	0	0	0	0	0	0	0	1	0	1	0	0	-99	0	0	0	0	2	1	0	3	4	11	6	2	3	5	2	4	2	0	0	0	0	0	0	-99
BS	-99	-99	-99	0	0	0	0	-99	0	0	0	0	0	0	0	-99	0	0	0	0	-99	0	0	2	4	-99	6	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1634

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	4	4	4	3	3	3	3	0	0	0	0	0	0	0	0	0	0
TP	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	-99	0	0	1	0	4	9	0	1	12	8	5	5	7	6	2	3	1	2	0	0	0	0	0	0
BS	0	-99	0	0	0	0	0	0	0	0	0	0	0	-99	0	0	0	0	0	2	4	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	-99	-99	0

SITE 1633

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	0	0	0	0	14	14	14	14	11	11	11	11	6	6	6	6	1	1	1	1	0	0	0	0	-99	-99
TP	-99	-99	-99	0	0	0	-99	0	0	0	0	0	0	0	0	0	-99	0	-99	-99	-99	5	3	5	9	8	5	4	4	5	2	-99	-99	2	6	0	0	0	0	0
BS	0	0	0	0	0	-99	-99	0	0	0	0	0	0	0	0	0	0	0	3	-99	-99	-99	10	12	11	10	11	10	6	5	-99	6	-99	2	-99	7	0	0	0	0	0

SITE 1632

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	0	0	0	0	-99	-99	-99	-99	0	0	0	0	0	0	0	0	0	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99

SITE 1631

DY	21	21	21	21	22	22	22	22	23	23	23	23	24	24	24	24	25	25	25	25	26	26	26	26	27	27	27	27	28	28	28	28	29	29	29	29	30	30	30	30
HR	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21	3	9	15	21
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	0	0	0	0	-99	-99	
TP	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99
BS	0	0	-99	0	0	0	0	-99	-99	0	0	0	0	0	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	-99	3	21	10	0	0	-99	0	0	0	0	-99	-99	-99	-99

2. SAMPLING AT REMOTE SITES

2.1 Introduction

In an attempt to investigate very long-range transport and the hemispheric background of tracers released during ANATEX, the ground-level sampling program included weekly measurements taken at 12 "remote" sites far downwind of the 77 primary sites. Weekly sampling at these remote sites was extended beyond the last March 29 daily sample collection, to investigate the build-up of tracer background on the hemispheric scale. The 12 remote sites are listed in Table 2-1 and shown in Fig. 2-1. The sites are combined by region as follows:

a) #1 , Bermuda
b) #2 to #6, western Europe
c) #7 to #12, western North America

Table 2-1. Remote Sampling Sites

Site #	WMO* #	Site Name	Country	Lat °N	Long °W	Elev m (msl)
1	780160	Bermuda	Bermuda	32.4	64.7	6
2	600300	Las Palmas	Canary Is.	27.9	15.4	25
3	085360	Lisbon	Portugal	38.8	9.1	123
4	037630	Bracknell	England	51.4	0.8	74
5	013110	Bergen	Norway	60.3	5.2	50
6	010250	Tromso	Norway	69.7	18.9	10
7	----	Mt Laguna	U.S.(CA)	32.8	116.4	~1200
8	725940	Eureka	U.S.(CA)	40.8	124.2	18
9	----	Bainbridge Is	U.S.(WA)	47.6	122.5	24
10	703810	Juneau	U.S.(AK)	58.4	134.6	7
11	702610	Fairbanks	U.S.(AK)	64.8	148.0	216
12	700260	Pt Barrow	U.S.(AK)	71.4	156.5	4

*World Meteorological Organization

2.2 Sampling

The weekly sampling period at remote sites lasted for 22 weeks starting January 5, 1987 and ending June 8, 1987. Each site sampled for 18 weeks, but some sites delayed starting for several weeks (thus the 22-week overall sampling duration) due to delays in arrival of equipment because of clearance through local customs, mechanical malfunction of equipment, or sampler site location placement problems. The sampling system was described in Section 1.2.

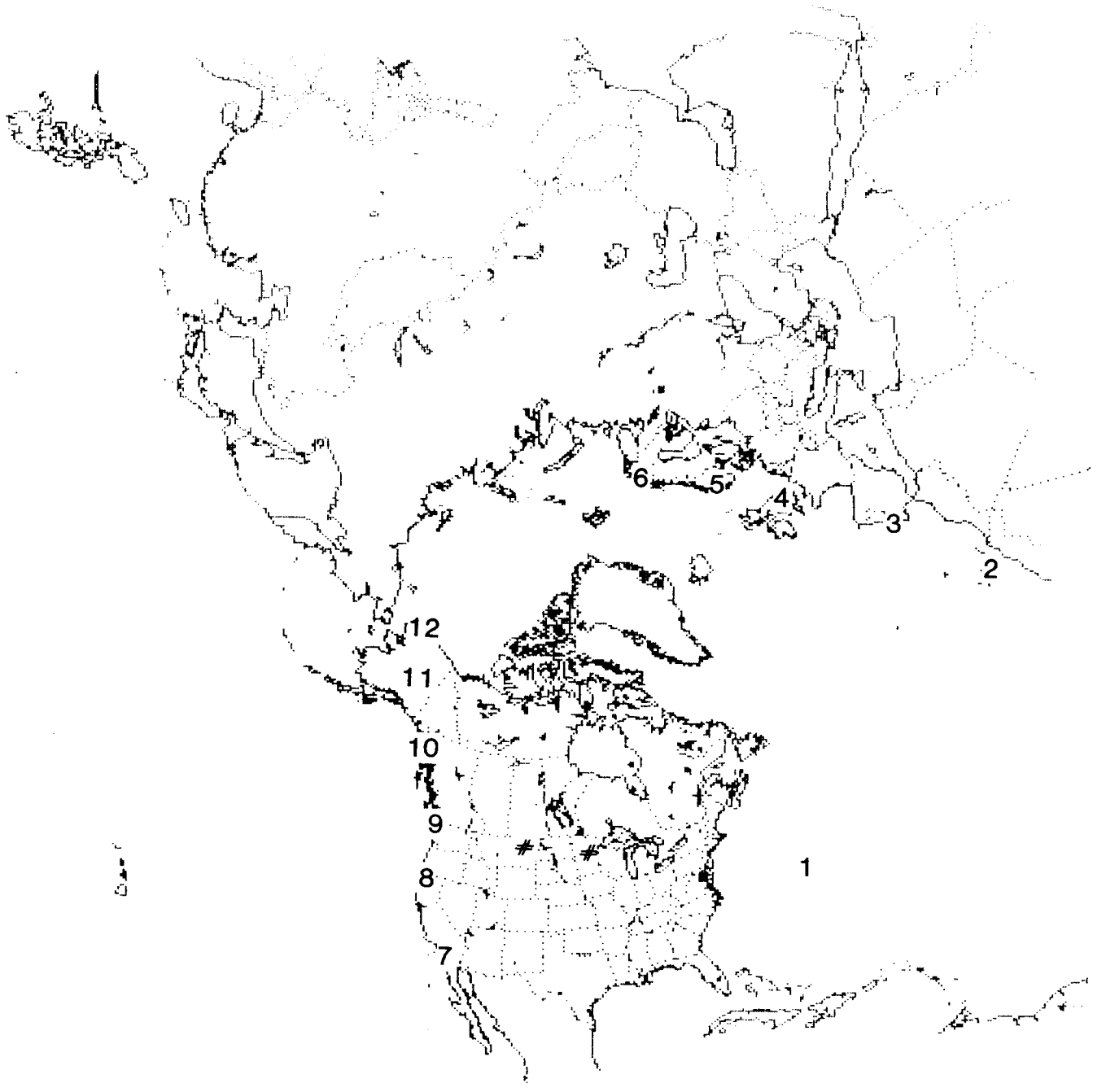

Figure 2-1. Remote sampling site locations (site number) with tracer release sites (#).

2.3 Concentration Calculations

Weekly-averaged concentrations at the remote sites were expected to be only slightly elevated above background, even in the presence of tracer directly attributed to a release (pluming). Background build-up, toward the end of the experiment, was also expected to be relatively small (see Section 2.4). Therefore, the correct determination of the sampled air volume was considered essential for determining tracer concentration. Since previously calibrated flow rates were often found unrepresentative of the amount of air drawn through a sampling tube (Section 6.2, Draxler and Heffter, 1989), the technique described here was used to calculate the air volume for each sample.

In the absence of tracer plumes, the ambient background concentration B_T of a tracer can be represented by the 50th percentile of the cumulative frequency distribution of V_T/V_A, determined from all sites over all sampling weeks, where V_T is the measured tracer volume and V_A is the calibrated air volume. Background concentrations were calculated only for PMCH, mPDCH, and pPDCH, perfluorocarbons not expected to be detected above background level at the sites. (PMCH, which was released, had high ambient levels, and mPDCH and pPDCH were not released.) Calculated values were $B_{PMCH} = 3.5$, $B_{mPDCH} = 14.0$, and $B_{pPDCH} = 4.6$; similar to those values reported for the primary sampling network (Section 6.3, Draxler and Heffter, 1989).

A "calculated" air volume V_A' for each sample was then determined as the average of the slopes from the origin through each tracer point on a tracer volume versus tracer background plot (see Fig 2-2). An uncertainty in calculating V_A' was estimated by applying this same technique separately to individual tracer pairs (i.e., PMCH and pPDCH, PMCH and mPDCH, pPDCH and mPDCH).

A tracer concentration for a sample is then V_T/V_A'. Concentration values (dfL/L) by remote site number and sequential week are given in Table 2-2 for oPDCH and Table 2-3 for PTCH. The center display in each table shows the calculated values. Uncertainty limits due to air volume calculations are included for each concentration value; the top display for the upper uncertainty (dfL/L) and the bottom display for the lower uncertainty (dfL/L). Values of 100 dfL/L or more are coded 99.9 and missing or questionable values are coded -9.9.

Concentration values with uncertainty limits included are combined by location and plotted in Figs. 2-3 and 2-4.

2.4 Discussion

Unfortunately, excessive data scatter due to analysis uncertainty, along with uncertainties due to air volume calculations, complicate data interpretation. Site 4 seems to be the epitome of these undesired characteristics for the entire 22-week period. The site should probably be disregarded. Luckily, the other sites reflect these characteristics for smaller portions of the experimental period. Most of these are obvious since they are totally uncharacteristic of surrounding periods. Examples are sites 2 and 3--weeks 1 through 7--and site 12 (oPDCH)--weeks 10 through 17. Less

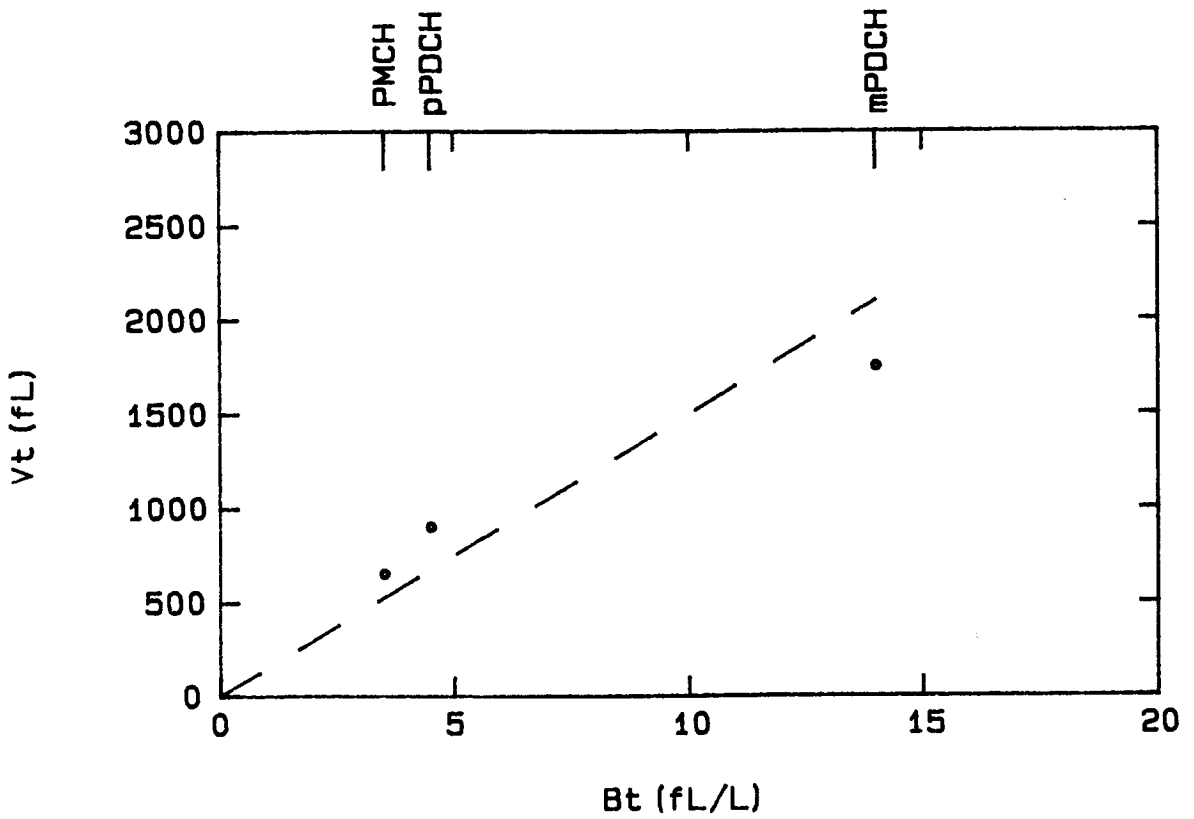

Figure 2-2. Example of plot used in calculating the air volume V_A'. The dashed line is the average of the slopes from the origin through each tracer point. Vt = tracer volume, Bt = calculated background concentration for perfluorocarbons PMCH, pPDCH, and mPDCH. In this case V_A' is about 150 L.

Table 2-2. Weekly oPDCH concentrations (dfL/L) - middle, with uncertainties (dfL/L) - top and bottom. Values of 100 dfL/L or more are coded 99.9 and missing or questionable values are coded -9.9.

WEEK / SITE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	-9.9	-9.9	-9.9	-9.9	13.9	0.8	1.1	0.2	0.5	1.2	0.2	1.3	1.3	1.0	1.9	2.1	2.2	2.0	1.4	1.6	1.0	2.5
2	-9.9	-9.9	99.9	16.1	-9.9	99.9	99.9	1.8	1.5	1.6	0.8	1.3	1.8	1.7	3.4	4.0	0.2	0.1	-9.9	-9.9	-9.9	-9.9
3	70.4	0.0	99.9	-9.9	-9.9	44.6	39.2	4.6	2.3	1.0	0.9	0.6	1.3	1.0	2.2	1.4	1.5	1.5	-9.9	-9.9	-9.9	-9.9
4	-9.9	1.7	4.3	0.2	3.5	1.7	0.8	6.8	0.3	3.4	5.0	4.5	1.9	1.7	10.3	3.0	1.0	1.7	1.3	-9.9	-9.9	-9.9
5	2.9	0.5	0.0	0.3	0.6	0.3	0.4	0.5	0.1	0.8	0.3	10.7	1.6	1.0	0.1	0.5	0.4	0.9	-9.9	-9.9	-9.9	-9.9
6	2.7	0.6	3.0	0.6	0.7	1.0	0.7	0.6	0.7	0.7	0.5	0.9	0.4	1.0	0.4	3.0	-9.9	0.9	-9.9	-9.9	-9.9	-9.9
7	-9.9	-9.9	-9.9	0.1	0.2	0.1	0.1	0.2	0.7	0.1	0.2	0.3	0.2	0.2	0.2	0.1	1.6	3.3	4.6	3.9	-9.9	-9.9
8	1.2	0.2	0.2	0.4	1.0	0.8	0.4	0.5	1.0	0.6	-9.9	0.6	0.8	0.7	0.5	0.7	0.5	1.2	-9.9	-9.9	-9.9	-9.9
9	30.8	39.3	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.2	0.7	-9.9	-9.9	-9.9	-9.9
10	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.3	0.5	0.3	0.3	0.2	0.1	0.2	0.5	0.3	0.4	0.2	-9.9	-9.9	-9.9	-9.9
11	0.2	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.2	0.2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	-9.9	-9.9	-9.9	-9.9
12	0.7	5.4	0.1	0.1	0.1	0.2	0.3	0.0	0.0	2.5	2.5	2.5	0.3	1.7	15.8	2.3	2.1	-9.9	-9.9	-9.9	-9.9	-9.9

WEEK / SITE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	-9.9	-9.9	-9.9	-9.9	27.4	8.3	8.5	6.3	8.0	8.6	6.5	9.5	9.1	8.5	9.9	10.8	10.9	10.9	10.1	10.0	9.4	12.4
2	-9.9	-9.9	9.7	3.1	-9.9	13.3	8.0	9.5	9.1	9.4	8.0	9.0	9.9	9.9	12.5	13.5	2.7	2.6	-9.9	-9.9	-9.9	-9.9
3	10.9	35.0	18.2	-9.9	-9.9	13.0	16.8	51.6	9.8	7.9	7.8	7.4	9.0	8.3	10.6	9.5	10.0	10.4	-9.9	-9.9	-9.9	-9.9
4	-9.9	12.3	12.1	4.7	4.7	14.3	3.3	4.8	2.7	6.3	4.8	6.1	5.0	5.0	9.0	11.9	9.0	10.5	7.3	-9.9	-9.9	-9.9
5	11.5	7.1	5.5	6.0	6.7	5.9	6.4	6.4	5.7	7.2	6.5	14.6	9.3	8.2	6.0	7.0	6.8	8.1	-9.9	-9.9	-9.9	-9.9
6	9.9	6.1	9.3	5.9	6.1	6.9	6.3	6.4	7.0	6.9	6.8	7.5	6.7	8.1	6.8	11.8	-9.9	8.7	-9.9	-9.9	-9.9	-9.9
7	-9.9	-9.9	-9.9	4.6	4.2	4.1	3.3	3.7	3.1	4.4	3.3	4.2	4.1	5.6	4.9	4.5	7.9	9.2	10.0	9.6	-9.9	-9.9
8	9.7	6.1	5.8	6.2	7.3	7.3	6.5	6.7	8.0	7.6	-9.9	7.8	8.6	8.2	7.7	8.5	8.1	9.8	-9.9	-9.9	-9.9	-9.9
9	72.3	26.6	6.4	5.0	6.1	5.1	4.7	4.3	5.2	5.4	5.0	5.3	5.9	5.8	5.3	5.7	6.1	7.6	-9.9	-9.9	-9.9	-9.9
10	5.8	3.3	3.5	2.9	3.1	3.7	3.9	4.0	5.5	3.6	4.0	4.0	4.4	3.6	4.5	4.3	4.6	4.2	-9.9	-9.9	-9.9	-9.9
11	5.5	4.9	4.0	2.9	3.1	2.9	3.0	3.0	3.7	4.0	3.6	3.6	3.5	3.4	3.4	3.4	3.5	3.5	-9.9	-9.9	-9.9	-9.9
12	7.9	12.0	5.0	4.3	4.2	4.5	3.7	4.9	5.3	11.1	11.6	12.2	7.1	11.2	25.7	12.4	12.1	-9.9	-9.9	-9.9	-9.9	-9.9

WEEK / SITE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	-9.9	-9.9	-9.9	-9.9	8.0	0.4	0.6	0.3	0.3	0.8	0.1	0.5	0.6	0.8	1.2	0.9	0.9	1.2	0.7	1.1	0.5	1.2
2	-9.9	-9.9	3.2	1.0	-9.9	4.4	2.7	1.0	0.8	0.8	0.5	0.7	0.9	0.8	1.4	1.6	0.2	0.2	-9.9	-9.9	-9.9	-9.9
3	3.6	35.0	6.1	-9.9	-9.9	4.3	5.6	6.9	1.3	0.5	0.7	0.3	0.6	0.5	1.3	0.8	0.8	0.7	-9.9	-9.9	-9.9	-9.9
4	-9.9	1.2	1.8	0.1	0.9	2.3	0.9	1.5	0.2	2.0	1.1	1.7	0.7	0.7	2.6	1.6	0.6	1.4	0.9	-9.9	-9.9	-9.9
5	1.4	0.3	0.0	0.3	0.4	0.2	0.3	0.4	0.1	0.3	0.2	3.4	1.0	0.5	0.2	0.2	0.2	0.5	-9.9	-9.9	-9.9	-9.9
6	1.2	0.3	1.2	0.4	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.5	0.3	0.5	0.4	1.2	-9.9	0.6	-9.9	-9.9	-9.9	-9.9
7	-9.9	-9.9	-9.9	0.2	0.2	0.2	0.2	0.3	0.4	0.2	0.2	0.3	0.3	0.2	0.1	0.2	0.6	1.2	1.5	1.6	-9.9	-9.9
8	0.6	0.1	0.2	0.4	0.6	0.5	0.3	0.3	0.5	0.3	-9.9	0.3	0.5	0.4	0.2	0.6	0.5	0.8	-9.9	-9.9	-9.9	-9.9
9	12.6	8.9	0.1	0.1	0.1	0.0	0.1	0.2	0.0	0.2	0.1	0.1	0.2	0.1	0.1	0.2	0.2	0.4	-9.9	-9.9	-9.9	-9.9
10	0.1	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.4	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.2	-9.9	-9.9	-9.9	-9.9
11	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.2	-9.9	-9.9	-9.9	-9.9
12	0.6	1.7	0.1	0.1	0.2	0.1	0.2	0.0	0.0	1.1	1.0	1.1	0.4	0.8	4.1	0.9	0.8	-9.9	-9.9	-9.9	-9.9	-9.9

Table 2-3. Same as Table 2-2 for PTCH.

WEEK / SITE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	-9.9	-9.9	-9.9	-9.9	0.9	0.1	0.2	0.1	0.1	0.2	0.0	0.3	0.2	0.2	-9.9	0.2	-9.9	-9.9	0.2	0.2	0.2	0.3
2	99.9	-9.9	99.9	42.9	-9.9	-9.9	-9.9	0.2	0.2	0.2	-9.9	0.2	0.2	0.2	-9.9	0.3	0.1	0.1	-9.9	-9.9	-9.9	-9.9
3	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	0.1	0.2	0.1	0.2	0.1	-9.9	0.2	0.2	0.2	0.2	0.2	-9.9	-9.9	-9.9	-9.9
4	-9.9	0.3	1.8	0.1	1.2	0.2	0.6	6.7	0.1	1.9	0.9	2.0	0.4	0.4	1.2	0.2	0.2	0.2	0.2	-9.9	-9.9	-9.9
5	0.3	-9.9	0.0	0.1	0.1	0.1	0.1	-9.9	0.0	0.2	0.1	-9.9	0.2	0.2	0.0	0.2	0.1	-9.9	-9.9	-9.9	-9.9	-9.9
6	-9.9	0.2	-9.9	0.2	0.2	0.2	-9.9	0.2	0.2	0.2	0.2	0.3	0.1	0.2	-9.9	-9.9	-9.9	0.2	-9.9	-9.9	-9.9	-9.9
7	-9.9	-9.9	-9.9	0.0	0.1	0.1	0.1	0.1	0.4	0.0	-9.9	0.1	0.1	0.1	0.1	0.0	0.1	-9.9	-9.9	-9.9	-9.9	-9.9
8	0.1	-9.9	0.0	0.1	0.1	0.1	0.1	0.4	0.1	0.1	-9.9	0.1	0.1	0.1	0.1	0.1	0.1	0.2	-9.9	-9.9	-9.9	-9.9
9	-9.9	-9.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.1	-9.9	-9.9	-9.9	-9.9
10	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.4	-9.9	0.1	0.1	0.1	0.1	0.4	0.2	0.2	0.1	-9.9	-9.9	-9.9	-9.9
11	0.1	0.1	-9.9	0.1	0.1	-9.9	-9.9	0.1	-9.9	0.1	0.1	-9.9	0.1	0.1	0.1	0.1	0.1	0.1	-9.9	-9.9	-9.9	-9.9
12	0.2	-9.9	0.0	0.0	0.1	-9.9	0.1	0.0	0.0	0.3	0.3	0.4	0.1	0.2	0.8	0.2	0.3	-9.9	-9.9	-9.9	-9.9	-9.9

WEEK / SITE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	-9.9	-9.9	-9.9	-9.9	1.8	1.3	1.5	1.5	1.7	1.6	1.8	2.0	1.8	1.7	-9.9	0.9	-9.9	-9.9	1.3	1.5	1.6	1.3
2	99.9	-9.9	77.8	8.3	-9.9	-9.9	-9.9	1.1	1.0	1.2	-9.9	1.2	1.2	1.3	-9.9	0.9	2.1	2.0	-9.9	-9.9	-9.9	-9.9
3	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	1.5	1.0	1.1	1.5	1.6	-9.9	1.4	1.1	1.1	1.2	1.2	-9.9	-9.9	-9.9	-9.9
4	-9.9	2.5	5.1	2.0	1.5	1.9	2.2	4.7	0.5	3.5	0.9	2.6	1.2	1.1	1.0	0.9	1.7	1.1	1.2	-9.9	-9.9	-9.9
5	1.1	-9.9	1.7	1.6	1.0	1.6	1.6	-9.9	1.8	1.4	2.2	-9.9	1.1	1.6	2.5	2.4	2.1	-9.9	-9.9	-9.9	-9.9	-9.9
6	-9.9	1.5	-9.9	1.5	1.7	1.7	-9.9	1.9	2.0	1.8	2.2	2.1	1.9	1.9	-9.9	-9.9	-9.9	1.6	-9.9	-9.9	-9.9	-9.9
7	-9.9	-9.9	-9.9	1.7	1.8	1.8	2.0	1.8	1.9	1.9	-9.9	2.3	1.9	1.8	1.9	1.4	0.5	-9.9	-9.9	-9.9	-9.9	-9.9
8	1.0	-9.9	0.8	1.1	1.0	0.9	1.3	5.3	1.2	1.2	-9.9	1.2	1.4	1.5	1.4	1.5	1.5	1.5	-9.9	-9.9	-9.9	-9.9
9	-9.9	-9.9	1.3	1.4	1.1	1.3	1.7	2.2	1.5	1.5	1.7	1.9	1.6	1.5	1.7	1.9	1.7	1.3	-9.9	-9.9	-9.9	-9.9
10	1.2	1.4	1.8	1.6	2.1	2.0	1.9	2.2	4.1	-9.9	2.2	2.5	2.5	2.2	3.3	2.4	2.1	2.2	-9.9	-9.9	-9.9	-9.9
11	1.6	1.1	-9.9	1.4	1.8	-9.9	-9.9	1.9	-9.9	2.2	2.1	-9.9	2.2	2.3	2.5	2.0	2.2	2.1	-9.9	-9.9	-9.9	-9.9
12	1.7	-9.9	1.3	1.4	1.5	-9.9	1.9	1.4	1.7	1.3	1.2	1.8	1.5	1.6	1.3	1.3	1.7	-9.9	-9.9	-9.9	-9.9	-9.9

WEEK / SITE	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	-9.9	-9.9	-9.9	-9.9	0.5	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.2	-9.9	0.1	-9.9	-9.9	0.1	0.2	0.1	0.1
2	60.9	-9.9	25.9	2.8	-9.9	-9.9	-9.9	0.1	0.1	0.1	-9.9	0.1	0.1	0.1	-9.9	0.1	0.2	0.2	-9.9	-9.9	-9.9	-9.9
3	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	-9.9	0.2	0.1	0.1	0.1	0.1	-9.9	0.1	0.1	0.1	0.1	0.1	-9.9	-9.9	-9.9	-9.9
4	-9.9	0.2	0.8	0.1	0.3	0.3	0.6	1.5	0.0	1.1	0.2	0.7	0.2	0.1	0.3	0.1	0.1	0.1	-9.9	-9.9	-9.9	-9.9
5	0.1	-9.9	0.0	0.1	0.1	0.1	0.1	-9.9	0.0	0.1	0.1	-9.9	0.1	0.1	0.1	0.1	0.1	-9.9	-9.9	-9.9	-9.9	-9.9
6	-9.9	0.1	-9.9	0.1	0.1	0.1	-9.9	0.1	0.1	0.1	0.1	0.1	0.1	0.1	-9.9	-9.9	-9.9	0.1	-9.9	-9.9	-9.9	-9.9
7	-9.9	-9.9	-9.9	0.1	0.1	0.1	0.1	0.1	0.2	0.1	-9.9	0.1	0.1	0.1	0.0	0.0	0.0	-9.9	-9.9	-9.9	-9.9	-9.9
8	0.1	-9.9	0.0	0.1	0.1	0.1	0.1	0.3	0.1	0.0	-9.9	0.1	0.1	0.1	0.0	0.1	0.1	0.1	-9.9	-9.9	-9.9	-9.9
9	-9.9	-9.9	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1	-9.9	-9.9	-9.9	-9.9
10	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.3	-9.9	0.1	0.2	0.1	0.1	0.2	0.1	0.2	0.1	-9.9	-9.9	-9.9	-9.9
11	0.0	0.0	-9.9	0.1	0.1	-9.9	-9.9	0.1	-9.9	0.1	0.1	-9.9	0.1	0.2	0.2	0.1	0.2	0.1	-9.9	-9.9	-9.9	-9.9
12	0.1	-9.9	0.0	0.0	0.1	-9.9	0.1	0.0	0.0	0.1	0.1	0.2	0.1	0.1	0.2	0.1	0.1	-9.9	-9.9	-9.9	-9.9	-9.9

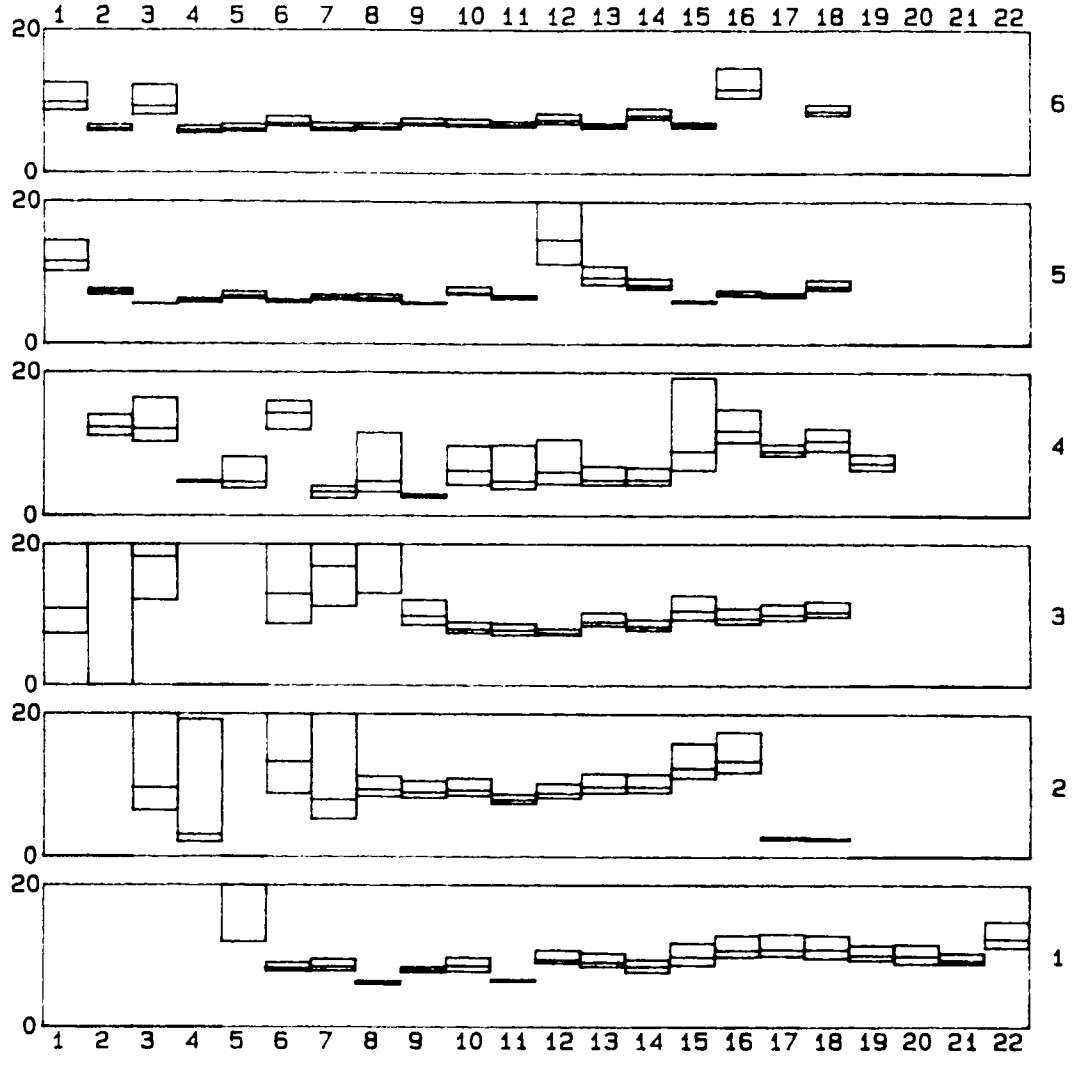

Figure 2-3. Weekly oPDCH concentrations and uncertainty limits (dfL/L) for Bermuda (1) and western Europe (2-6) sites.

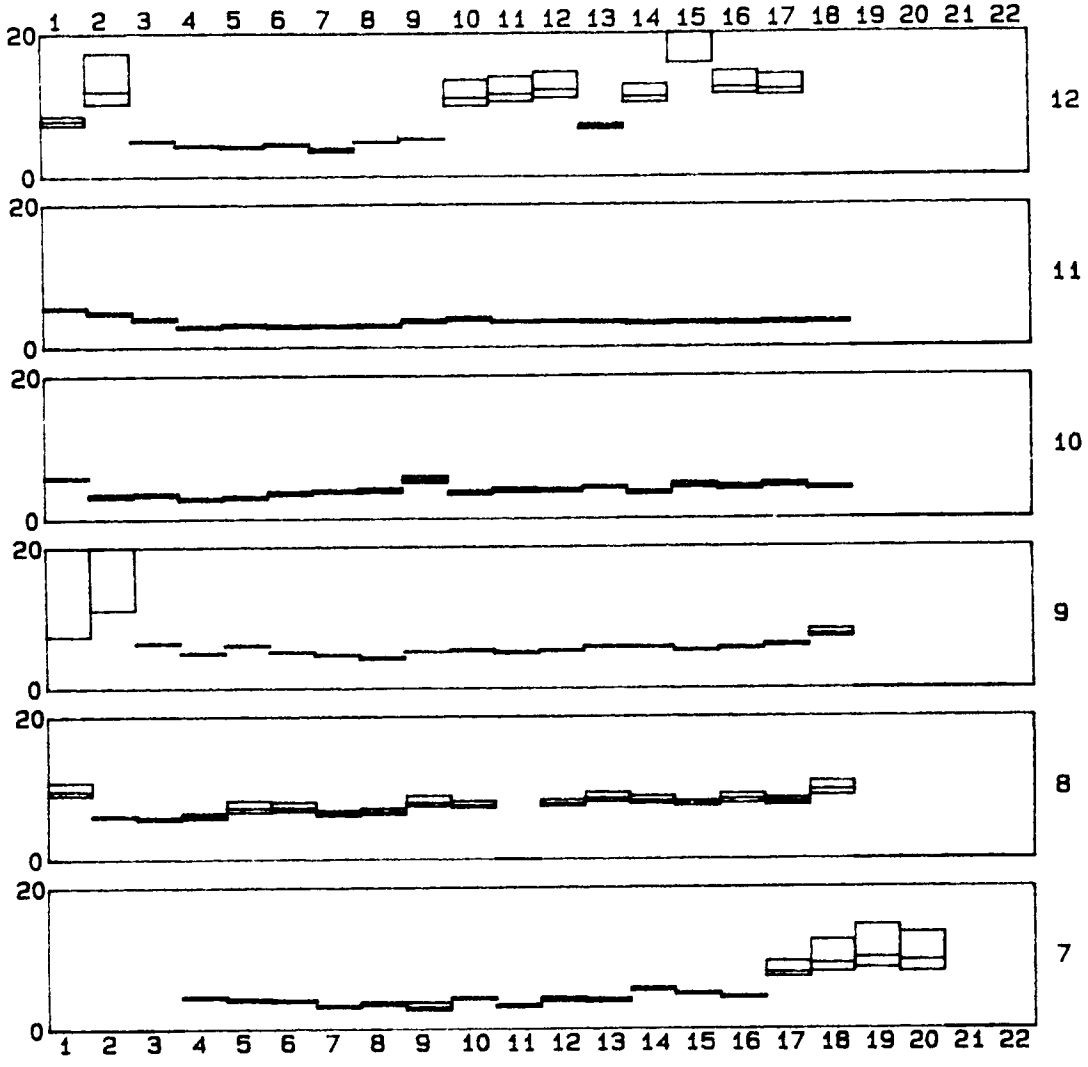

Figure 2-3. Con't. For western North America (7-12) sites.

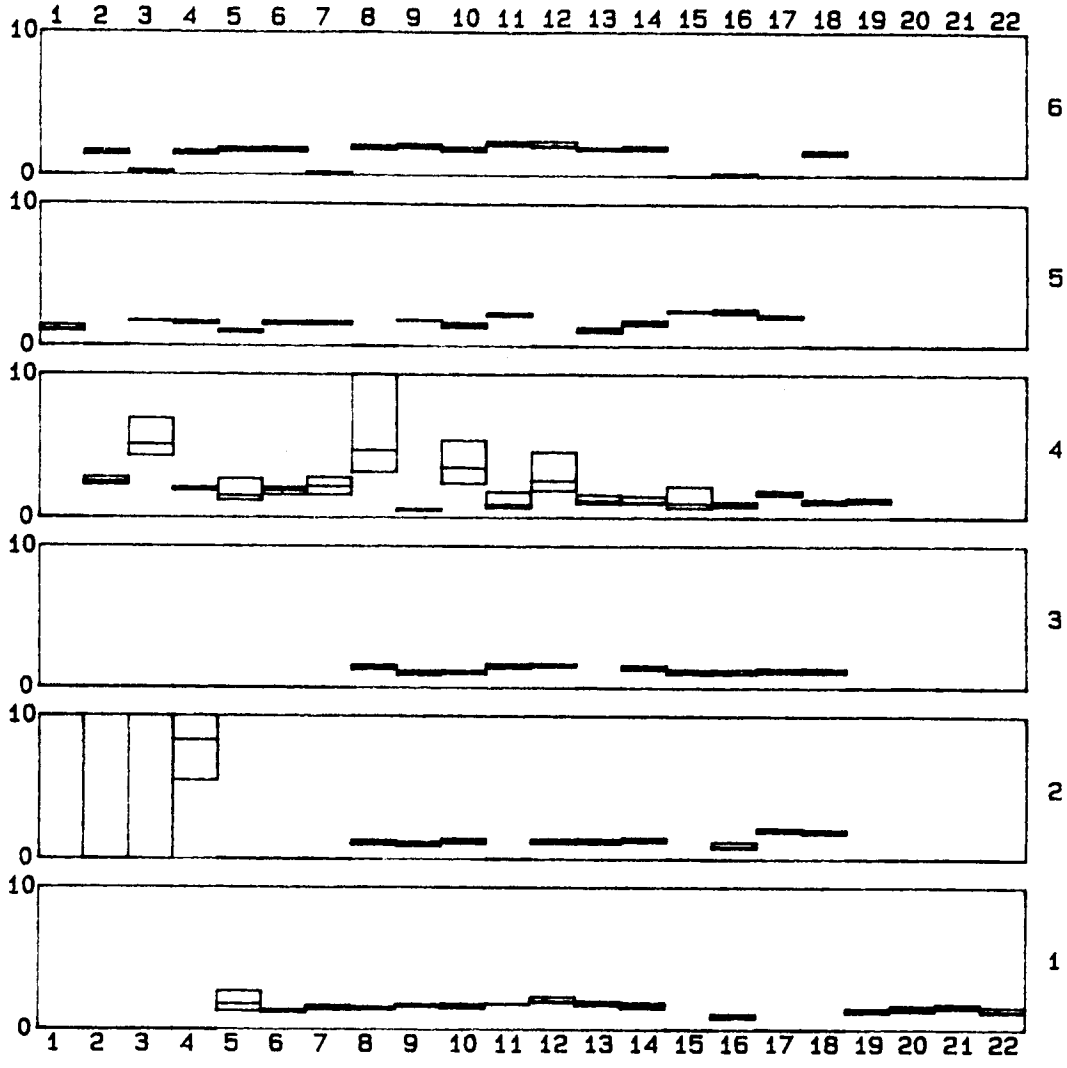

Figure 2-4. Same as Fig. 2-3 for PTCH.

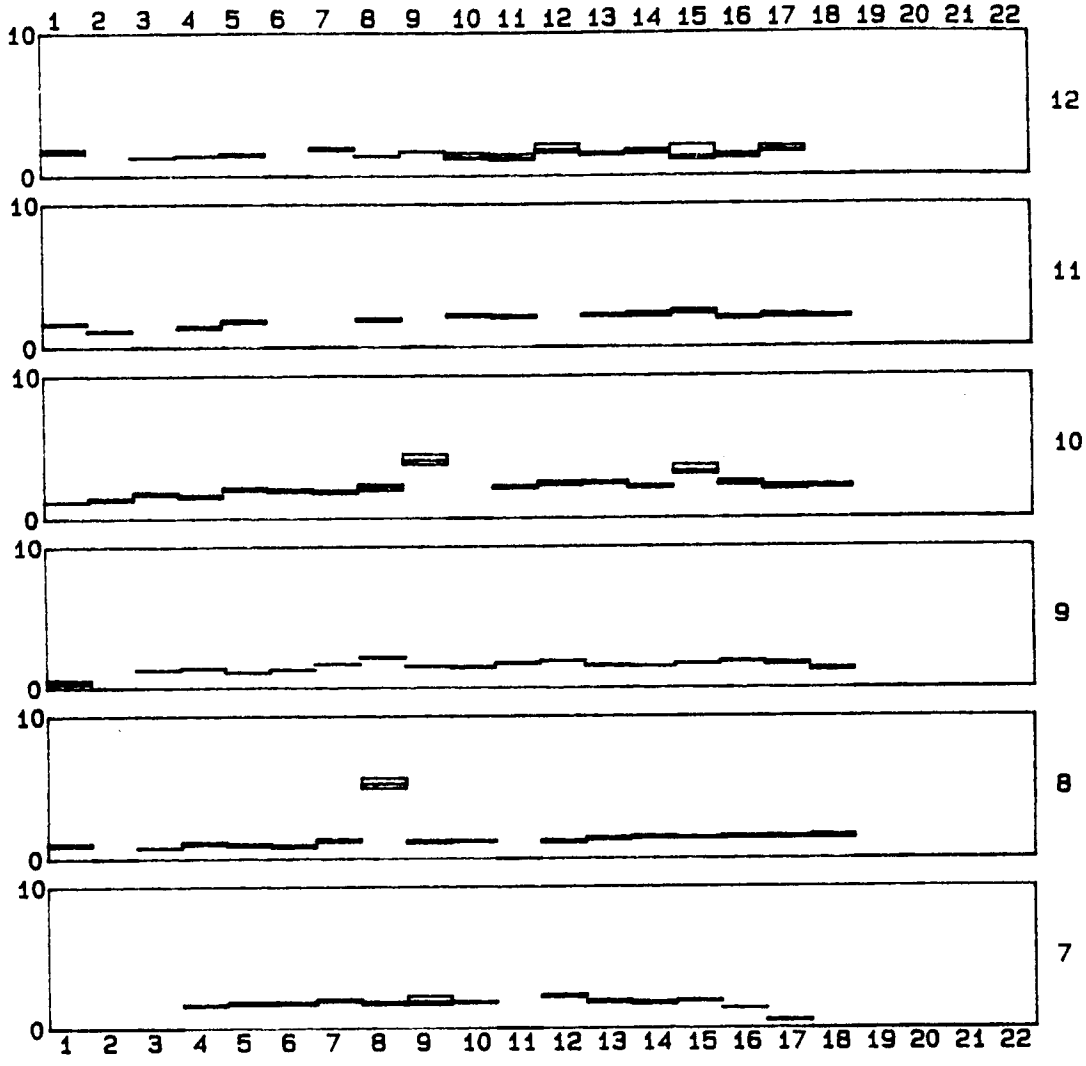

Figure 2-4. Con't. Same as Fig. 2-3 (con't.) for PTCH.

obvious would be the apparent excesses of oPDCH concentration at site 5 during weeks 12 through 14. This might be due to data scatter and air volume uncertainty (week 12 is especially suspicious) or there might be oPDCH pluming. Similarly, there might be slight oPDCH background build-up at sites 1, 2, and 3 starting week 12, depending on the interpretation of scatter and uncertainty.

However, one feature in the data seems to stand out. PTCH pluming is clearly evident at sites 8 and 10 for weeks 8 and 9, respectively (less intensive pluming at site 9 for week 8 might be inferred considering surrounding values in time and space). Another pluming possibility might be oPDCH at site 10 during week 9. The isolated elevated PTCH value at site 10 during week 15 seems out of place with surrounding measurements, especially since the last tracer release occurred at the end of week 12.

One other phenomenon in the data should be mentioned. oPDCH background seems consistently higher for Bermuda and western Europe than for western North America (with the exception of site 8). At early time this might be explained by the fact that Europe is closer in a downwind sense to the source. However, with no equilibrium in time reached between areas, added to the exception at site 8, one cannot adequately explain this phenomenon. This, therefore, casts doubt on the indication of background build-up noted above. This phenomenon cannot be seen at all in the PTCH data, which is curious since twice as much PTCH as oPDCH was released. However, since the PTCH data were consistent in this respect, a useful result ensues.

During the ANATEX planning period, a question arose whether the hemispheric build-up of concentration toward the end of the experiment, would mask weak pluming over the primary sampling sites. A calculated long-term hemispheric background concentration B, assuming uniform mixing, was determined by:

$$B = Q / (A_z D)$$

where Q is the total tracer emission, A_z the area of a latitudinal zone, and D the vertical depth. A plot of the calculated PTCH background as a function of latitudinal zone and depth is given in Fig. 2.5. We estimated the most likely mixing scenario would extend above 5 km in depth and below 20°N (i.e., beyond a 20° to 90° lat. zone, the hatched area in Fig. 2-4. Thus, a background build-up was estimated to be no more than 1 to 2 dfL/L, with little effect on plume detection at the primary sites. The measured PTCH background values from Table 2-3, at levels below about 2 dfL/L, justify the assumption.

2.5 Conclusions

Sampling at the remote sites during ANATEX was in itself successful, but the overall results were somewhat disappointing, because of scatter due to analysis and uncertainties due to air volume calculations. One instance of PTCH pluming was clearly detected at several western North American sites. No background build-up was detected (the level might have been within the data noise levels), and a comparison of average calculated oPDCH background values for western Europe and western North America gave inconsistencies that cannot

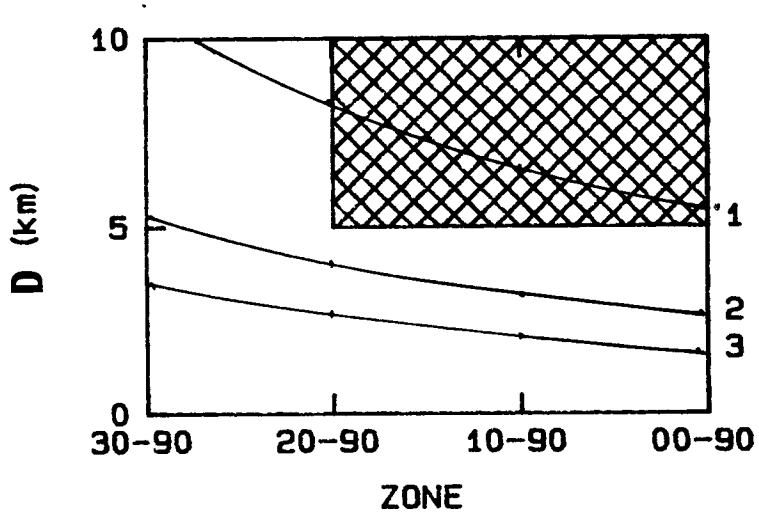

Figure 2-5. Calculated PTCH background values (dfL/L) as a function of latitudinal zone (^{o}lat.) and vertical depth D (km). The estimated most-likely mixing scenario is hatched.

be adequately explained. However, the more consistent PTCH background values justified an assumption that hemispheric mixing extended above 5 km and below 20°N with little effect on plume detection at the primary sites.

All the data and known uncertainties and given here. It is emphasized that modelers should use these data with caution, even considering the known uncertainties.

3. ACKNOWLEDGEMENTS

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We want to thank North American Weather Consultants, Salt Lake City, Utah for coordinating the tower sampling program. Of course, we are extremely grateful to the dedicated tower climbers, especially those at Madison, Wisconsin, and Green Bay, Wisconsin, who collected the tower top samples, even under adverse weather conditions (chiseling through ice to change a sampler).

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