# III. THREE-HOUR SAMPLING PERIODS: DIURNAL PROFILES OF THE MUTAGENICITY OF AMBIENT POM COLLECTED DURING SUMMER AND WINTER

## A. Introduction

The behavior of the mutagenicity of ambient particles in the SCAB as a function of time of day was investigated using collection periods of three hours. The resolution obtained in this work more closely approaches the ideal of continuous monitoring capability, routinely applied to other components of polluted air, than any other similar study performed to date. The diurnal concentration profiles of the more commonly measured pollutants, such as NO, $NO_2$, $O_3$, $SO_2$, CO, PAN, have been established by such continuous monitoring efforts (Hoggan et al., 1980), and these profiles have helped determine the atmospheric chemistry of such pollutants. The patterns displayed by particulate mutagenicity may be correlated to these gas phase pollutant trends, and thus provide information concerning the sources and atmospheric fate of mutagenic POM. This information will be useful, for example, in establishing the influence of atmospheric reactions on the mutagenicity of ambient POM and will also serve to identify periods of highest potential risk associated with the inhalation of mutagenic material by the public. In addition, the data may provide some insights into the previously observed trend towards increased levels of mutagen density during nighttime hours, and should reveal the extent of short-term variation in this value to complement the pattern of large longer-term changes we have previously observed. The study is also designed to assess the extent of error involved in routine 24-hour collections due to chemical reaction or other loss of mutagenic material during particulate filtration, by comparing the sum of the short-term measurements with that derived from a simultaneous 24-hour collection on a single filter.

## B. Procedures and Results

### 1. Sampling of Airborne Particles

#### a. Procedures

Sites. The three sites used for sample collection were chosen to examine an air mass as it was transported through the SCAB, and thus each site represents a specific "age" of smog. The Los Angeles site, CSULA, just east of downtown Los Angeles, is predominately downwind of a major source of primary vehicular emissions, and represents "new" smog. Here the ratio of primary to secondary particulate matter should be the highest. The actual sampling site was the west side of the roof of the Physical Science Building, some 30 meters above ground level. Following an established trajectory, an air mass originating in downtown Los Angeles generally travels eastward along the base of the San Gabriel Mountains. Thus Claremont, some 30 miles eastward, would represent an "intermediate age" smog receptor site. This collection station was located on the west edge of the roof of the Jacobs Science Center of Harvey Mudd College (HMC), about 10 meters above ground level. Finally, under the usual meteorological conditions, the air mass passing through Claremont travels to Riverside, located some 25 miles southeast. Regardless of the exact pollutant source, Riverside is considered to be primarily an "aged" smog receptor area. The air pollutants emitted in the 0600-0900 a.m. emission period at Los Angeles arrive at this site photochemically "well-aged" after approximately eight hours in transit. The samplers at Riverside were on the roof (four meters above the ground level) of the California Air Resources Board Mobile Laboratory for Air Pollution Research (ARBML) located at the University of California campus (UCR).

Samplers. Six standard hi-vol samplers (Sierra Model 305-2000) were located at each site. By means of a special adapter on the motor housing, the exhaust was routed away from the sampler with 5 meters of 4-inch dryer ducting. This was done to prevent the exhaust from being recirculated into the inlet. Sampling rates were set and maintained at 40 SCFM by use of a Sierra Model 330 orifice plate flow measuring device and Sierra Model 310 mass flow controllers.

Filters. Teflon-impregnated glass fiber filters (Pallflex T60A20) were used for the particulate collections. This filter type was chosen for its ease of extraction, low background, and presumed inertness [although comparison studies conducted during the previous grant period showed no artifact that could be ascribable to filter media composition (Pitts et al. 1980)]. Prior to use, all filters were thoroughly extracted with $CH_2Cl_2$ and $CH_3OH$, dried under vacuum, equilibrated at $75^{o}F$ and 50% RH and then weighed. The filters were stored in solvent-washed aluminum foil; after the collection period they were folded, rewrapped in the foil and stored at -20°C. All filters were again allowed to equilibrate at 75°F and 50% RH, reweighed, and then placed in the freezer prior to extraction.

Sampling Period. The sampling protocol was set up such that five of the samplers at each site ran the nominal three hours between filter changes while the sixth was operated the entire 24 hours without filter replacement. During filter changes all hi-vols were shut off simultaneously (including the 24-hour sampler); the filters were then changed and all samplers were restarted at the same time. In this way, the eight short-term collection times total exactly the collection time of the long-term sample.

b. Results

The raw filter weights and calculated particulate loading are shown in Tables 9 and 10 for the September 12 and 17, 1980 collections, and Table 11 for the March 11-12, 1981 collection. Except for four outlying values, the TSPs collected by the parallel running samplers were in quite good agreement. It was not necessary to use these four back-up filters for extraction because three of the five were found to provide sufficient sample for mutagen testing.

2. Extraction and Sample Handling Procedures

The three filters from each short-term sampling interval at each site which most closely matched in particulate mass were combined and extracted in the usual way (see Section II C), but using 200 ml aliquots of solvent rather than 150 ml. This change was made to compensate for the greater hold-up of solvent in the filter material in order to assure complete extraction. The long-term (24-hour) sample was handled in an identical manner. One-sixth of the extract from the long-term filter at all three sites for the September 12, 1980 and the March 12, 1981 collections was set aside for polycyclic aromatic hydrocarbon (PAH) analysis.

3. Quantitation of Six Selected Polycyclic Aromatic Hydrocarbons by Gas Chromatography/Mass Spectrometry

a. Procedures

The Finnigan Model 3200 GC/MS used for this study was fitted with a 0.25 mm x 30 m fused silica SE-54 capillary column. Data was acquired with the Finnigan Model 6100 data system in the mass fragmentography mode. Peak areas were also determined using the 6100 data

Table 9. Collected Mass and Particulate Loadings for September 12, 1980 Collection

| Sampler Number | 000-0300 PST | 0300-0600 PST | 0600-0900 PST | 0900-1200 PST | 1200-1500 PST | 1500-1800 PST | 1800-2100 PST | 2100-2400 PST | Total for Day |
|---|---|---|---|---|---|---|---|---|---|
| | Particulate Mass (mg)/Total Suspended Particulate (μg/m³) | | | | | | | | |
| Los Angeles (CSULA) | | | | | | | | | |
| 9 | 22.2/114 | 25.6/132 | 26.7/ 138 | 39.7/205 | 46.8/241 | 20.6*/106 | 23.0/119 | 27.9/136 | 232.5/ 149 |
| 11 | 22.5/119 | 22.3/118 | 24.6/ 130 | 36.2/192 | 4017/215 | 30.8/ 163 | 21.7/115 | 24.7/124 | 223.5/ 147 |
| 12 | 25.2/127 | 25.8/130 | 29.4/ 148 | 42.0/211 | 45.4/228 | 31.0/ 156 | 24.6/124 | 29.6/140 | 253.0/ 158 |
| 14 | 24.6/124 | 25.7/130 | 29.5/ 149 | 40.9/207 | 47.0/237 | 30.5/ 154 | 24.5/124 | 28.6/136 | 251.3/ 157 |
| 18 | 23.4/121 | 24.3/125 | 28.0/ 144 | 38.4/198 | 43.9/226 | 28.8/ 148 | 22.8/118 | 26.6/130 | 236.2/ 151 |
| 13 | | | | | | | | 24-HOUR TOTAL | 216.7/1352 |
| Claremont (HMC) | | | | | | | | | |
| 7 | 28.2/138 | 32.5/164 | 56.1/ 282 | 54.7/275 | 48.8/237 | 45.0/ 220 | 24.1/118 | 25.8/119 | 315.2/ 193 |
| 8 | | | | | | | | | |
| 10 | 30.8/155 | 32.8/170 | 57.1/ 294 | 57.6/297 | 52.5/261 | 45.7/ 229 | 35.2/177 | 28.3/134 | 340.0/ 214 |
| 15 | 27.8/138 | 31.7/163 | 58.5/ 297 | 55.2/284 | 52.1/255 | 45.1/ 222 | 26.6/132 | 26.9/126 | 323.9/ 201 |
| 17 | 28.9/148 | 31.2/164 | 55.4/ 290 | 54.1/283 | 49.2/248 | 45.9/ 234 | 32.6/167 | 25.8/125 | 323.1/ 207 |
| 16 | | | | | | | | 24-HOUR TOTAL | 350.2/ 208 |
| Riverside (UCR) | | | | | | | | | |
| 1 | 52.3/275 | 39.7/208 | 44.4/ 251 | 57.3/356 | 68.6/363 | 50.5/ 269 | 36.6/193 | 32.8/173 | 392.2/ 261 |
| 2 | 45.5/241 | 37.5/199 | 33.0*/186 | 64.5/343 | 64.7/344 | 48.1/ 257 | 37.5/198 | 31.4/177 | 362.2/ 241 |
| 3 | 47.7/246 | 39.1/201 | 44.9/ 249 | 66.1/355 | 69.9/364 | 52.1/ 273 | 38.2/197 | 34.3/177 | 394.3/ 258 |
| 4 | 49.1/246 | 40.2/200 | 46.1/ 248 | 71.2/358 | 73.9/371 | 55.9/ 284 | 40.5/204 | 36.7/184 | 413.6/ 262 |
| 5 | 45.0/233 | 37.9/195 | 41.1/ 223 | 66.5/346 | 65.2/340 | 48.5/ 255 | 37.7/195 | 33.1/172 | 375.0/ 245 |
| 6 | | | | | | | | 24-HOUR TOTAL | 424.0/ 270 |

*Error in data (probably in weighing).

Table 10. Collected Mass and Particulate Loadings for September 17, 1980 Collection

| Sampler Number | 000-0300 PST | 0300-0600 PST | 0600-0900 PST | 0900-1200 PST | 1200-1500 PST | 1500-1800 PST | 1800-2100 PST | 2100-2400 PST | Total for Day |
|---|---|---|---|---|---|---|---|---|---|
| | Particulate Mass (mg)/Total Suspended Particulate (μg/m$^3$) | | | | | | | | |
| **Los Angeles (CSULA)** | | | | | | | | | |
| 9 | 24.6/ 127 | 25.7/139 | 36.6/189 | 62.5/322 | 31.9/164 | 17.0/ 88 | 21.6/111 | 18.8/ 92 | 248.7/154 |
| 11 | 24.0/ 127 | 23.4/124 | 35.8/189 | 60.2/319 | 29.5/156 | 17.4/ 92 | 19.3/102 | 17.0/ 85 | 226.6/149 |
| 12 | 27.9/ 140 | 28.8/145 | 40.2/292 | 69.9/351 | 30.1/152 | 19.4/ 97 | 17.4/ 87 | 20.1/ 95 | 253.8/159 |
| 14 | 26.8/ 135 | 26.9/136 | 40.7/206 | 67.7/342 | 31.8/161 | 19.1/ 96 | 23.8/120 | 21.4/102 | 258.2/161 |
| 18 | 24.9/ 128 | 25.7/132 | 36.8/190 | 61.9/319 | 34.8/179 | 21.0/168 | 20.8/107 | 20.1/ 98 | 246.0/158 |
| 13 | | | | | | | | 24-HOUR TOTAL | 189.6/119 |
| **Claremont (HMC)** | | | | | | | | | |
| 7 | 30.0*/147 | 16.3/ 84 | | | 37.7/183 | 32.9/165 | 17.3/ 85 | 15.8/ 74 | |
| 8 | 38.0/ 197 | 15.4/ 83 | | | | | | | |
| 10 | 41.3/ 208 | 18.4/ 96 | 41.1/211 | 38.1/191 | 36.1/181 | 32.6/164 | 16.9/ 85 | 16.5/ 79 | 241.0/152 |
| 15 | 42.6/ 212 | 17.9/ 93 | 42.0/212 | 38.5/192 | 38.9/192 | 34.5/175 | 17.5/ 87 | 16.2/ 77 | 248.1/154 |
| 17 | 38.7/ 198 | 16.6/ 89 | 37.8/197 | 36.5/187 | 36.1/184 | 33.1/173 | 17.2/ 88 | 16.2/ 79 | 232.2/149 |
| 16 | | | | | | | | 24-HOUR TOTAL | 230.9/138 |
| **Riverside (UCR)** | | | | | | | | | |
| 1 | 28.0/ 146 | 26.6/141 | 39.7/223 | 22.6/120 | 33.4/177 | 38.0/201 | 17.8/ 93 | 12.0/ 63 | 218.1/144 |
| 2 | 25.9/ 136 | 25.8/137 | 38.6/217 | 26.7/142 | 32.2/171 | 35.8/160 | 17.5/ 92 | 11.4/ 61 | 213.9/143 |
| 3 | 27.6/ 141 | 26.9/140 | 40.0/220 | 26.4/138 | 32.6/171 | 38.7/202 | 19.6/101 | 11.1/ 58 | 222.9/146 |
| 4 | 29.7/ 147 | 27.9/140 | 42.1/224 | 29.5/148 | 35.4/178 | 42.3/213 | 20.2/100 | 11.4/ 57 | 238.5/150 |
| 5 | 26.2/ 130 | 27.8/141 | 38.4/212 | 27.4/143 | 33.5/172 | 36.5/190 | 18.6/ 96 | 12.4/ 65 | 220.8/144 |
| 6 | | | | | | | | 24-HOUR TOTAL | 201.3/128 |

*Error in data (probably in weighing).

Table 11. Collected Mass and Particulate Loadings for March 11-12, 1981 Collection

| Sampler Number | 1200-1500 PST | 1500-1800 PST | 1800-2100 PST | 2100-2400 PST | 0000-0300 PST | 0300-0600 PST | 0600-0900 PST | 0900-1200 PST | Total for Day |
|---|---|---|---|---|---|---|---|---|---|
| | Particulate Mass (mg)/Total Suspended Particulate (μg/m³) | | | | | | | | |
| Los Angeles (CSULA) | | | | | | | | | |
| 9 | 31.3/205 | 21.4/127 | 9.9*/58 | 16.6/ 95 | 15.8/86 | 10.0/54 | 11.0/ 65 | 10.6/ 63 | 126.6/ 94 |
| 11 | 38.3/209 | 22.0/120 | 15.7/ 84 | 17.6/ 92 | 16.0/87 | 12.5/68 | 11.6/ 62 | 15.8/ 86 | 149.5/101 |
| 12 | 39.8/214 | 23.1/125 | 14.0/ 75 | 19.6/102 | 15.8/86 | 13.0/70 | 15.4/ 82 | 16.8/ 91 | 158.7/106 |
| 14 | 35.1/190 | 20.6/111 | 15.3/ 81 | 17.5/ 91 | 14.9/80 | 12.1/65 | 14.1/ 75 | 16.2/ 87 | 145.8/ 98 |
| 18 | 47.4/205 | 32.7/128 | 23.9/ 92 | 25.9/ 98 | 21.5/84 | 17.7/69 | 17.8/ 69 | 21.9/ 86 | 208.8/104 |
| 13 | | | | | | | 24-HOUR TOTAL | | 126.9/ 88 |
| Claremont (HMC) | | | | | | | | | |
| 7 | 26.7/134 | 22.8/127 | 14.1/ 77 | 13.3/ 75 | 16.4/90 | 19.5/98 | 15.7/ 84 | 18.6/ 99 | 147.1/ 98 |
| 8 | 22.1/115 | 21.9/126 | 14.0/ 79 | 13.4/ 78 | 14.3/81 | 17.4/90 | 14.9/ 82 | 17.1/ 94 | 135.1/ 93 |
| 10 | 21.0/110 | 20.5/119 | 11.2/ 64 | 12.3/ 72 | 14.9/85 | 16.5/86 | 14.5/ 80 | 18.4/102 | 129.3/ 90 |
| 15 | 25.2/126 | 23.1/128 | 13.7/ 75 | 13.7/ 77 | 16.8/92 | 17.8/89 | 16.0/ 85 | 19.5/104 | 145.8/ 97 |
| 17 | 22.9/115 | 20.3/113 | 13.2/ 72 | 13.0/ 73 | 13.9/76 | 16.7/84 | 15.7/ 83 | 17.3/ 92 | 133.0/ 89 |
| 16 | | | | | | | 24-HOUR TOTAL | | 99.1/ 85 |
| Riverside (UCR) | | | | | | | | | |
| 1 | 22.3/104 | 22.5/111 | 18.5/ 90 | 14.2/ 69 | 12.8/62 | 14.6/68 | 18.1/ 85 | 17.0/ 75 | 140.0/ 83 |
| 2 | 25.4/131 | 22.8/124 | 16.7/ 90 | 15.0/ 80 | 11.6/62 | 14.8/77 | 18.4/ 95 | 17.4/ 85 | 142.1/ 93 |
| 3 | 27.6/145 | 22.0/122 | 20.5/112 | 16.4/ 89 | 13.9/75 | 15.5/81 | 21.8/114 | 19.1/ 94 | 156.8/104 |
| 4 | 25.9/121 | 22.9/113 | 18.4/ 90 | 13.6/ 66 | 12.3/59 | 14.9/70 | 17.6/ 82 | 17.3/ 77 | 142.9/ 85 |
| 5 | 24.4/114 | 22.0/109 | 18.0/ 88 | 13.6/ 66 | 11.9/57 | 15.5/73 | 17.0/ 80 | 17.7/ 79 | 140.7/ 83 |
| 6 | | | | | | | 24-HOUR TOTAL | | 143.5/ 90 |

*Possible error in data.

system. A standard solution of the six PAH of interest [benzo(a)anthracene, chrysene/triphenylene, benzo(e)pyrene, benzo(a)pyrene, perylene, coronene] plus 1,3,5-triphenylbenzene (an internal standard) was used to determine response factors of the parent ions ($M^+$) relative to the internal standard parent ion. All September samples were run in quintuplet and all March samples were run in triplicate.

A portion of the total extract from each filter was received in ~125 ml of a 1:1:1 (v/v/v) mixture of dichloromethane/methanol/toluene. They were spiked with the internal standard, concentrated and chromatographed on a silica gel gravity column with dichloromethane to enrich the PAH relative to polar compounds. At the levels of PAH present in these samples, about 2% of the sample was used for each injection (e.g., 1-2 µl out of a total of ~100 µl). A direct Grob-type splitless injection was employed. The GC oven was held isothermally at 40°C for one minute, then programmed at 20°C $min^{-1}$ to 180°C, immediately followed by a rise to 300°C at 4°C $min^{-1}$.

Parent ions at m/e 228, 252, 300.1 and 306.1 were monitored and peak areas of the PAH of interest were measured using the 6100 data system.

b. Results

Table 12 presents the data from these analyses as nanograms of PAH per cubic meter of sampled air.

4. Mutagen Assay

a. Procedures

The test protocols and computer data reduction used in these assays were identical to those previously described (see Section II. D). Ames' Salmonella strain TA98 is consistently the most sensitive strain for assaying ambient POM and due to a limited amount of sample, only this strain was employed in these assays. Each day's samples were processed on a single day of Ames testing. Each sample was tested in triplicate at 10, 20, 40, 60, 80, 100, 200, 400 and 1000 µg per plate both with and without S9. A 2% (V/V) S9 mix, corresponding to 0.710 mg of protein per plate, was used for mammalian metabolic activation. Benzo(a)pyrene (BaP) and 2-nitrofluorene (2-NF) were used as standard mutagens, and were assayed in parallel with each site's samples. The response of strain TA98 to these standards is given in Table 13.

Table 12. Ambient Concentrations of Selected Polycyclic Aromatic Hydrocarbons is Determined by GC/MS

| | ($ng/m^3$ of sampled air) | | | | | |
|---|---|---|---|---|---|---|
| | September 12, 1980 | | | March 12, 1981 | | |
| | Los Angeles | Riverside | Claremont | Los Angeles | Riverside | Claremont |
| Benzo(a)anthracene | 0.061 | 0.25 | 0.064 | 0.10 | 0.046 | 0.077 |
| Chrysene/triphenylene | 0.31 | 0.55 | 0.28 | 0.31 | 0.16 | 0.20 |
| Benzo(e)pyrene | 0.27 | 0.64 | 0.25 | 0.43 | 0.16 | 0.25 |
| Benzo(a)pyrene | 0.037 | 0.25 | 0.11 | 0.15 | 0.067 | 0.14 |
| Perylene | 0.0055 | 0.043 | 0.16 | 0.037 | 0.027 | 0.046 |
| Coronene | 0.89 | 1.3 | 1.7 | 1.4 | 0.37 | 0.61 |

Table 13. Response of Strain TA98 to Standard Mutagens

| | September 12, 1980[a] | September 17, 1980[a] | March 11-12, 1981[a] |
|---|---|---|---|
| BaP(2%S9)[b] | 850 | 606 | 770 |
| | 654 | 764 | 700 |
| | 206[d] | 730 | 670 |
| 2NF(0%S9)[c] | 380 | 448 | 516 |
| | 425 | 472 | 370 |
| | 413 | 410 | 370 |

[a]Tested on date of mutagen assay for indicated particulate collections.

[b]Doses of 0.1-0.6 μg/plate were used for September 12 and 17 collections; doses of 0.2 to 0.5 μg/plate for the March 11-12, 1981 data.

[c]Doses of 0.25-5 μg/plate were used for the September 12 and 17, 1980 collections; doses of 0.25 to 1.75 μg/plate for the March 11-12, 1981 collection.

[d]This low value may have been due to the exhaustion of co-factors in the S9 mix; this was the last sample of the day tested.

b. Results

The mutagenicity results for the September 12 and 17, 1980 collections are presented in Tables 14 through 19 and the March 11-12, 1981 collection in Tables 20 through 22. In addition, the samples from September 12, 1980 were also assayed using strain TA98NR, an isolate of TA98 which is deficient in the enzymes responsible for bacterial metabolic activation of simple nitroarenes (such as 2-nitrofluorene) to their mutagenic derivatives. The standard mutagen, quercetin, was co-tested in this assay as a positive control of non-nitroaromatic direct-acting mutagens. The results of this assay, conducted on a separate day, are given in Tables 23 and 24.

5. Air Quality and Air Mass Trajectory Measurements

a. Procedures

Ambient air quality analyzers were installed at each sampling site. Ozone was monitored with Dasibi Model 1003 AH UV photometric instruments calibrated at the California Air Resources Board using a long path UV reference. Nitrogen oxides were measured by commercial chemiluminescent analyzers: Thermoelectron Model 14B at Claremont (HMC) and Los Angeles (CSULA) and Columbia Scientific Model 1600 at Riverside (ARBML). Calibrations were performed by the dynamic dilution of an NBS certified cylinder of NO in nitrogen. $NO_2$ to NO converter efficiency was verified by gas phase titration of NO with ozone. Light scattering aerosols were monitored at each site by Model 1550B MRI Integrating Nephelometers, while analysis for PAN was done chromatographically by a previously described technique (Stephens and Price 1973). Strip chart recorders were used to record all data, except at Riverside where the on-board computer recorded data. In addition, a Beckman 6800 air quality chromatograph was used at Riverside to monitor carbon monoxide, total hydrocarbons and methane. This instrument was calibrated directly by a Scott-Marin Inc. tank of $CH_4$ and CO analyzed to ± 2%. Monitoring equipment failures necessitated the use of $NO_x$ data from the SCAQMD stations at downtown Los Angeles (approximately five miles southwest of CSULA) and Pomona (approximately six miles southwest of HMC) for the March 11-12, 1981 collection.

(Text begins again on page 75)

Table 14. Mutagenicity Data using Strain TA98 for September 12, 1980 Collection, Los Angeles

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/μg) | | Mutagen Density (rev/m$^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 0000-0300 | 8.255 | 0.67 | 0.71 | 29 | 31 | 240 | 260 |
| 0300-0600 | 8.781 | 0.46 | 0.49 | 21 | 22 | 170 | 180 |
| 0600-0900 | 10.255 | 0.46 | 0.59 | 25 | 32 | 180 | 230 |
| 0900-1200 | 13.705 | 0.38 | 0.58 | 27 | 41 | 140 | 210 |
| 1200-1500 | 14.169 | 0.32 | 0.48 | 24 | 35 | 100 | 160 |
| 1500-1800 | 8.996 | 0.61 | 0.54 | 29 | 26 | 210 | 180 |
| 1800-2100 | 7.598 | 0.70 | 0.70 | 30 | 30 | 240 | 240 |
| 2100-2400 | 8.292 | 0.65 | 0.62 | 35 | 33 | 200 | 190 |
| Sum of 3-Hr Samples | 80.051 | 0.50 | 0.58 | 27 | 31 | 170 | 200 |
| 24-Hour Sample | 60.185 | 0.55 | 0.70 | 21 | 26 | 150 | 190 |

Table 15. Mutagenicity Data using Strain TA98 for September 12, 1980 Collection, Claremont

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/μg) | | Mutagen Density (rev/m$^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 0000-0300 | 12.296 | 0.85 | 0.83 | 53 | 51 | 360 | 350 |
| 0300-0600 | 14.836 | 0.60 | 0.62 | 46 | 47 | 280 | 290 |
| 0600-0900 | 21.765 | 0.61 | 0.77 | 68 | 87 | 230 | 290 |
| 0900-1200 | 15.418 | 0.34 | 0.36 | 27 | 29 | 95 | 99 |
| 1200-1500 | 21.399 | 0.19 | 0.24 | 20 | 25 | 77 | 99 |
| 1500-1800 | 15.328 | 0.36 | 0.44 | 28 | 34 | 120 | 150 |
| 1800-2100 | 10.050 | 0.65 | 0.83 | 33 | 42 | 210 | 270 |
| 2100-2400 | 10.106 | 0.72 | 0.82 | 35 | 39 | 280 | 320 |
| Sum of 3-Hr Samples | 121.198 | 0.51 | 0.58 | 39 | 44 | 200 | 230 |
| 24-Hour Sample | 121.993 | 0.50 | 0.55 | 36 | 40 | 170 | 190 |

Table 16. Mutagenicity Data Using Strain TA98 for September 12, 1980 Collection, Riverside

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/μg) | | Mutagen Density (rev/$m^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 0000-0300 | 25.555 | 0.28 | 0.38 | 37 | 51 | 150 | 200 |
| 0300-0600 | 24.654 | 0.25 | 0.39 | 32 | 50 | 160 | 250 |
| 0600-0900 | 26.520 | 0.27 | 0.35 | 40 | 52 | 170 | 210 |
| 0900-1200 | 23.128 | 0.31 | 0.36 | 37 | 43 | 110 | 120 |
| 1200-1500 | 29.705 | 0.13 | 0.16 | 20 | 25 | 57 | 71 |
| 1500-1800 | 20.455 | 0.19 | 0.27 | 20 | 29 | 75 | 110 |
| 1800-2100 | 16.728 | 0.42 | 0.53 | 37 | 46 | 190 | 240 |
| 2100-2400 | 16.911 | 0.29 | 0.34 | 26 | 30 | 150 | 170 |
| Sum of 3-Hr Samples | 183.656 | 0.26 | 0.34 | 31 | 41 | 120 | 160 |
| 24-Hour Samples | 189.836 | 0.21 | 0.26 | 25 | 31 | 94 | 120 |

Table 17. Mutagenicity Data using Strain TA98 for September 17, 1980 Collection, Los Angeles

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/μg) | | Mutagen Density (rev/$m^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 0000-0300 | 12.359 | 1.8 | 2.8 | 120 | 180 | 890 | 1,400 |
| 0300-0600 | 14.162 | 1.3 | 1.6 | 96 | 120 | 710 | 850 |
| 0600-0900 | 20.541 | 0.96 | 1.6 | 100 | 170 | 530 | 880 |
| 0900-1200 | 32.242 | 0.43 | 0.92 | 71 | 150 | 220 | 460 |
| 1200-1500 | 11.703 | 0.51 | 0.76 | 31 | 46 | 200 | 290 |
| 1500-1800 | 6.182 | 1.1 | 2.1 | 36 | 66 | 390 | 710 |
| 1800-2100 | 6.770 | 1.1 | 1.4 | 39 | 50 | 430 | 540 |
| 2100-2400 | 8.073 | 1.2 | 1.2 | 46 | 47 | 510 | 520 |
| Sum of 3-Hr Samples | 112.033 | 0.93 | 1.4 | 67 | 100 | 440 | 670 |
| 24-Hour Samples | 72.004 | 1.4 | 1.6 | 63 | 71 | 530 | 600 |

Table 18. Mutagenicity Data using Strain TA98 for September 17, 1980 Collection, Claremont

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/µg) | | Mutagen Density (rev/m$^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 0000-0300 | 22.843 | 0.83 | 1.2 | 95 | 140 | 460 | 670 |
| 0300-0600 | 8.861 | 0.72 | 0.84 | 34 | 39 | 360 | 420 |
| 0600-0900 | 17.389 | 0.91 | 1.1 | 81 | 100 | 400 | 480 |
| 0900-1200 | 16.500 | 0.37 | 0.46 | 31 | 38 | 160 | 200 |
| 1200-1500 | 14.620 | 0.30 | 0.32 | 22 | 23 | 120 | 130 |
| 1500-1800 | 8.379 | 0.60 | 0.72 | 26 | 31 | 150 | 180 |
| 1800-2100 | 5.361 | 1.3 | 1.5 | 34 | 41 | 400 | 470 |
| 2100-2400 | 5.589 | 1.7 | 1.7 | 45 | 46 | 570 | 590 |
| Sum of 3-Hr Samples | 99.542 | 0.73 | 0.90 | 46 | 57 | 300 | 370 |
| 24-Hour Sample | 80.895 | 1.2 | 1.1 | 58 | 52 | 420 | 380 |

Table 19. Mutagenicity Data using Strain TA98 for September 17, 1980 Collection, Riverside

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/µg) | | Mutagen Density (rev/m$^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 0000-0300 | 16.626 | 0.44 | 0.43 | 38 | 37 | 270 | 260 |
| 0300-0600 | 16.462 | 0.36 | 0.33 | 31 | 29 | 230 | 210 |
| 0600-0900 | 18.792 | 0.69 | 0.92 | 73 | 96 | 330 | 440 |
| 0900-1200 | 12.083 | 0.39 | 0.52 | 25 | 33 | 190 | 250 |
| 1200-1500 | 37.227 | 0.036 | 0.050 | 7.1 | 9.8 | 41 | 57 |
| 1500-1800 | 11.930 | 0.26 | 0.32 | 16 | 20 | 83 | 100 |
| 1800-2100 | 4.562 | 1.2 | 1.4 | 28 | 33 | 290 | 350 |
| 2100-2400 | 3.543 | 1.5 | 1.5 | 28 | 29 | 450 | 470 |
| Sum of 3-Hr Samples | 121.285 | 0.38 | 0.44 | 30 | 35 | 210 | 250 |
| 24-Hour Sample | 66.945 | 0.82 | 0.89 | 35 | 38 | 270 | 300 |

Table 20. Mutagenicity Data using Strain TA98 for March 11-12, 1981 Collection, Los Angeles

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/µg) | | Mutagen Density ($rev/m^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 1200-1500 | 15.969 | 0.32 | 0.48 | 28 | 42 | 140 | 200 |
| 1500-1800 | 10.823 | 0.49 | 0.71 | 29 | 42 | 240 | 350 |
| 1800-2100 | 7.836 | 0.57 | 0.61 | 24 | 25 | 300 | 320 |
| 2100-2400 | 9.165 | 0.55 | 0.64 | 26 | 31 | 280 | 320 |
| 0000-0300 | 8.249 | 0.70 | 0.65 | 31 | 29 | 370 | 340 |
| 0300-0600 | 6.628 | 0.62 | 0.55 | 22 | 20 | 330 | 290 |
| 0600-0900 | 6.129 | 1.8 | 1.5 | 59 | 49 | 810 | 670 |
| 0900-1200 | 6.860 | 0.42 | 0.58 | 16 | 22 | 200 | 280 |
| Sum of 3-Hr Samples | 71.658 | 0.61 | 0.67 | 29 | 32 | 290 | 320 |
| 24-Hour Sample | 54.049 | 0.53 | 0.71 | 19 | 26 | 230 | 300 |

Table 21. Mutagenicity Data using Strain TA98 for March 11-12, 1981 Collection, Claremont

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/µg) | | Mutagen Density ($rev/m^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 1200-1500 | 9.012 | 0.25 | 0.28 | 12 | 13 | 98 | 110 |
| 1500-1800 | 10.432 | 0.29 | 0.37 | 17 | 22 | 140 | 180 |
| 1800-2100 | 7.128 | 0.49 | 0.55 | 20 | 22 | 280 | 310 |
| 2100-2400 | 7.617 | 0.39 | 0.29 | 17 | 13 | 230 | 170 |
| 0000-0300 | 8.847 | 0.18 | 0.15 | 9.0 | 7.5 | 110 | 92 |
| 0300-0600 | 10.144 | 0.22 | 0.19 | 11 | 9.9 | 130 | 110 |
| 0600-0900 | 8.787 | 0.46 | 0.59 | 22 | 28 | 260 | 330 |
| 0900-1200 | 8.827 | 0.29 | 0.44 | 14 | 21 | 150 | 220 |
| Sum of 3-Hr Samples | 70.885 | 0.31 | 0.35 | 15 | 17 | 170 | 190 |
| 24-Hour Sample | 50.748 | 0.34 | 0.40 | 15 | 17 | 170 | 200 |

Table 22. Mutagenicity Data using Strain TA98 for March 11-12, 1981 Collection, Riverside

| Sample Collection Period (PST) | Extract Weight (mg) | Specific Activity (rev/μg) | | Mutagen Density (rev/$m^3$ sampled air) | | Mutagen Loading (rev/mg) | |
|---|---|---|---|---|---|---|---|
| | | -S9 | +S9 | -S9 | +S9 | -S9 | +S9 |
| 1200-1500 | 12.668 | 0.16 | 0.16 | 9.8 | 9.8 | 80 | 80 |
| 1500-1800 | 10.881 | 0.22 | 0.34 | 12 | 18 | 110 | 160 |
| 1800-2100 | 8.057 | 0.49 | 0.73 | 19 | 29 | 220 | 320 |
| 2100-2400 | 7.854 | 0.25 | 0.36 | 9.5 | 14 | 140 | 200 |
| 0000-0300 | 7.098 | 0.14 | 0.13 | 4.8 | 4.4 | 81 | 75 |
| 0300-0600 | 8.394 | 0.19 | 0.14 | 7.5 | 5.5 | 110 | 78 |
| 0600-0900 | 9.258 | 0.33 | 0.43 | 14 | 19 | 170 | 230 |
| 0900-1200 | 8.530 | 0.16 | 0.23 | 6.0 | 8.7 | 79 | 110 |
| Sum of 3-Hr Samples | 72.739 | 0.24 | 0.31 | 11 | 14 | 120 | 160 |
| 24-Hour Sample | 71.618 | 0.26 | 0.34 | 12 | 15 | 130 | 170 |

Table 23. Mutagenicity Data for September 12, 1980 Collection in Los Angeles on TA98NR, Direct Activity (-S9)

| PST | | | | | | | | 24 Hour Sum of Parts | 24 Hour Collection |
|---|---|---|---|---|---|---|---|---|---|
| 0000-0300 | 0300-0600 | 0600-0900 | 0900-1200 | 1200-1500 | 1500-1800 | 1800-2100 | 2100-2400 | | |
| rev/μg | | | | | | | | | |
| TA98 | | | | | | | | | |
| 0.67 | 0.46 | 0.46 | 0.38 | 0.32 | 0.61 | 0.70 | 0.65 | 0.50 | 0.55 |
| TA98NR | | | | | | | | | |
| 0.42 | 0.21 | 0.19 | 0.17 | 0.13 | 0.20 | 0.33 | 0.24 | 0.22 | 0.22 |
| TA98NR/TA98 x 100% | | | | | | | | | |
| 63 | 46 | 41 | 45 | 41 | 33 | 47 | 37 | 44 | 40 |

Table 24. Mutagenicity Data for September 12, 1980 Collection in Los Angeles, TA98NR, Activatable Mutagenicity (+S9)

| PST | | | | | | | | 24 Hour Sum of Parts | 24 Hour Collection |
|---|---|---|---|---|---|---|---|---|---|
| 0000-0300 | 0300-0600 | 0600-0900 | 0900-1200 | 1200-1500 | 1500-1800 | 1800-2100 | 2100-2400 | | |
| rev/μg | | | | | | | | | |
| TA98 | | | | | | | | | |
| 0.71 | 0.49 | 0.59 | 0.58 | 0.48 | 0.54 | 0.70 | 0.62 | 0.58 | 0.70 |
| TA98NR | | | | | | | | | |
| 0.27 | 0.21 | 0.21 | 0.20 | 0.19 | 0.21 | 0.36 | 0.27 | 0.23 | 0.28 |
| TA98NR/TA98 x 100% | | | | | | | | | |
| 38 | 43 | 36 | 34 | 40 | 39 | 51 | 44 | 40 | 40 |

b. Results

The ambient air monitoring data acquired at the sampling sites for the collections on September 12 and 17, 1980 are shown in Tables 25 and 26. September 12, 1980 is typical of moderate summer air pollution in the SCAB, while September 17, 1980 represents a severe episode. The ambient air quality data for March 11-12, 1981 is given in Table 27. March 11, 1981 was a day of light winter photochemical smog, while March 12 experienced slightly improved air quality.

6. Lead and Bromine Analysis

a. Procedures

In order to further investigate the sources of mutagenicity, it was thought useful to have data on the filter content of bromine, lead and nickel. The former two would give an indication of the contribution of the gasoline-powered vehicles and the age of the particulate, while the latter would be a useful signature of particulate contribution by oil fired power plant emissions. Thus, although not funded by this contract, a limited number of samples were analyzed by Dr. Robert Giauque of the Lawrence Berkeley Laboratory. A one-inch diameter disk cut from an unused hi-vol filter was subjected to elemental analysis by X-ray fluorescent elemental analysis. Unfortunately, the Teflon-impregnated filters had a high zinc background which precluded the nickel determination.

b. Results

The concentration data for lead and bromine for the Los Angeles site on September 17, 1980 are shown in Table 28 and Figures 19 through 20. [Figures appear at the end of Section III.] This site was chosen for its proximity to freeways; this date was chosen because it showed the highest pollutant levels of the two.

Table 25. Monitored Ambient Air Data for September 12, 1980 (Hourly Averages)

| Time Interval PST | Los Angeles (CSULA) | | | | | Claremont (HMC) | | | | | Riverside (UCR) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb |
| 0000-0100 | 0 | 45. | 0 | 8.5 | 4. | 22. | 86. | 17. | 4.3 | 5. | 2. | 40. | 11. | 19.9 | 5. |
| 0100-0200 | 0 | 45. | 5. | 9.8 | 3. | 13. | 88. | 17. | 4.8 | 5. | 5. | 41. | 4. | 20.3 | 4. |
| 0200-0300 | 0 | 46. | 9. | 9.4 | 4. | 4. | 82. | 17. | 4.9 | 11. | 9. | 54. | 2. | 19.9 | 4. |
| 0300-0400 | 2. | 47. | 15. | 9.1 | 4. | 4. | 75. | 15. | 4.2 | 11. | 0 | 52. | 3. | 19.0 | 5. |
| 0400-0500 | 2. | 50. | 10. | 8.0 | 4. | 5. | 72. | 16. | 4.0 | 12. | 1. | 52. | 2. | 16.6 | 4. |
| 0500-0600 | 0 | 20. | 17. | 8.6 | 4. | 6. | 69. | 15. | 4.4 | 10. | 0 | 46. | 2. | 18.3 | 4. |
| 0600-0700 | 7. | 53. | 23. | 8.8 | 5. | 10. | 69. | 15. | 4.8 | 13. | 3. | 47. | 6. | 18.5 | 5. |
| 0700-0800 | 10. | 60. | 20. | 8.8 | 6. | 19. | 80. | 15. | 5.3 | 10. | 7. | 52. | 11. | 19.8 | 5. |
| 0800-0900 | 13. | 69. | 27. | 8.7 | 6. | 15. | 95. | 18. | 6.0 | 13. | 9. | 64. | 13. | 18.5 | 6. |
| 0900-1000 | 15. | 76. | 28. | 7.2 | 6. | 17. | 105. | 39. | 6.4 | 22. | 17. | 75. | 29. | 16.5 | 7. |
| 1000-1100 | 10. | 89. | 36. | 7.6 | 7. | 11. | 102. | 75. | 7.1 | 20. | 21. | 103. | 42. | 15.8 | 9. |
| 1100-1200 | 7. | 94. | 82. | 8.4 | 10. | 8. | 81. | 131. | 6.5 | 30. | 4. | 75. | 90. | 15.3 | 13. |
| 1200-1300 | 6. | 92. | 113. | 8.0 | 14. | 7. | 74. | 186. | 5.7 | 43. | 0 | 43. | 139. | 14.3 | 14. |
| 1300-1400 | 7. | 97. | 111. | 6.6 | 12. | 9. | 82. | 207. | 5.6 | 45. | 0 | 33. | 145. | 10.8 | 12. |
| 1400-1500 | 7. | 82. | 91. | 4.6 | 9. | 10. | 84. | 232. | 5.4 | 52. | 0 | 40. | 159. | 8.7 | 15. |
| 1500-1600 | 8. | 77. | 83. | 4.4 | 7. | 11. | 95. | 228. | 4.9 | 45. | 0 | 50. | 169. | 7.9 | 16. |
| 1600-1700 | 6. | 72. | 88. | 5.1 | 10. | 12. | 104. | 168. | 4.5 | 29. | 0 | 56. | 130. | 7.1 | 12. |
| 1700-1800 | 4. | 75. | 78. | 6.2 | 10. | 11. | 94. | 105. | 3.3 | 19. | 0 | 62. | 90. | 6.8 | 10. |
| 1800-1900 | 1. | 78. | 56. | 6.0 | 8. | 10. | 91. | 52. | 2.7 | 11. | 0 | 66. | 70. | 7.8 | 13. |
| 1900-2000 | 2. | 63. | 38. | 4.6 | 4. | 10. | 82. | 34. | 2.6 | 6. | 0 | 52. | 53. | 8.3 | 7. |
| 2000-2100 | 1. | 57. | 32. | 6.2 | 4. | 10. | 63. | 31. | 2.4 | 4. | 0 | 54. | 29. | 9.3 | 5. |
| 2100-2200 | 0 | 48. | 39. | 7.2 | 5. | 10. | 65. | 26. | 2.8 | 3. | 1. | 48. | 20. | 12.0 | 4. |
| 2200-2300 | 0 | 47. | 27. | 8.4 | 5. | 12. | 78. | 22. | 3.5 | 6. | 0 | 41. | 18. | 13.6 | 3. |
| 2300-2400 | 0 | 48. | 20. | 6.8 | 5. | 10. | 72. | 24. | 3.8 | 8. | 0 | 32. | 24. | 14.5 | 3. |

Table 26. Monitored Ambient Air Data for September 17, 1980 (Hourly Averages)

| Time Interval PST | Los Angeles (CSULA) | | | | | Claremont (HMC) | | | | | Riverside (UCR) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb |
| 0000-0100 | 81. | 124. | 1. | 3.2 | 1. | 4. | 87. | 65. | 6.3 | 23. | 0 | 63. | 38. | 5.3 | 16. |
| 0100-0200 | 16. | 122. | 5. | 3.6 | 4. | 4. | 71. | 85. | 3.9 | 26. | 0 | 57. | 33. | 6.1 | 14. |
| 0200-0300 | 57. | 124. | 5. | 3.9 | 4. | 4. | 57. | 85. | 4.1 | 24. | 0 | 50. | 36. | 6.4 | 15. |
| 0300-0400 | 26. | 108. | 11. | 3.9 | 4. | 4. | 54. | 57. | 3.0 | 18. | 2. | 45. | 32. | 6.5 | 14. |
| 0400-0500 | 5. | 74. | 18. | 3.8 | 11. | 5. | 50. | 45. | 1.4 | 10. | 2. | 42. | 36. | 6.5 | 14. |
| 0500-0600 | 73. | 97. | 10. | 4.4 | 9. | 15. | 65. | 37. | 1.1 | 8. | 6. | 62. | 19. | 6.6 | 14. |
| 0600-0700 | 9. | 82. | 21. | 5.4 | 13. | 17. | 73. | 30. | 2.1 | 2. | 19. | 85. | 10. | 5.9 | 9. |
| 0700-0800 | 153. | 152. | 13. | 5.8 | 9. | 9. | 102. | 60. | 3.6 | 12. | 75. | 119. | 7. | 6.7 | 8. |
| 0800-0900 | 74. | 272. | 18. | 7.2 | 8. | 7. | 100. | 115. | 4.8 | 12. | 21. | 113. | 48. | 6.4 | 10. |
| 0900-1000 | 31. | 291. | 47. | 8.8 | 14. | 10. | 77. | 150. | 4.9 | 2. | 1. | 16. | 85. | 4.6 | 10. |
| 1000-1100 | 13. | 316. | 53. | 12.8 | 23. | 10. | 58. | 195. | 3.1 | 15. | 7. | 34. | 119. | 2.4 | 8. |
| 1100-1200 | 10. | 213. | 87. | 6.8 | 29. | 12. | 72. | 220. | 3.4 | 18. | 9. | 27. | 119. | 1.9 | 5. |
| 1200-1300 | 12. | 111. | 83. | 4.3 | 21. | 14. | 59. | 180. | 2.3 | 11. | 4. | 25. | 110. | 2.9 | 5. |
| 1300-1400 | 13. | 89. | 56. | 3.2 | 13. | 16. | 80. | 225. | 2.9 | 14. | 2. | 34. | 148. | 4.1 | 8. |
| 1400-1500 | 29. | 74. | 12. | 1.2 | 5. | 8. | 93. | 285. | 3.3 | 17. | 3. | 40. | 165. | 3.5 | 11. |
| 1500-1600 | 25. | 69. | 1. | 0.6 | 1. | 19. | 87. | 180. | 2.0 | 10. | 2. | 61. | 255. | 6.4 | 21. |
| 1600-1700 | 28. | 73. | 1. | 0.7 | 1. | 20. | 80. | 70. | 0.9 | 1. | 0 | 66. | 169. | 3.1 | 12. |
| 1700-1800 | 33. | 71. | 0 | 0.8 | 0 | 17. | 80. | 30. | 0.8 | 1. | 6. | 57. | 49. | 1.1 | 4. |
| 1800-1900 | 54. | 75. | 0 | 1.2 | 0 | 17. | 76. | 16. | 0.6 | 0 | 5. | 50. | 14. | 0.8 | 1. |
| 1900-2000 | 75. | 74. | 0 | 1.2 | 0 | 37. | 70. | 13. | 0.6 | 0 | 0 | 45. | 12. | 0.9 | 1. |
| 2000-2100 | 78. | 81. | 0 | 1.4 | 0 | 72. | 75. | 17. | 0.6 | 0 | 9. | 45. | 2. | 0.8 | 1. |
| 2100-2200 | 59. | 78. | 0 | 1.4 | 0 | 90. | 75. | 14. | 0.7 | 0 | 14. | 37. | 0 | 0.9 | 0 |
| 2200-2300 | 44. | 74. | 0 | 1.2 | 0 | 46. | 75. | 15. | 0.7 | 1. | 19. | 34. | 0 | 0.9 | 0 |
| 2300-2400 | 41. | 63. | 0 | 1.1 | 0 | 22. | 50. | 13. | 0.6 | 0 | 21. | 32. | 0 | 0.9 | 0 |

Table 27. Monitored Ambient Air Data for March 11-12, 1981 (Hourly Averages)

| Time Interval PST | Los Angeles (CSULA) | | | | | Claremont (HMC) | | | | | Riverside (UCR) | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb | NO ppb | $NO_2$ ppb | $O_3$ ppb | b-Scat $x10^{-4}$ $m^{-1}$ | PAN ppb |
| 1200-1300 | 0 | 70 | 55. | 4.1 | ND[a] | - | - | - | 2.9 | ND | 27. | 45. | 65. | 4.7 | 4. |
| 1300-1400 | 0 | 70 | 67. | 4.2 | ND | 10 | 20 | - | 3.1 | ND | 23. | 36. | 70. | 4.9 | 5. |
| 1400-1500 | 10 | 60 | 55. | 4.6 | ND | 20 | 20 | 76. | 2.2 | ND | 24. | 43. | 70. | 5.2 | 6. |
| 1500-1600 | - | 50 | 38. | 3.1 | ND | 10 | 20 | 8. | 2.7 | ND | 28. | 48. | 98. | 5.9 | 7. |
| 1600-1700 | - | 40 | 24. | 2.4 | ND | 10 | 20 | 8. | 2.5 | ND | 25. | 56. | 60. | 4.2 | 4. |
| 1700-1800 | - | 40 | 7. | 2.4 | ND | 10 | 20 | 13. | 1.9 | ND | 21. | 43. | 52. | 2.8 | 3. |
| 1800-1900 | - | 40 | 1. | 2.8 | ND | 10 | 20 | 20. | 1.5 | ND | 24. | 49. | 32. | 2.4 | 2. |
| 1900-2000 | - | 30 | 5. | 2.6 | ND | 10 | 20 | 20. | 1.2 | ND | 26. | 52. | 17. | 3.2 | 2. |
| 2000-2100 | - | 40 | 0 | 2.8 | ND | 10 | 20 | 31. | 1.9 | ND | 45. | 55. | 5. | 3.3 | 1. |
| 2100-2200 | - | 40 | 0 | 3.0 | ND | 10 | 10 | 31. | 1.6 | ND | 43. | 50. | 1. | 3.8 | 0 |
| 2200-2300 | - | 40 | 0 | 3.2 | ND | 10 | 10 | 31. | 1.6 | ND | 30. | 40. | 7. | 4.7 | 0 |
| 2300-2400 | - | 40 | 0 | 3.1 | ND | 10 | 10 | 32. | 1.6 | ND | 21. | 26. | 17. | 4.4 | 0 |
| 0000-0100 | 10 | 40 | 1. | 2.8 | ND | 0 | 10 | 32. | 2.2 | ND | 20. | 23. | 20. | 4.3 | 0 |
| 0100-0200 | - | - | 1. | 2.9 | ND | 0 | 10 | 36. | 2.3 | ND | 19. | 20. | 27. | 3.5 | 0 |
| 0200-0300 | - | 30 | 0 | 3.2 | ND | 0 | 10 | 33. | 2.3 | ND | 15. | 15. | 25. | 3.7 | 1. |
| 0300-0400 | 0 | 30 | 0 | 3.3 | ND | 0 | 10 | 26. | 2.5 | ND | 13. | 18. | 23. | 4.1 | 0 |
| 0400-0500 | 0 | 20 | 9. | 2.7 | ND | 0 | 10 | 28. | 2.1 | ND | 18. | 28. | 8. | 5.2 | 0 |
| 0500-0600 | 0 | 30 | 8. | 2.4 | ND | 0 | 10 | 27. | 2.0 | ND | 14. | 29. | 7. | 6.1 | 0 |
| 0600-0700 | 0 | 40 | 1. | 2.2 | ND | 0 | 10 | 24. | 1.9 | ND | 20. | 31. | 5. | 6.0 | 0 |
| 0700-0800 | - | - | 1. | 1.7 | ND | 10 | 10 | 23. | 1.9 | ND | 44. | 37. | 4. | 6.0 | 0 |
| 0800-0900 | 20 | 30 | 5. | 2.3 | ND | 20 | 20 | 29. | 1.7 | ND | 15. | 28. | 13. | 6.1 | 1. |
| 0900-1000 | 10 | 30 | 25. | 2.6 | ND | 20 | 20 | 51. | 1.7 | ND | 18. | 26. | 21. | 5.1 | 1. |
| 1000-1100 | 10 | 40 | 34. | 2.5 | ND | 20 | 20 | 54. | 2.1 | ND | 8. | 19. | 32. | 6.8 | 1. |
| 1100-1200 | 0 | 40 | 39. | 2.9 | ND | 10 | 20 | 63. | 2.3 | ND | 8. | 23. | 37. | 7.0 | 2. |

Table 28. Lead and Bromine Concentrations at Los Angeles (CSULA), September 17, 1980

| Time PST | Lead ($\mu g/m^3$) | Bromine ($\mu g/m^3$) | Lead/Bromine |
|---|---|---|---|
| 0000-0300 | 2.2 | 0.37 | 5.9 |
| 0300-0600 | 1.6 | 0.25 | 6.4 |
| 0600-0900 | 2.6 | 0.52 | 5.0 |
| 0900-1200 | 4.1 | 0.66 | 6.2 |
| 1200-1500 | 1.2 | 0.25 | 4.8 |
| 1500-1800 | 0.6 | 0.14 | 4.3 |
| 1800-2100 | 1.3 | 0.33 | 3.9 |
| 2100-2400 | 0.9 | 0.20 | 4.5 |

### 7. Air Mass Trajectory Measurements

#### a. Procedure

Air mass trajectories were calculated in a manner similar to that described in Section II E. These trajectories are based on the data from 24 measurement stations and are back-calculated in the following manner:

(1) The intervals used were one-hour segments.

(2) For each segment the wind speed and direction data for the previous hour at the three closest monitoring stations were used to calculate a vector, with the closer stations receiving a proportionately higher mathematical weighting.

(3) This vector was plotted, corresponding roughly to where the air parcel originated during the middle of the segment.

(4) This process was repeated for the next previous hour using another set of three closest stations.

(5) Vectors were backplotted for six hours or until no station was deemed close or a mountain range or ocean was reached.

#### b. Results

The trajectories for September 12 and 17, 1980 and for March 11-12, 1981 are shown in Figures 21 through 28, 29 through 36 and 37 through 44, respectively. [Figures appear at the end of Section III.] In these figures, the strong onshore flow of air is quite apparent. On March 11, 1981 and September 12, 1980, the air parcel impacting Riverside appears to have originated in Orange County, while on March 12, 1981 and on September 17, 1980 it originated nearer to Los Angeles.

## C. Discussion

Particulate collections for the 12-hour resolution study described in Section II were carried out during a period of changeable atmospheric conditions, and proved to be most interesting as a result. Because one goal of our high-resolution studies was the establishment of typical diurnal profiles of particulate mutagenicity, however, we sought to conduct sampling for these measurements on days which would be representative of "average" meteorological conditions in the SCAB. Fortunately, the sampling days discussed here satisfy this criterion.

### 1. September 12, 1980

The trajectory analysis for this period indicated that onshore flow prevailed at all three sites throughout the sampling period, with increased wind speed later in the day. The levels of mutagen density, mutagen loading, NO, $NO_2$, CO, $O_3$, $b_{scat}$ and PAN are plotted as a function of time of day in Figures 45 through 52, 53 through 60, and 61 through 68 for Los Angeles, Claremont and Riverside, respectively. [Figures appear at the end of Section III.] The day was characterized by moderate pollutant levels; the highest ozone concentration was reached in Claremont at 232 ppb (1400-1500 hours PST). The diurnal variation displayed by the measured pollutant concentrations followed a distinct pattern, with primary pollutants peaking at the morning and evening rush hours and photochemical activity during the day leading to the highest ozone and peroxyacetyl nitrate concentrations during mid-afternoon. The mutagen density and loading were relatively low at all three sites compared to the highest values we have observed previously. The diurnal variations in mutagenicity were similar at all three sites, showing peaks in the morning and evening superimposed on a smooth variation in particulate mutagenicity from higher values at night to minima at mid-afternoon. These samples gave an increased activity in the presence of S9 which was particularly noticeable in the morning rush hour samples. The average 24-hour mutagenicity values derived from analysis of the long-term samples were slightly lower (~30%) than the sum of the three-hour measurements at Riverside and Los Angeles, and approximately equal at Claremont.

The sample set collected at Los Angeles on September 12 was also tested using a newly developed Ames Salmonella strain, TA98NR, which is similar to TA98 but lacks the bacterial metabolism responsible for the strong "direct" mutagenicity of simple nitroarenes such as 2-nitrofluorene and 1-nitropyrene toward TA98 (Rosenkranz and Speck 1975, 1976; Rosenkranz and Poirier 1979, Rosenkranz et al. 1981). The results of this assay together with those obtained with TA98 are presented in Figures 69 through 74. [Figures appear at the end of Section III.] The curves are similarly shaped, but the response of TA98NR was consistently 30-70% lower than that of TA98. This result would be expected if a substantial proportion of the mutagenic activity was due to nitroarenes.

2. September 17, 1980

On this day, offshore flow took place until about 1100 PST, when onshore breezes began to blow. This offshore/onshore alternation is a very common feature in the wind pattern of the SCAB (Hoggan et al. 1980). The measured atmospheric variables (mutagen density, mutagen loading, NO, $NO_2$, CO, $O_3$ $b_{scat}$ and PAN) are plotted vs. time of day in Figures 75 through 82, 83 through 90, and 91 through 98, respectively, for Los Angeles, Claremont and Riverside. [Figures appear at the end of Section III.] The relative severity of this smog episode is reflected in the peak one-half hour average ozone concentration of 280 ppb recorded at Claremont (1400-1500 hours PST). The mutagen density measurements also produced higher values than those observed on September 12, and the variation during the day was also more pronounced. Again, the maximum mutagen density was recorded either in the early morning or during the morning rush hour at all three sites, with a minimum value occurring at mid-afternoon, and increased activity was observed with metabolic activation; this was most noticeable in Los Angeles where the largest difference between direct and activatable mutagenicity was measured.

3. March 11 and 12, 1981

The wind trajectories indicate onshore flow over the sample period with the expected weakening in the evening. The levels of mutagen density, mutagen loading, NO, $NO_2$, CO, $O_3$ and $b_{scat}$ are plotted as a function of time of day in Figures 99 through 105, 106 through 112, and 113 through 120 for Los Angeles, Claremont and Riverside respectively. [Figures appear at the end of Section III.] Riverside showed light winter air pollution with an ozone maxima of 98 ppb while the two upwind stations indicated somewhat cleaner air.

Mutagenicity values for this collection again displayed similar profiles, with pronounced peaks during the evening and morning rush hours. Again, promutagenic activity roughly paralleled direct activity, with higher ratios of promutagenic to direct activity occurring during rush hour periods. An exception to this pattern is the morning rush hour peak in Los Angeles on March 12 where the promutagenic activity is lower. The average mutagen densities were lower than during the two previous days.

Strong onshore flow took place at all three sites during the beginning of this collection period (the afternoon of March 11) and continued throughout the evening hours. Wind velocity decreased during the early morning hours to a minima at 0600-0900 hours PST. This wind pattern may be reflected in the mutagenicity diurnal profiles; rush hour peaks in Los Angeles were relatively greater during the morning of March 12 than they were the previous evening. At the intermediate smog receptor site, Claremont, evening and morning rush hour peaks are approximately equal. At Riverside, the farthest downwind site, evening peaks were greater than those during the following morning. This pattern is most pronounced with mutagen loading values.

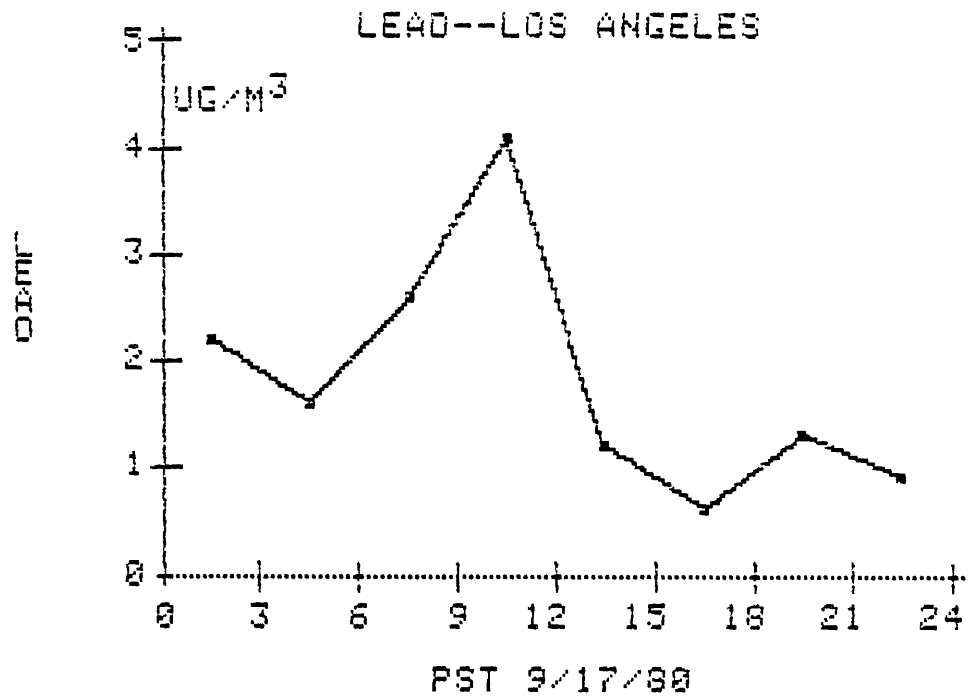
The 24-hour density values calculated from the eight three-hour samples are in excellent agreement with the 24-hour collection values for the Claremont and Riverside samples. In Los Angeles, the calculated values are higher. If chemical transformations were responsible for this discrepancy, then these two conclusions could be drawn:

1) Atmospheric transformations were rapid; the airborne mutagenic material impacting Claremont was already fully "aged".

2) Sampling transformations occurring in Los Angeles were slower, allowing them to be detected with the three-hour time resolution of this study.

The fact that analysis of the long-term samples gave lower mutagen density figures than the short-term averages when there was a difference may be attributed to a filter artifact resulting in destruction of mutagenic materials, or less efficient extraction of the 24-hour filters. However, none of the differences we have observed are large enough to be statistically significant.

(Text begins again on page 149)



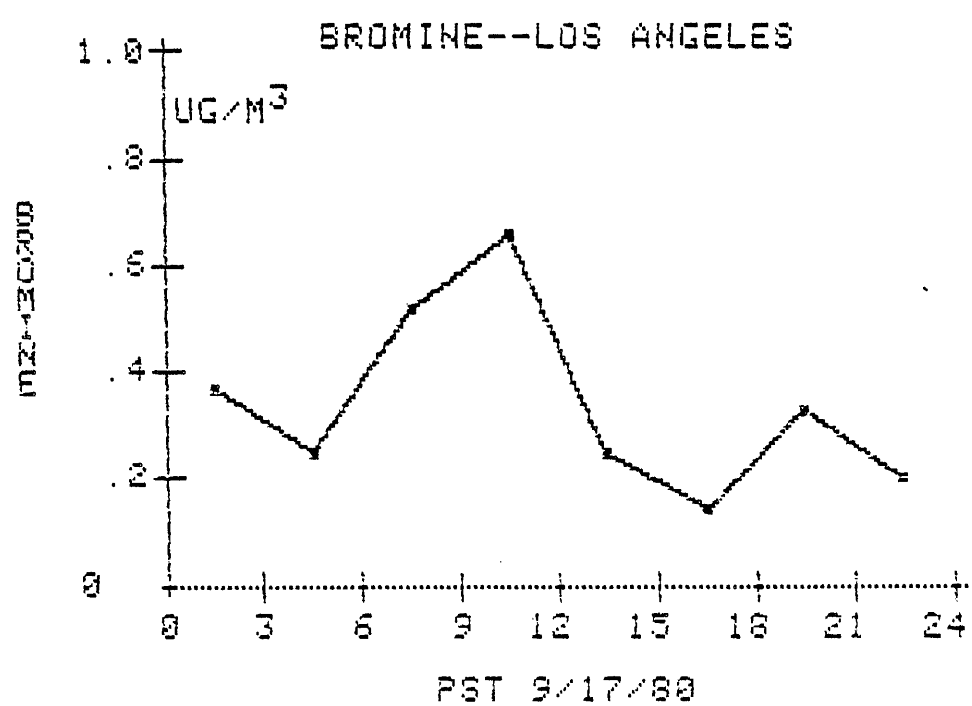




Figure 19. Diurnal variation of lead and bromine, September 17, 1980: Los Angeles

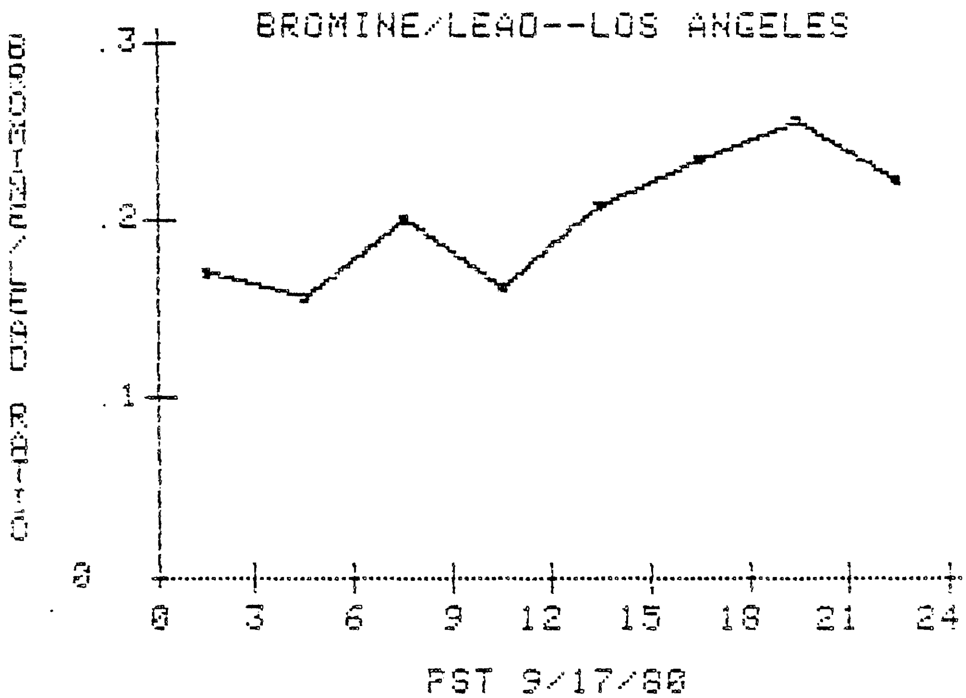



Figure 20. Diurnal variation of ratio of bromine to lead, September 17, 1980: Los Angeles

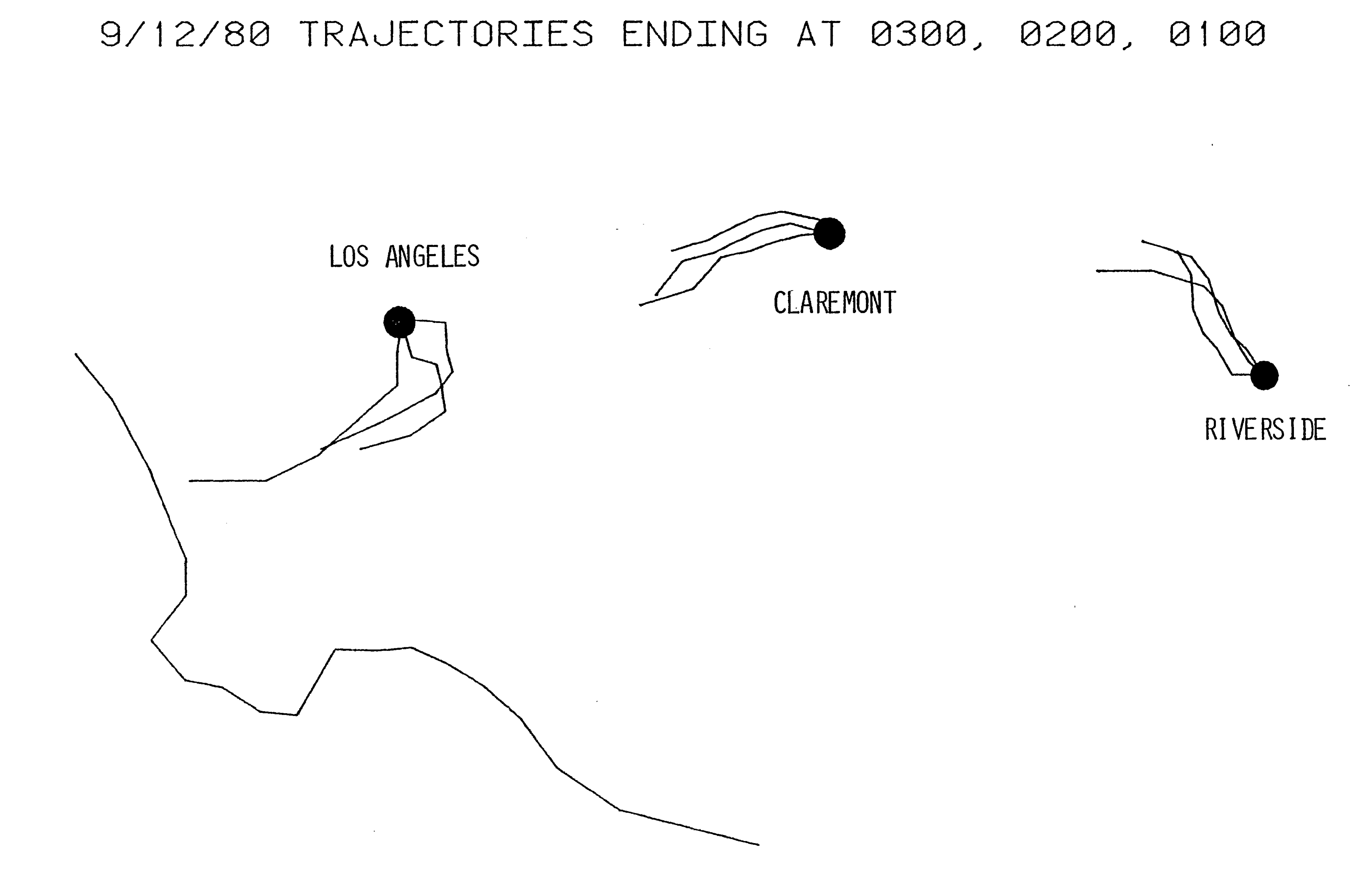



Figure 21. Air mass trajectory for the three-hour sampling period 0000-0300 hours PST, September 12, 1980

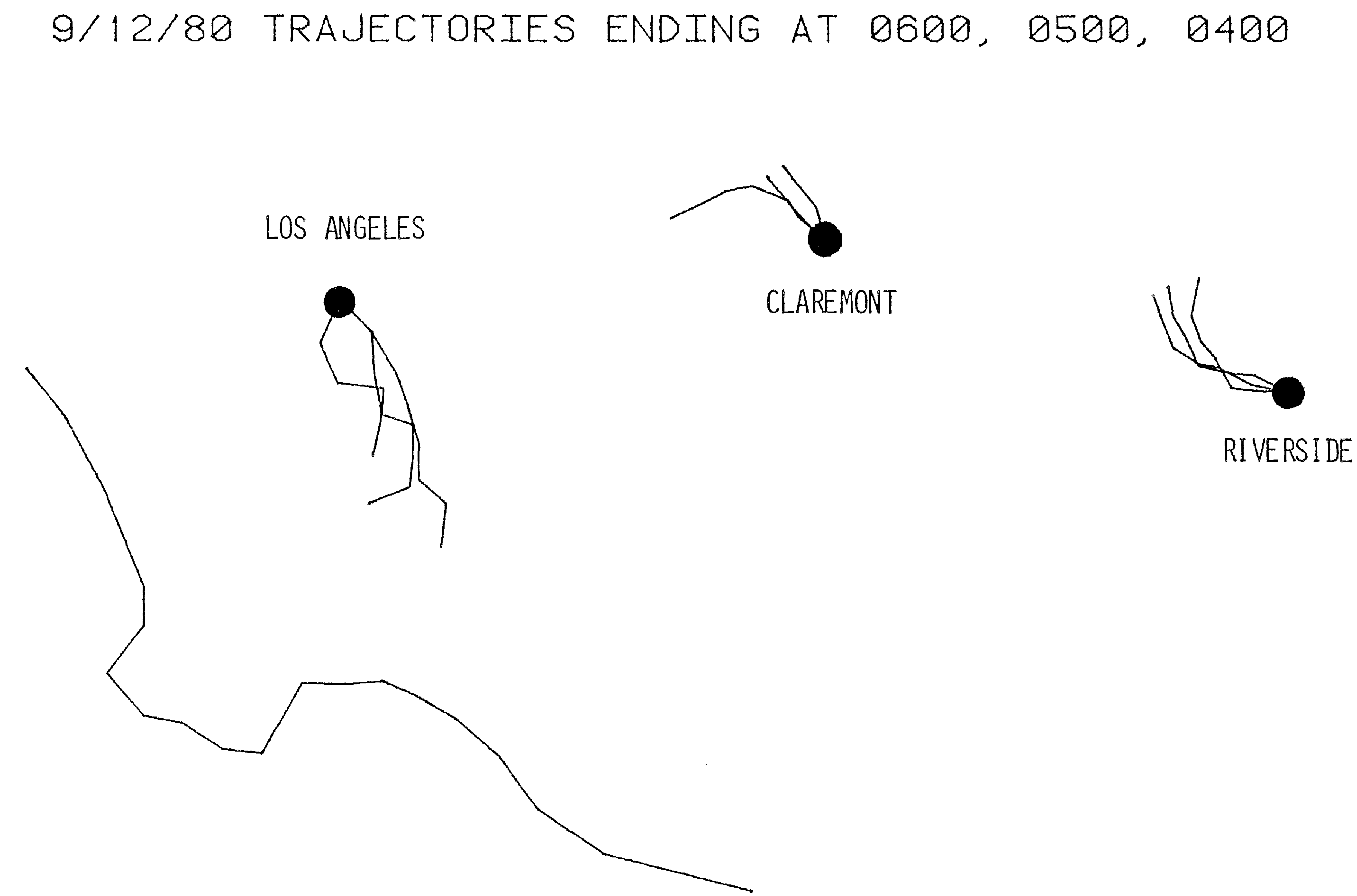



Figure 22. Air mass trajectories for the three-hour sampling period 0300-0600 hours PST, September 12, 1980

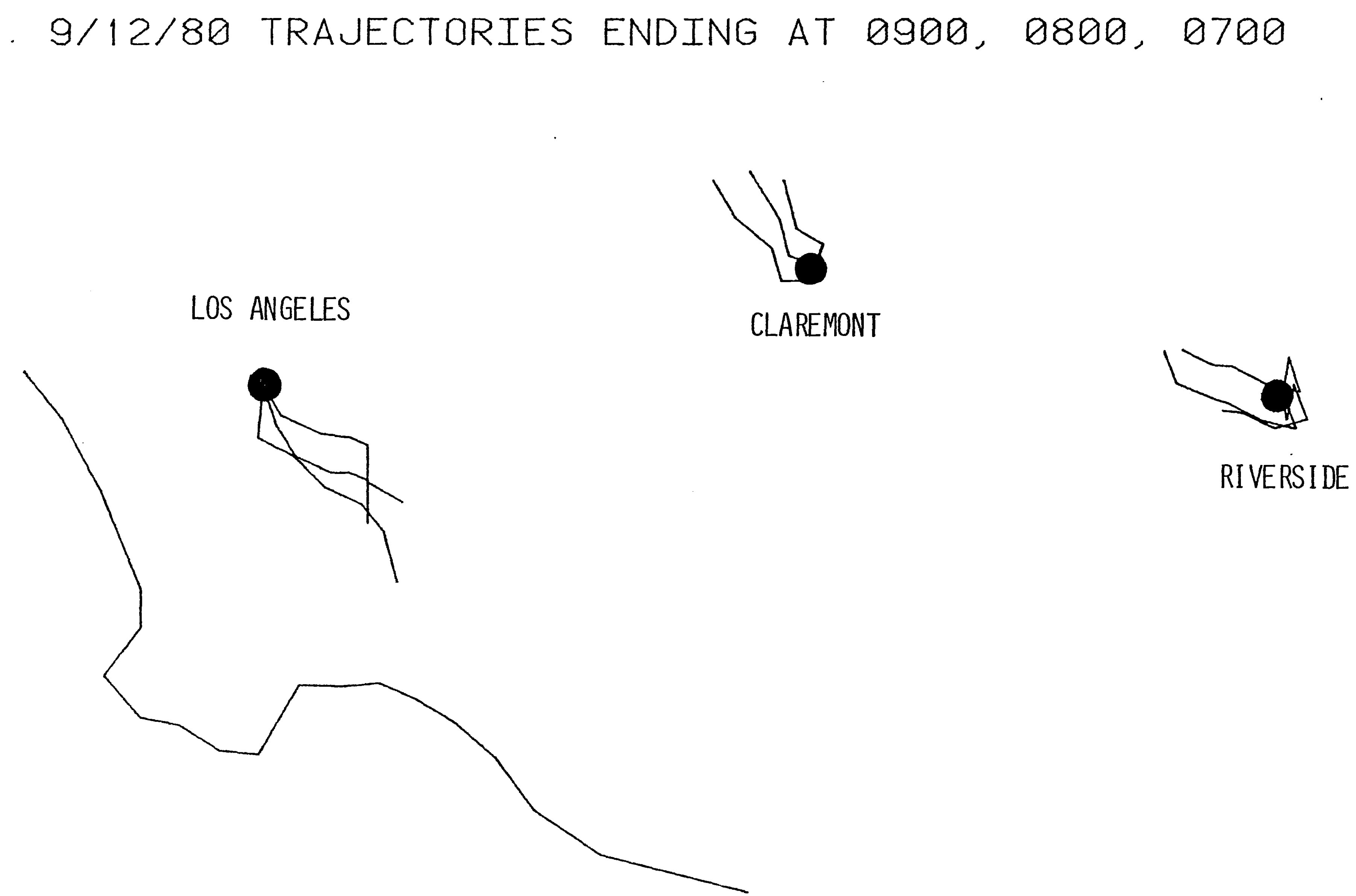



Figure 23. Air mass trajectories for the three-hour sampling period 0600-0900 hours PST, September 12, 1980

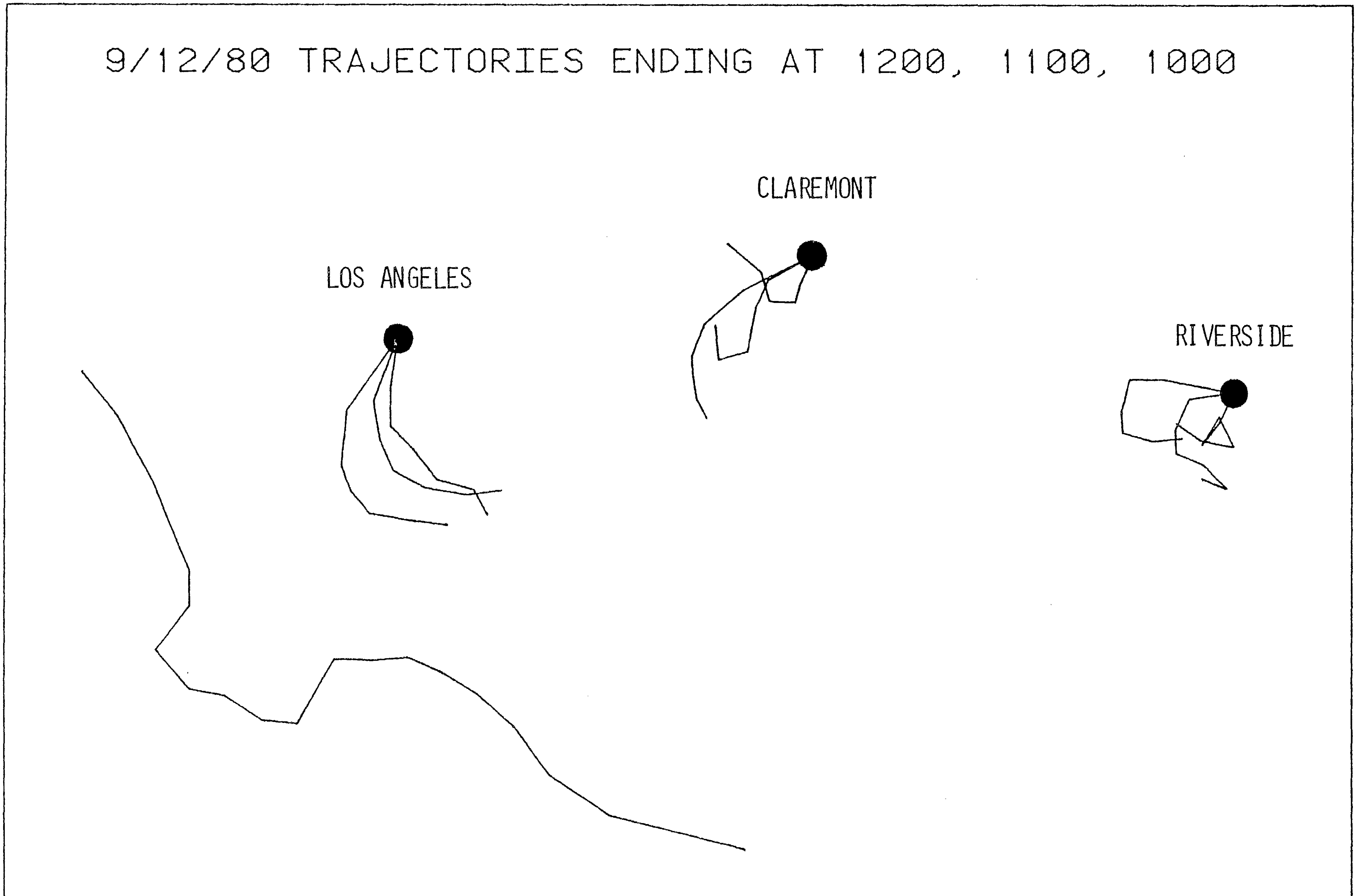



Figure 24. Air mass trajectories for the three-hour sampling period 0900-1200 hours PST, September 12, 1980

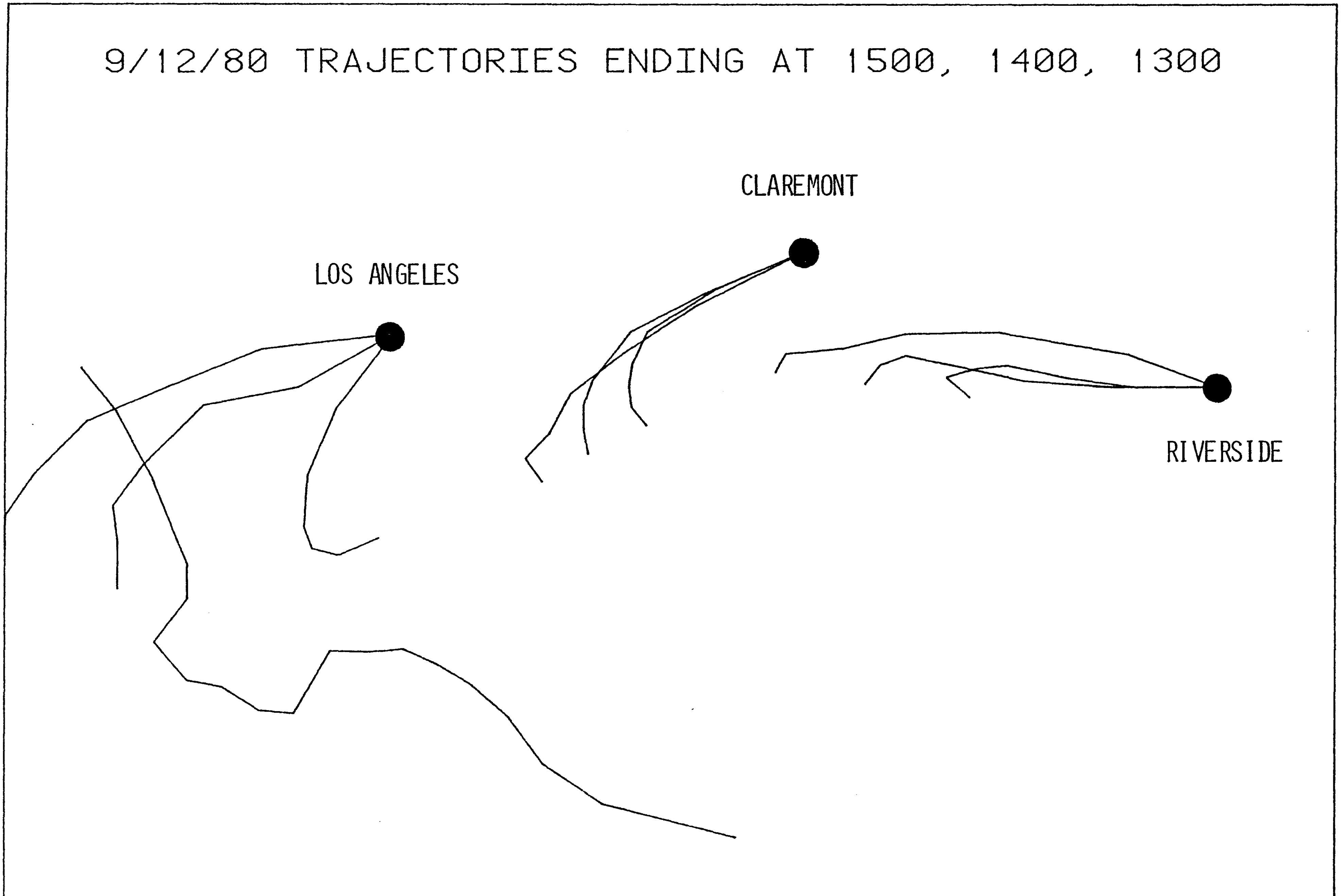



Figure 25. Air mass trajectories for the three-hour sampling period 1200-1500 hours PST, September 12, 1980

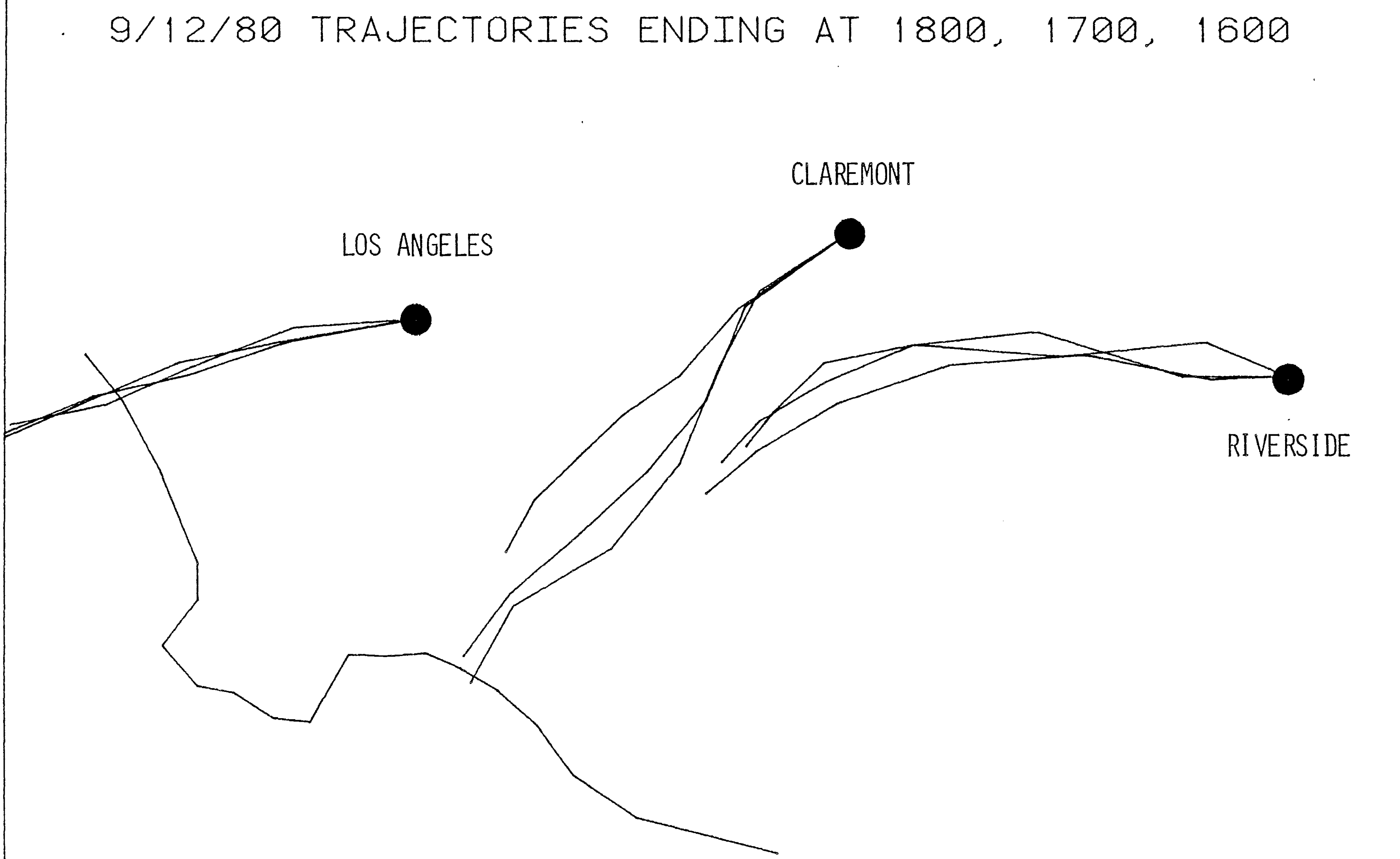



Figure 26. Air mass trajectories for the three-hour sampling period 1500-1800 hours PST, September 12, 1980

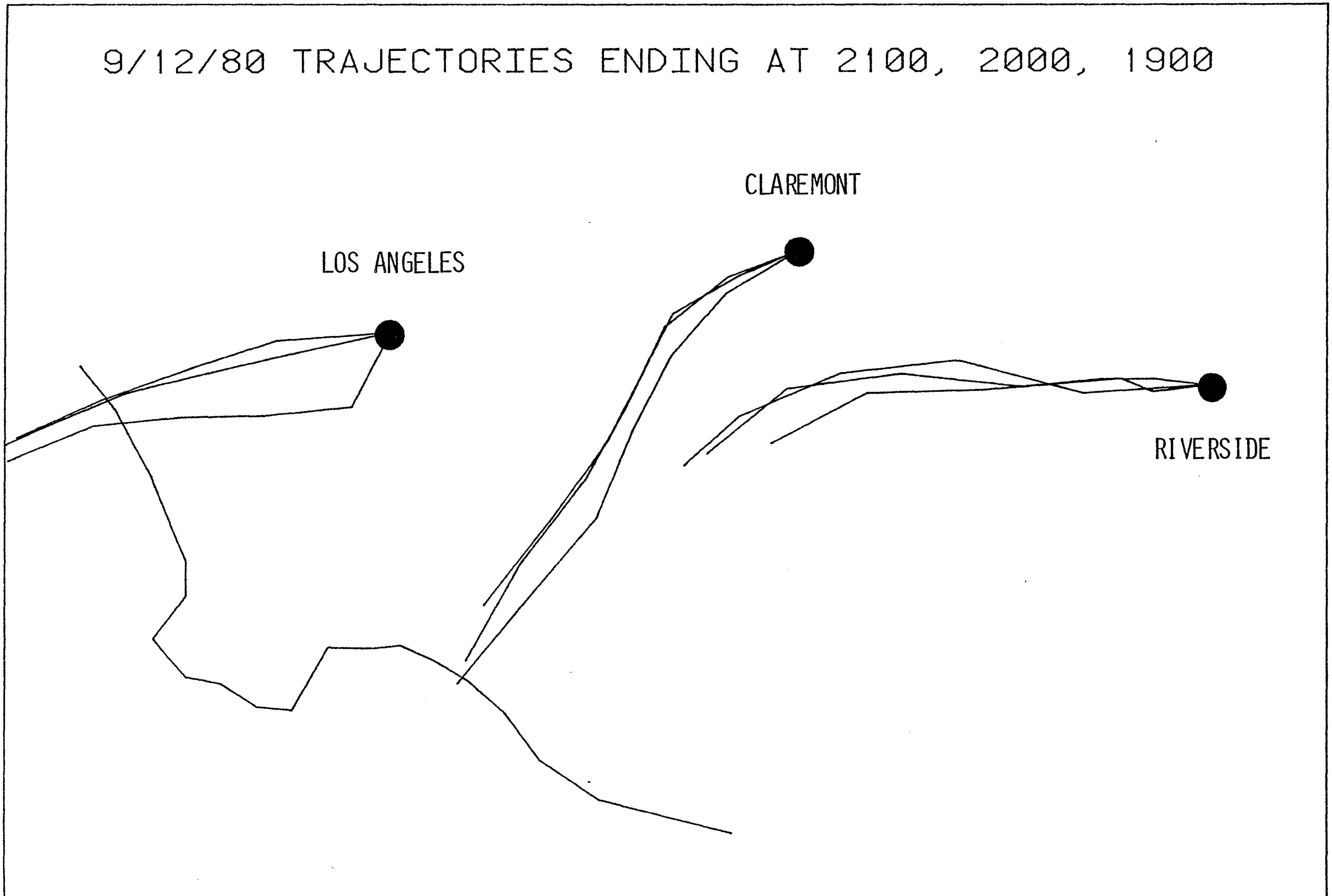



Figure 27. Air mass trajectories for the three-hour sampling period 1800-2100 hours PST, September 12, 1980

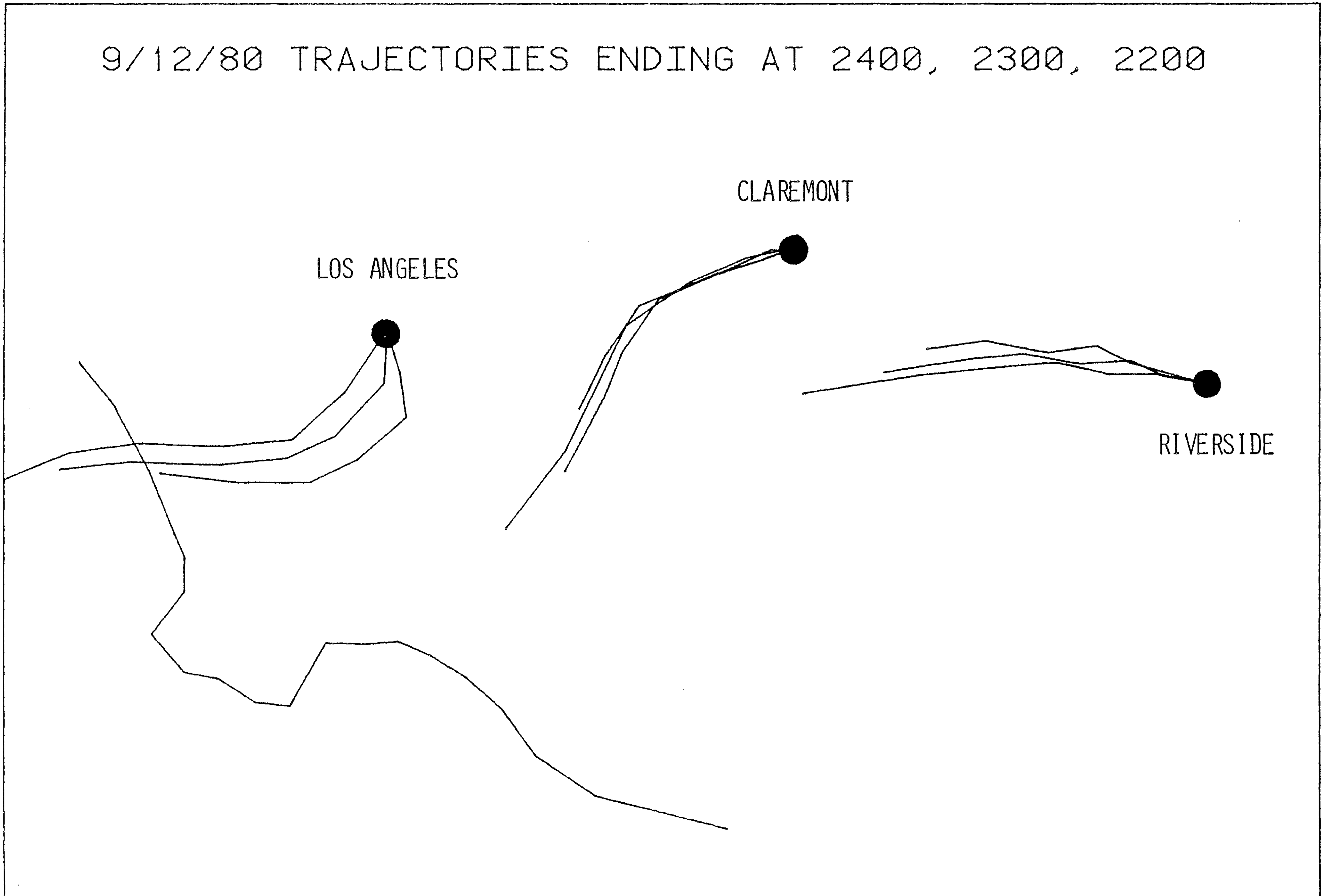



Figure 28. Air mass trajectories for the three-hour sampling period 2100-2400 hours PST, September 12, 1980

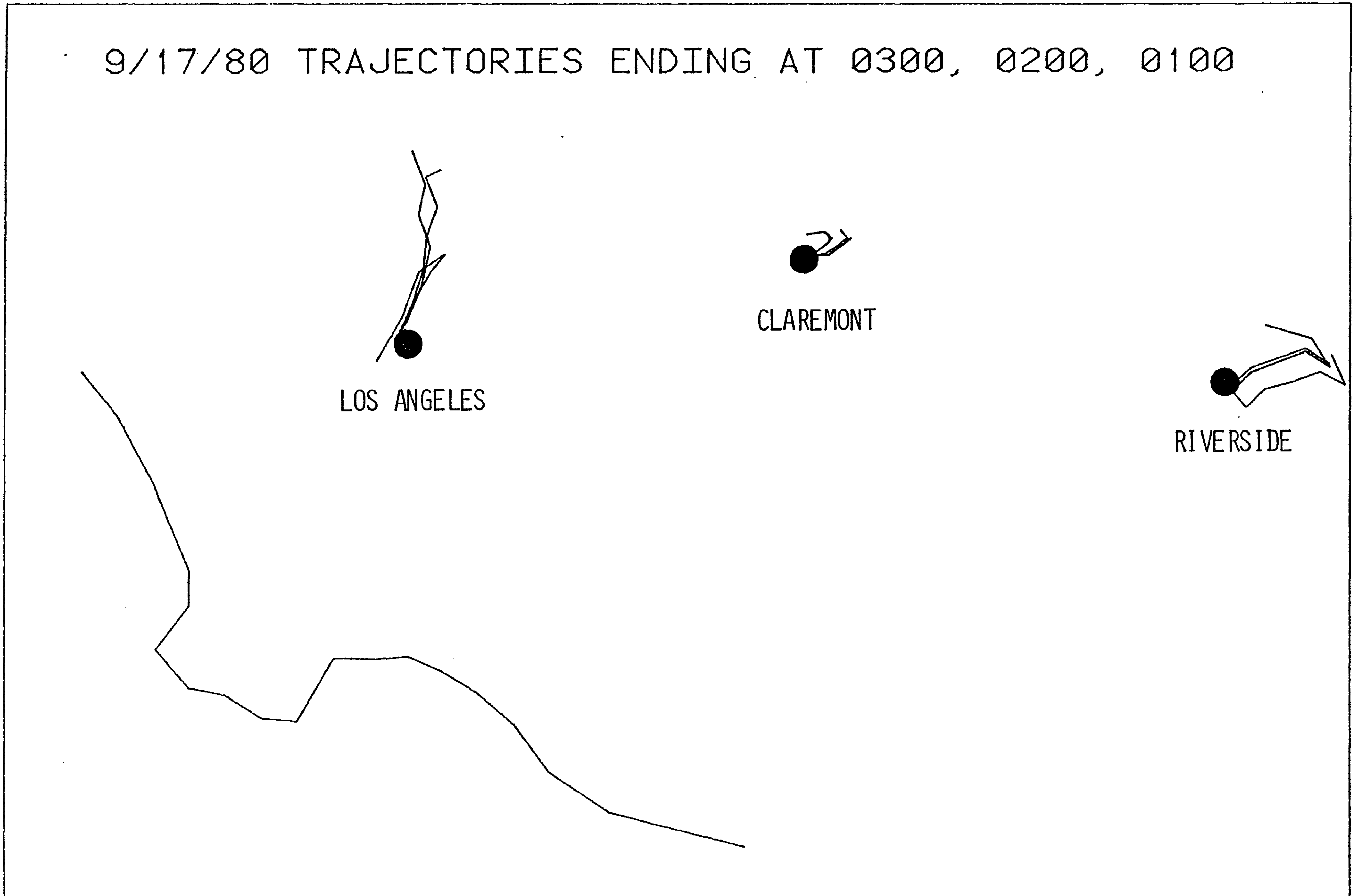



Figure 29. Air mass trajectories for the three-hour sampling period 0000-0300 hours PST, September 17, 1980

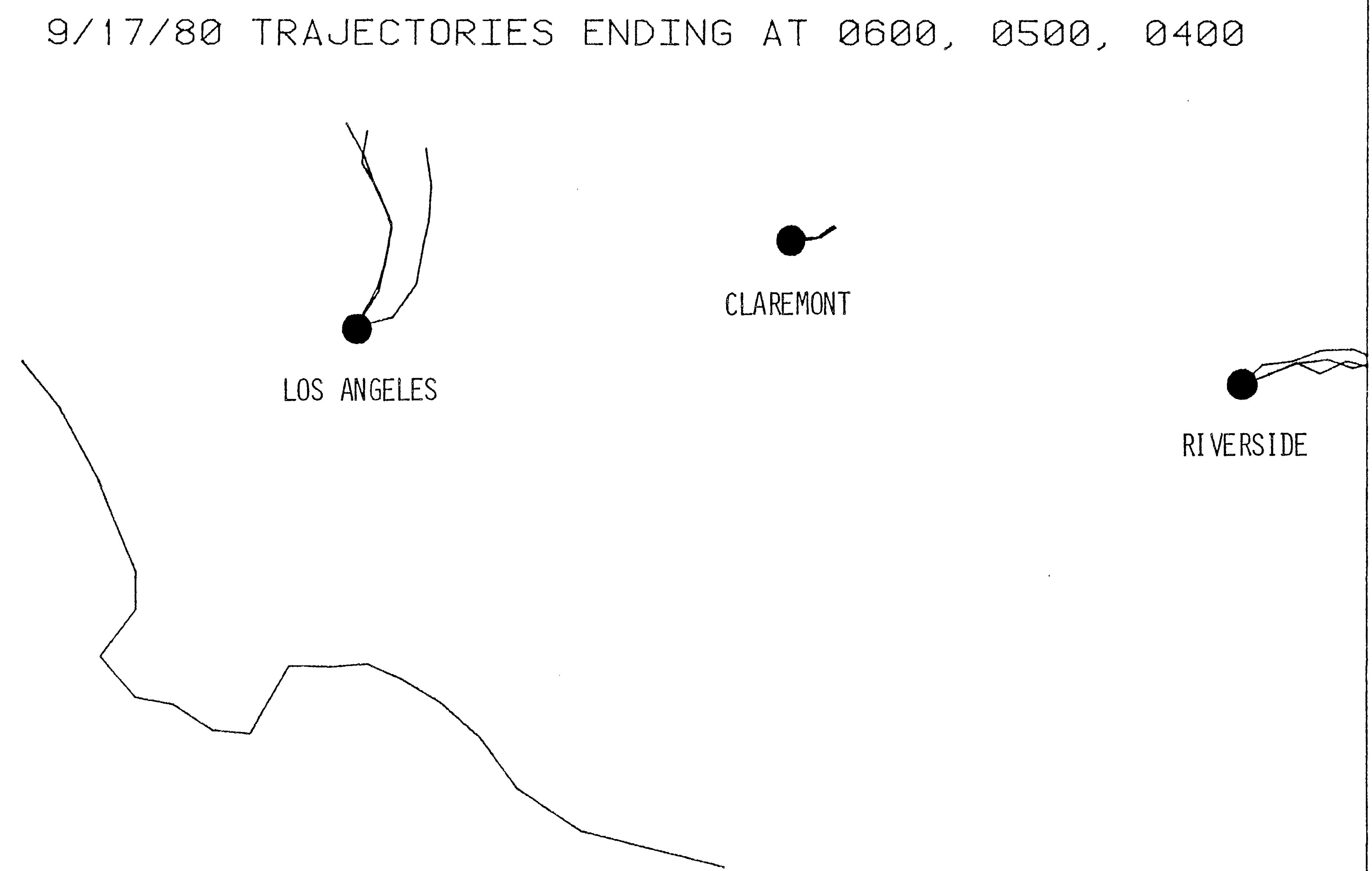



Figure 30. Air mass trajectories for the three-hour sampling period 0300-0600 hours PST, September 17, 1980

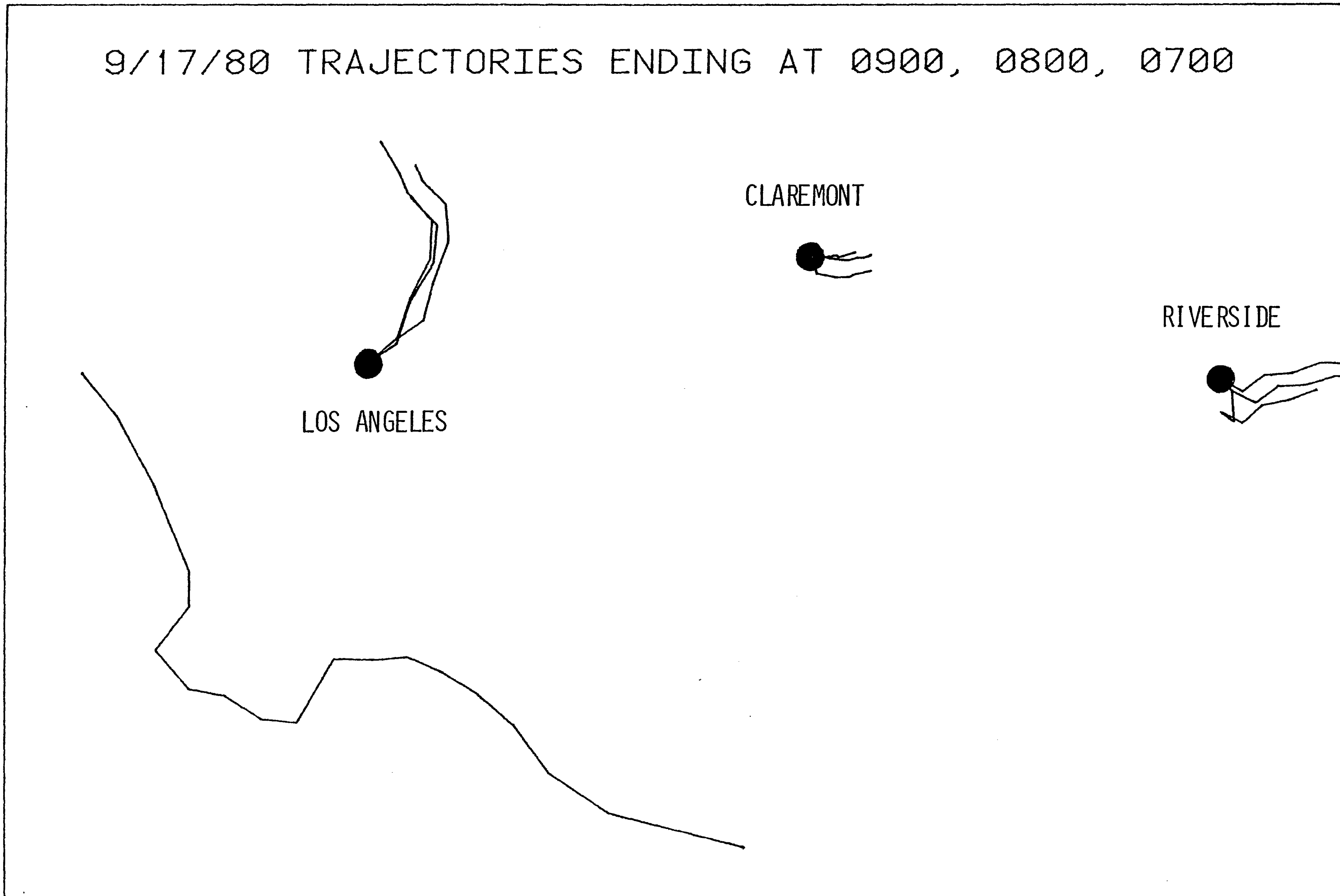



Figure 31. Air·mass trajectories for the three-hour sampling period 0600-0900 hours PST, September 17, 1980

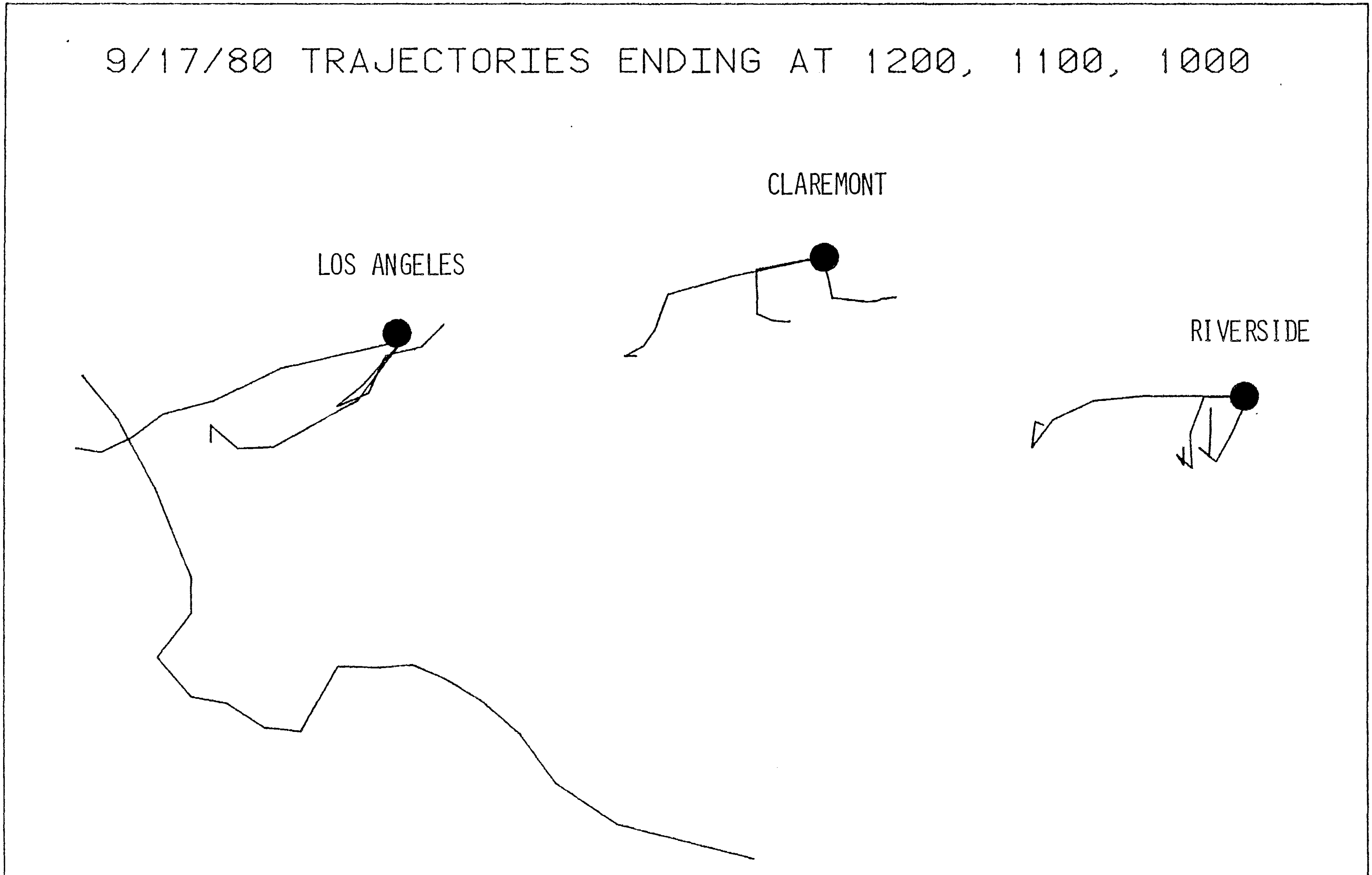



Figure 32. Air mass trajectories for the three-hour sampling period 0900-1200 hours PST, September 17, 1980

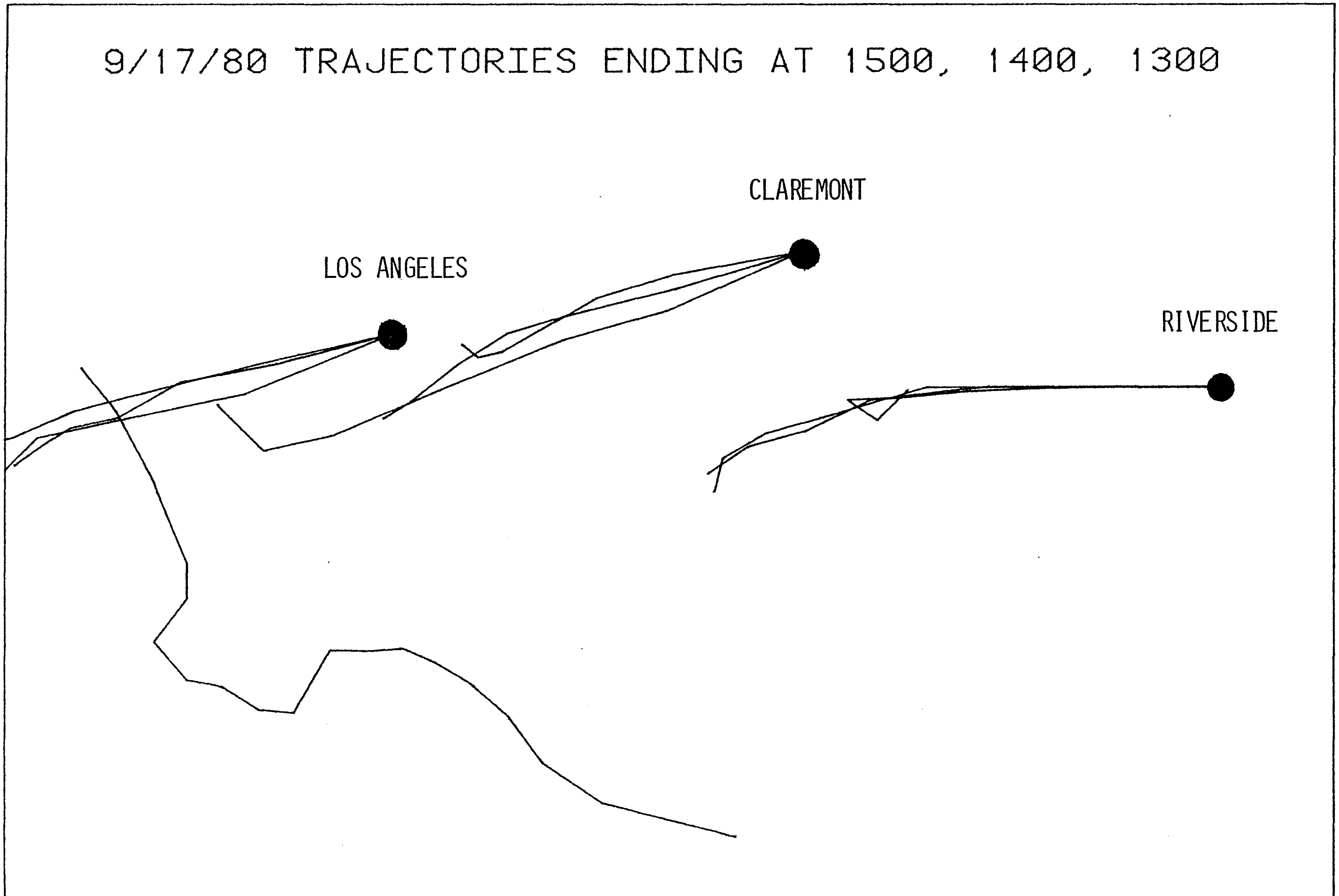



Figure 33. Air mass trajectories for the three-hour sampling period 1200-1500 hours PST, September 17, 1980

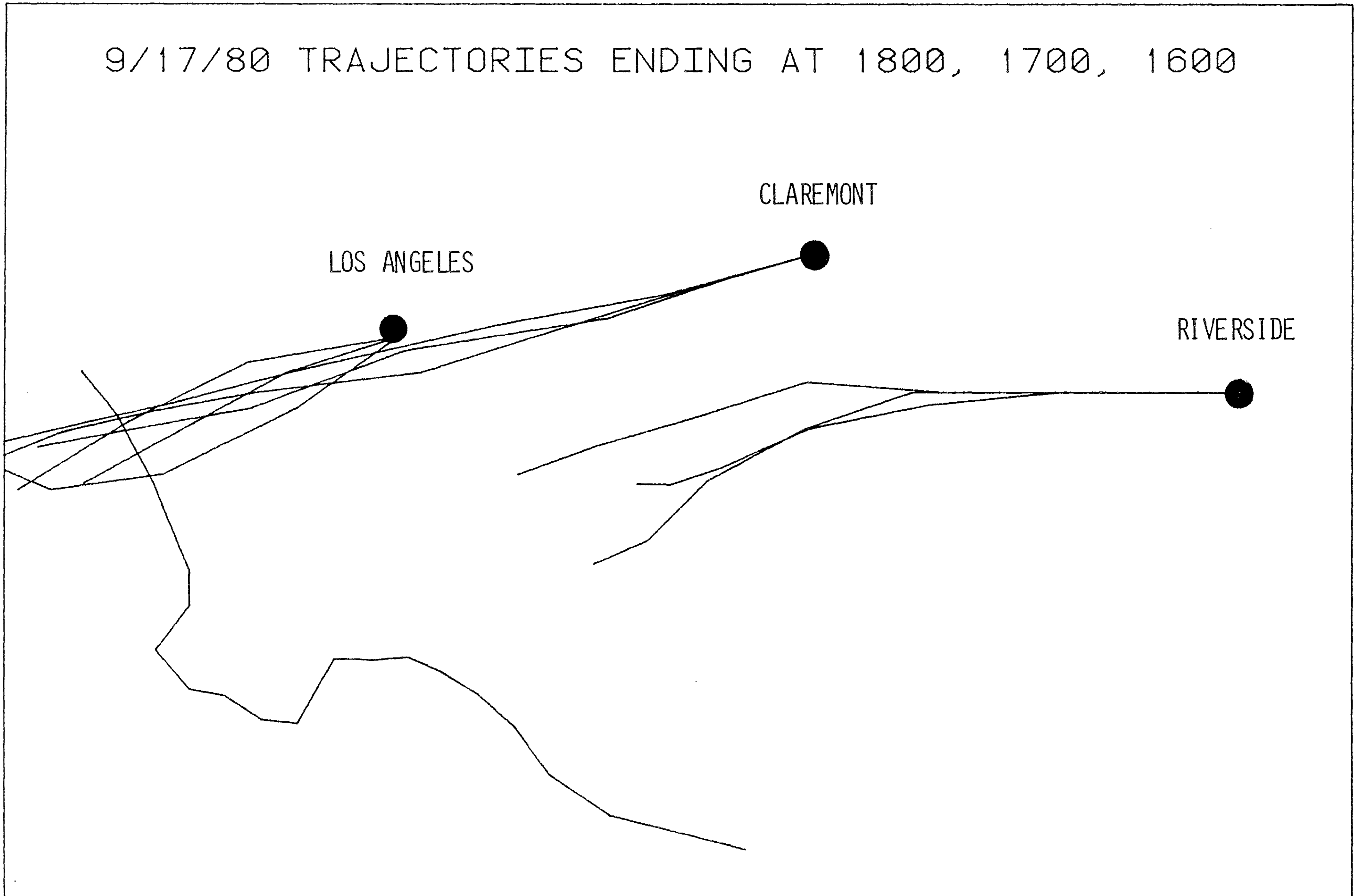



Figure 34. Air·mass trajectories for the three-hour sampling period 1500-1800 hours PST, September 17, 1980

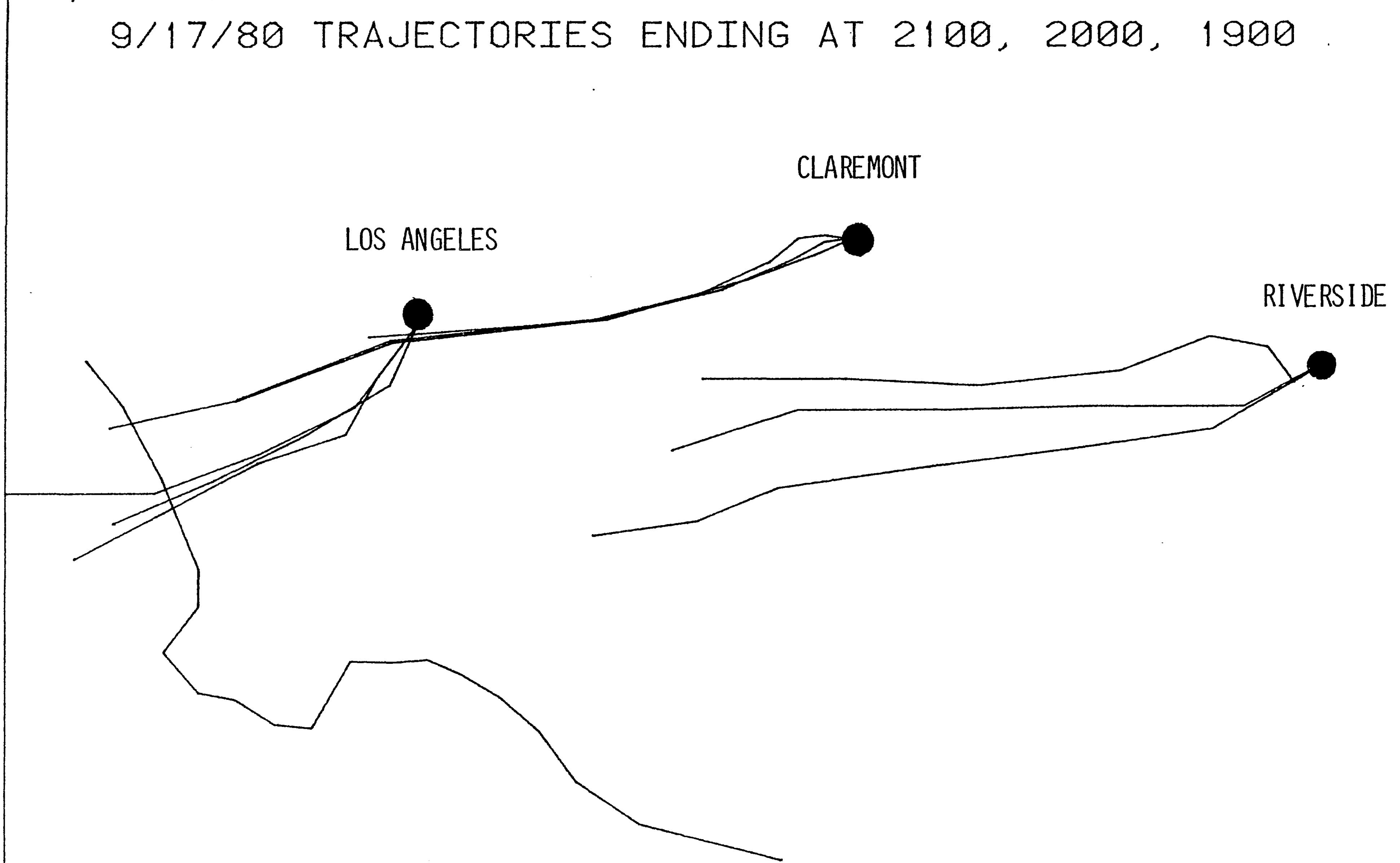



Figure 35. Air mass trajectories for the three-hour sampling period 1800-2100 hours PST, September 17, 1980

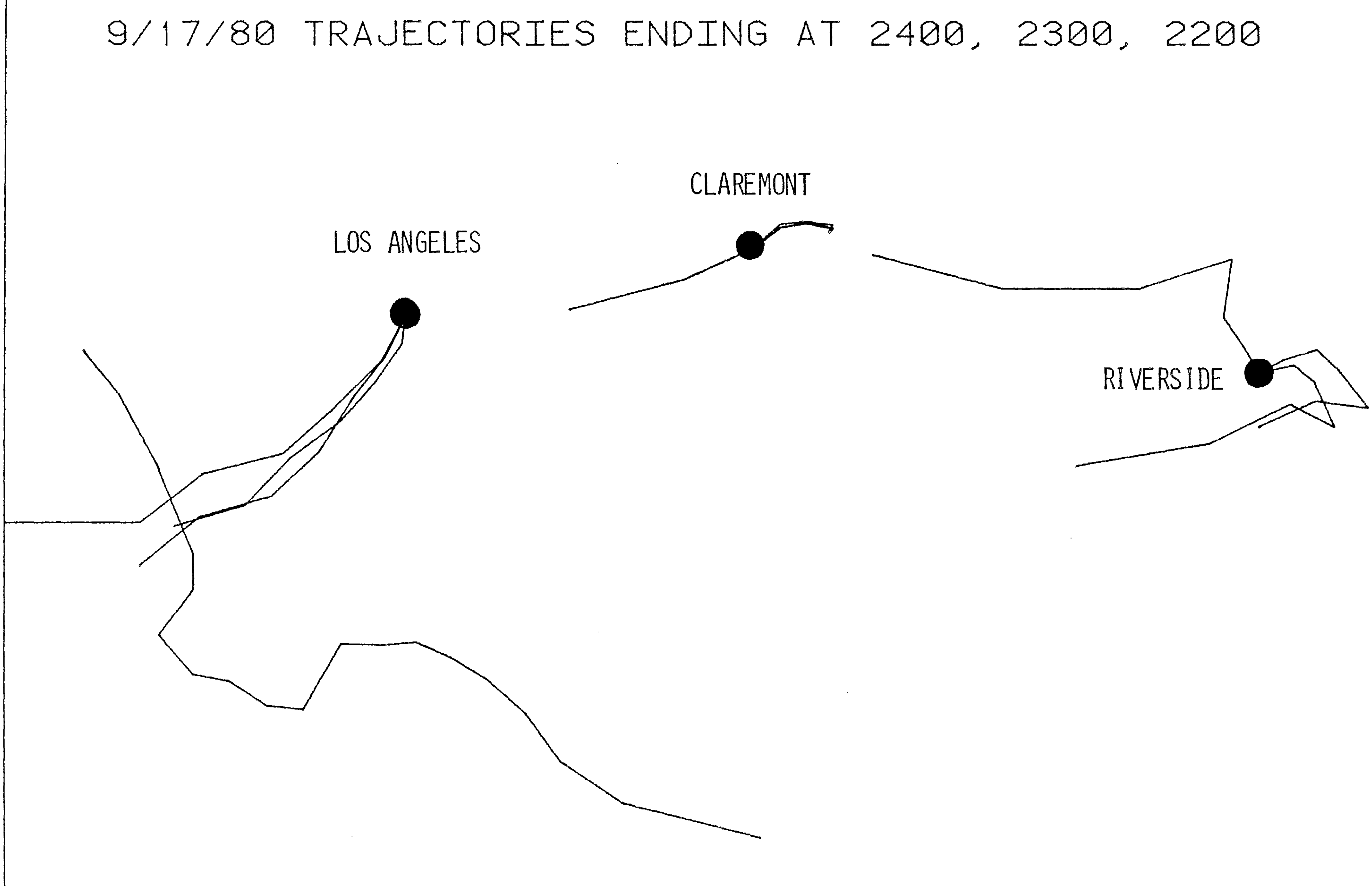



Figure 36. Air mass trajectories for the three-hour sampling period 2100-2400 hours PST, September 17, 1980

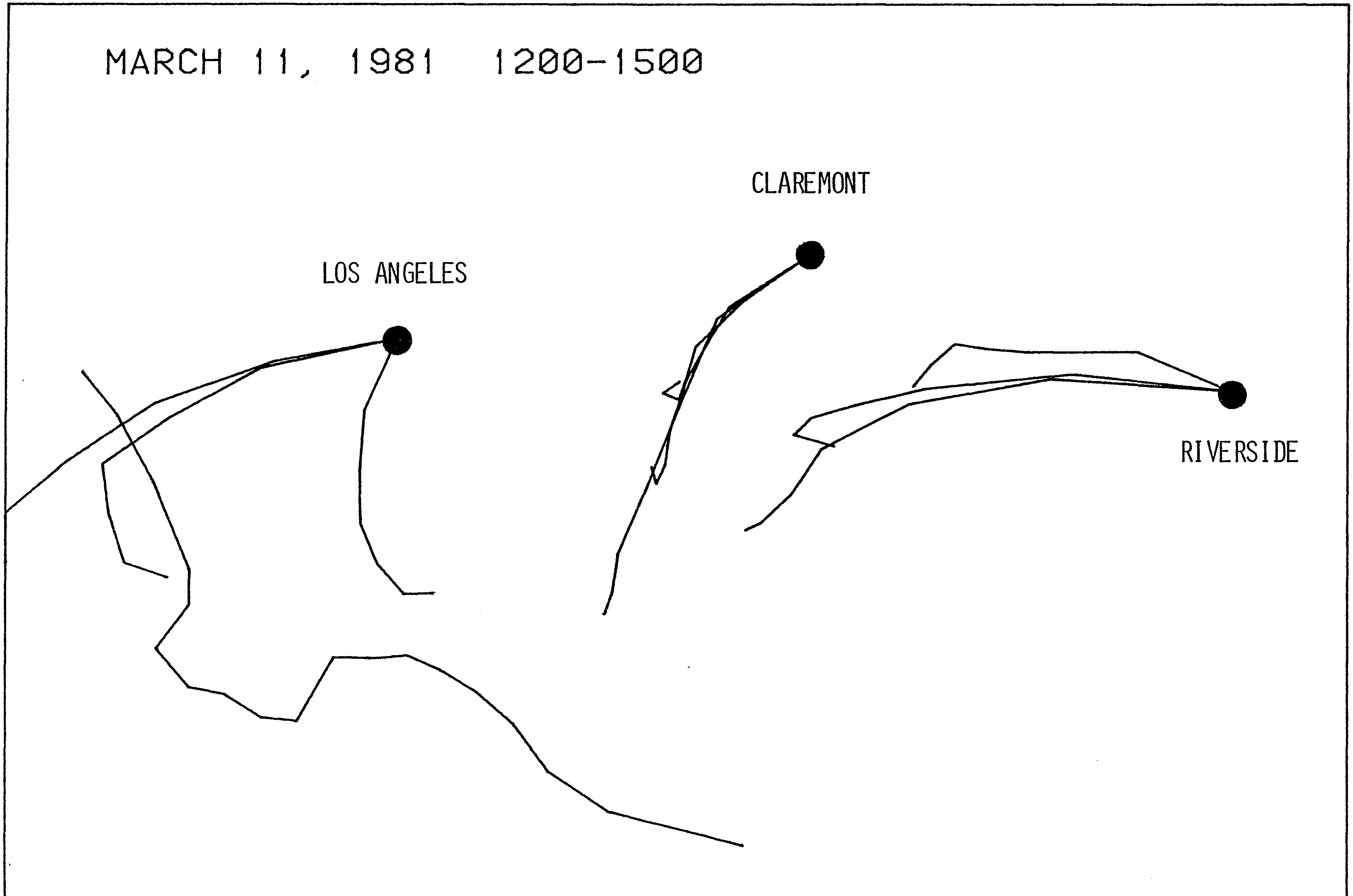



Figure 37. Air mass trajectories for the three-hour sampling period 1200-1500 hours PST, March 11, 1981

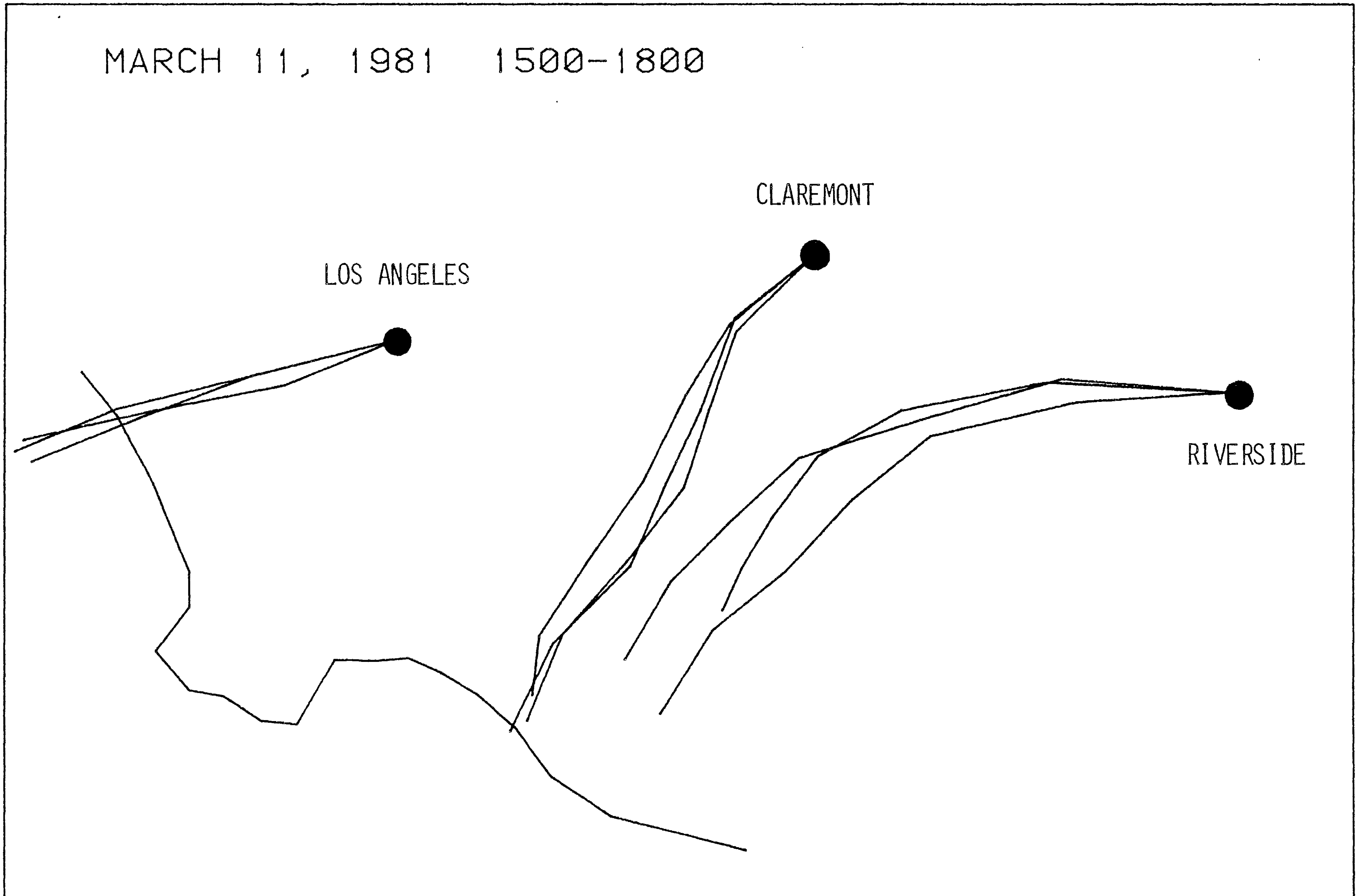



Figure 38. Air mass trajectories for the three-hour sampling period 1500-1800 hours PST, March 11, 1981

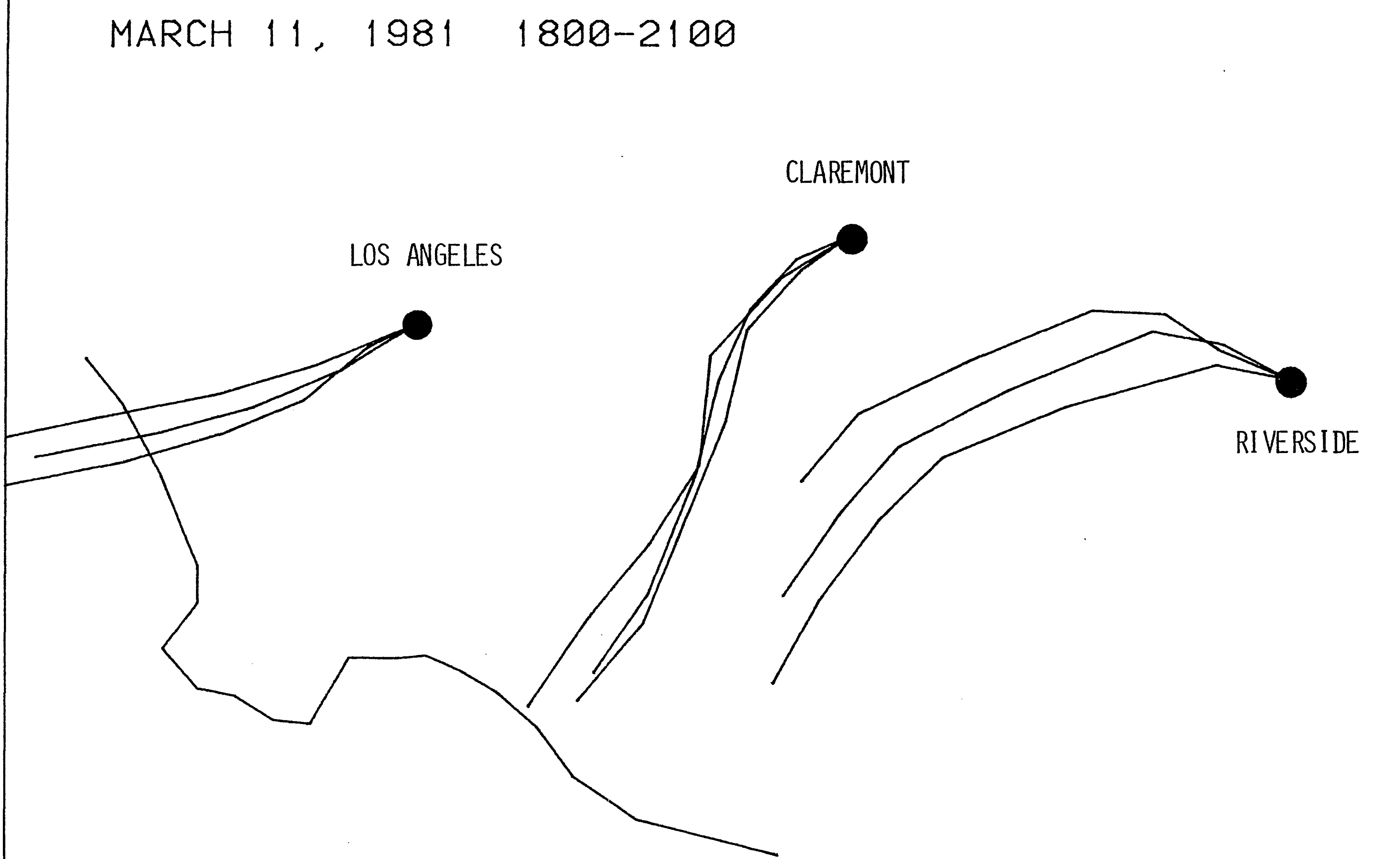



Figure 39. Air mass trajectories for the three-hour sampling period 1800-2100 hours PST, March 11, 1981

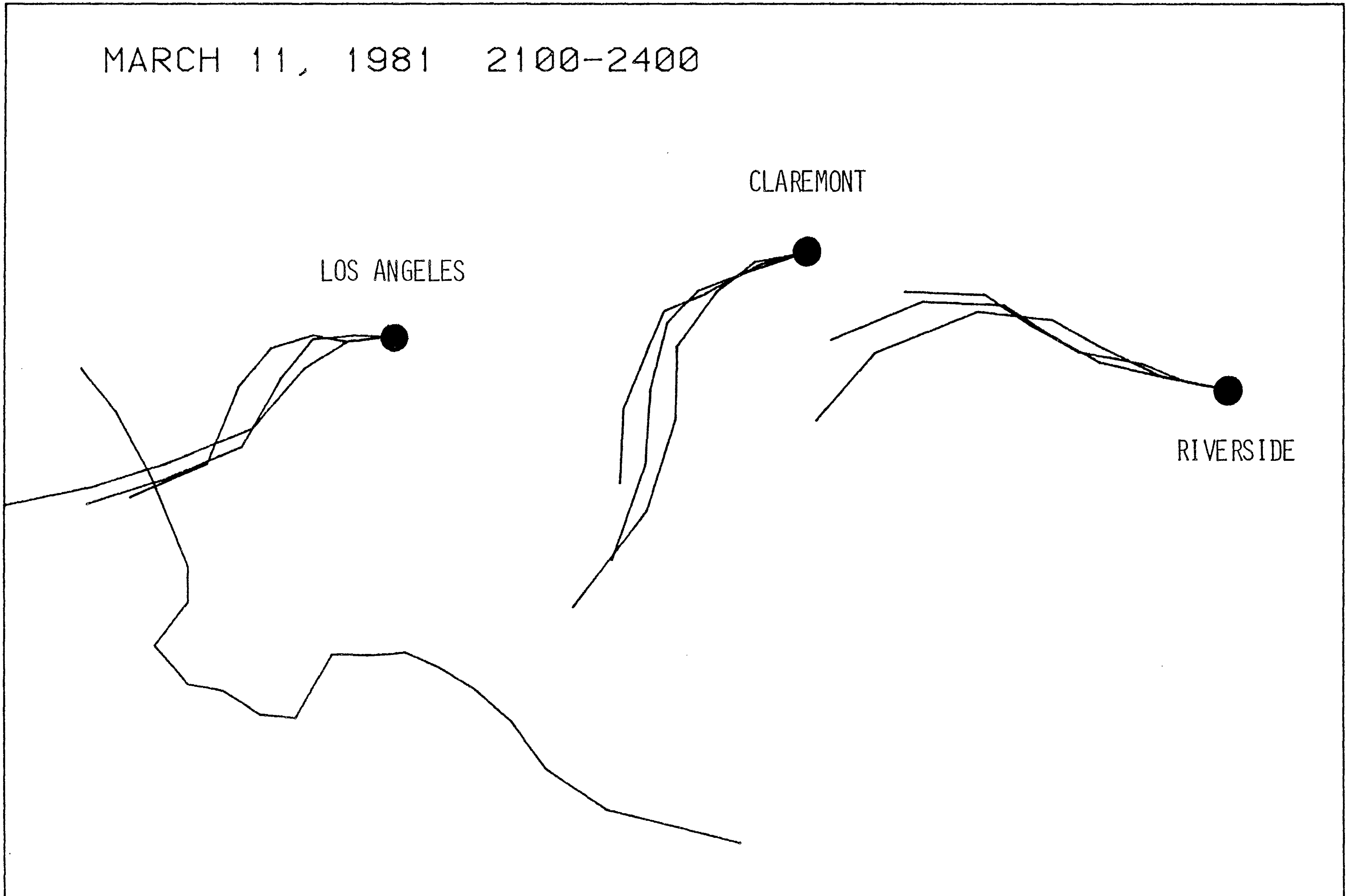



Figure 40. Air mass trajectories for the three-hour sampling period 2100-2400 hours PST, March 11, 1981

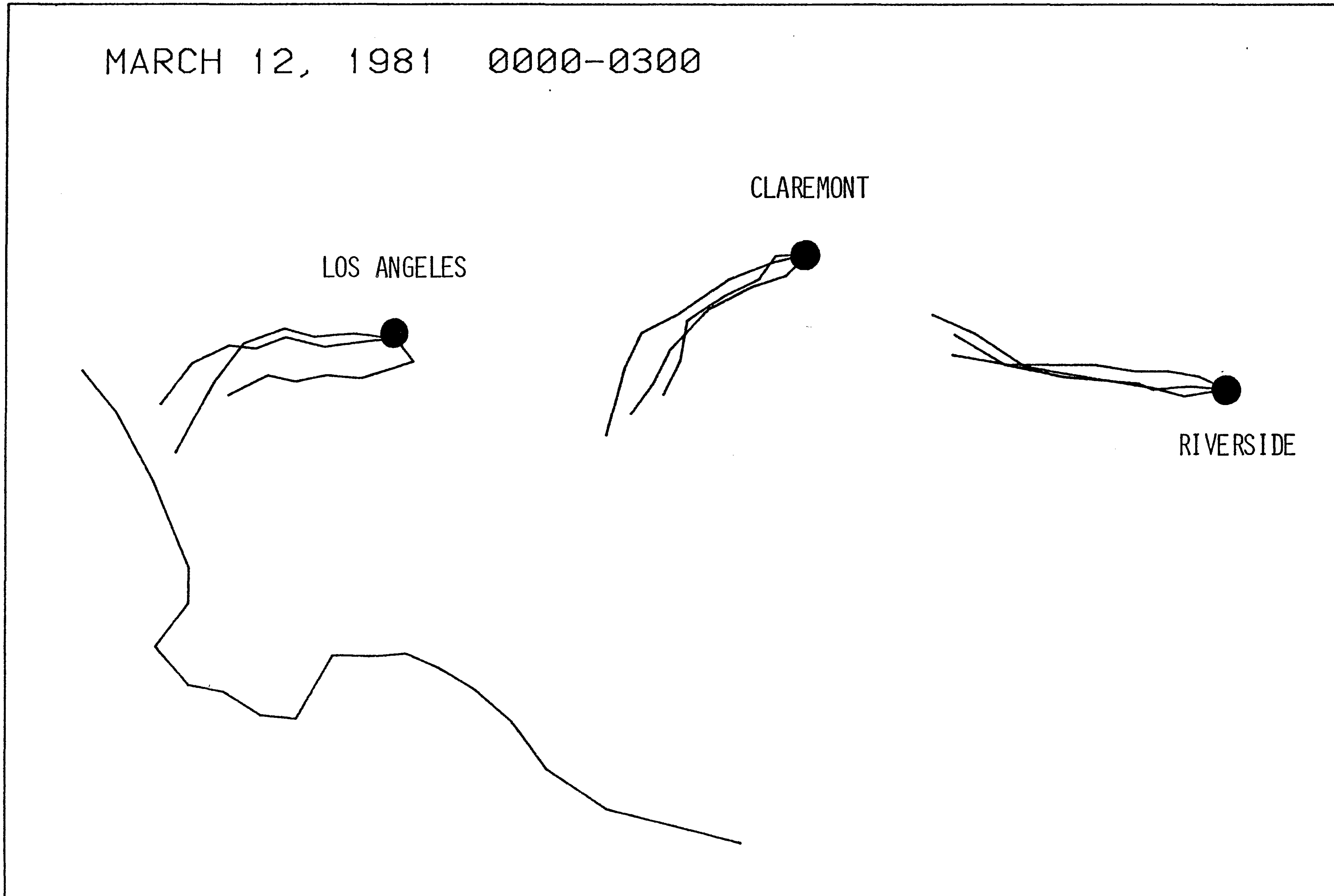



Figure 41. Air mass trajectories for the three-hour sampling period 0000-0300 hours PST, March 12, 1981

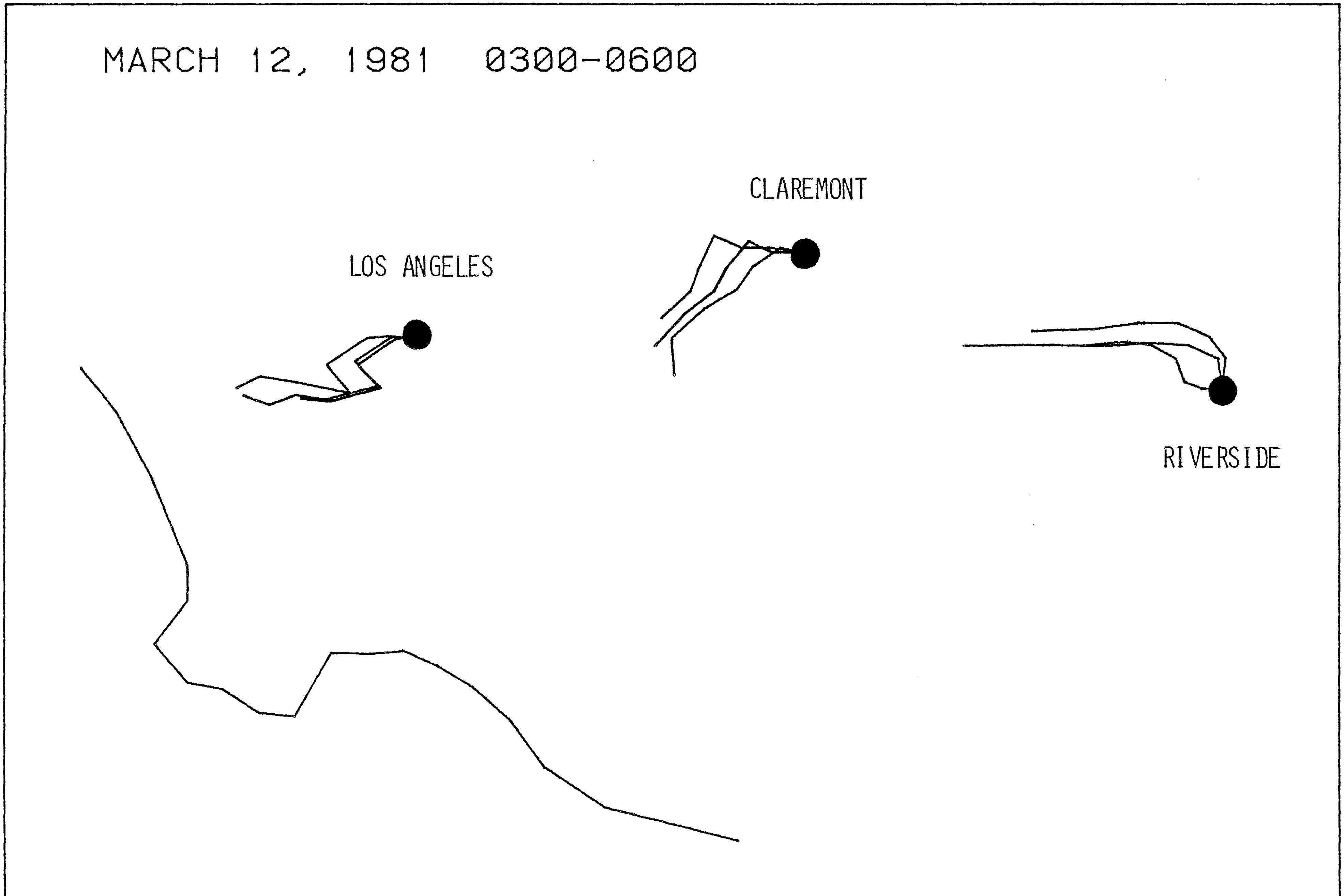



Figure 42. Air mass trajectories for the three-hour sampling period 0300-0600 hours PST, March 12, 1981

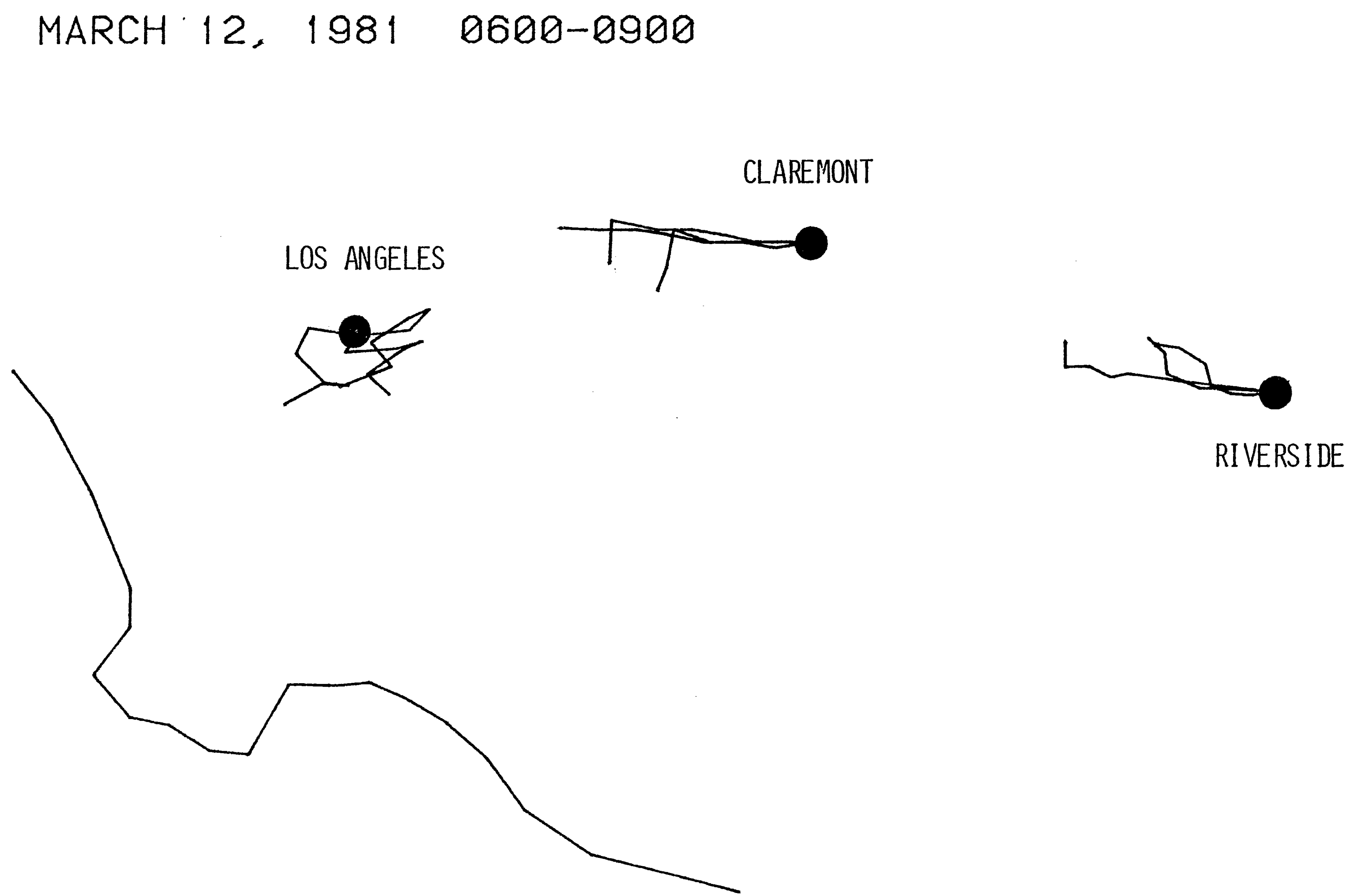



Figure 43. Air mass trajectories for the three-hour sampling period 0600-0900 hours PST, March 12, 1981

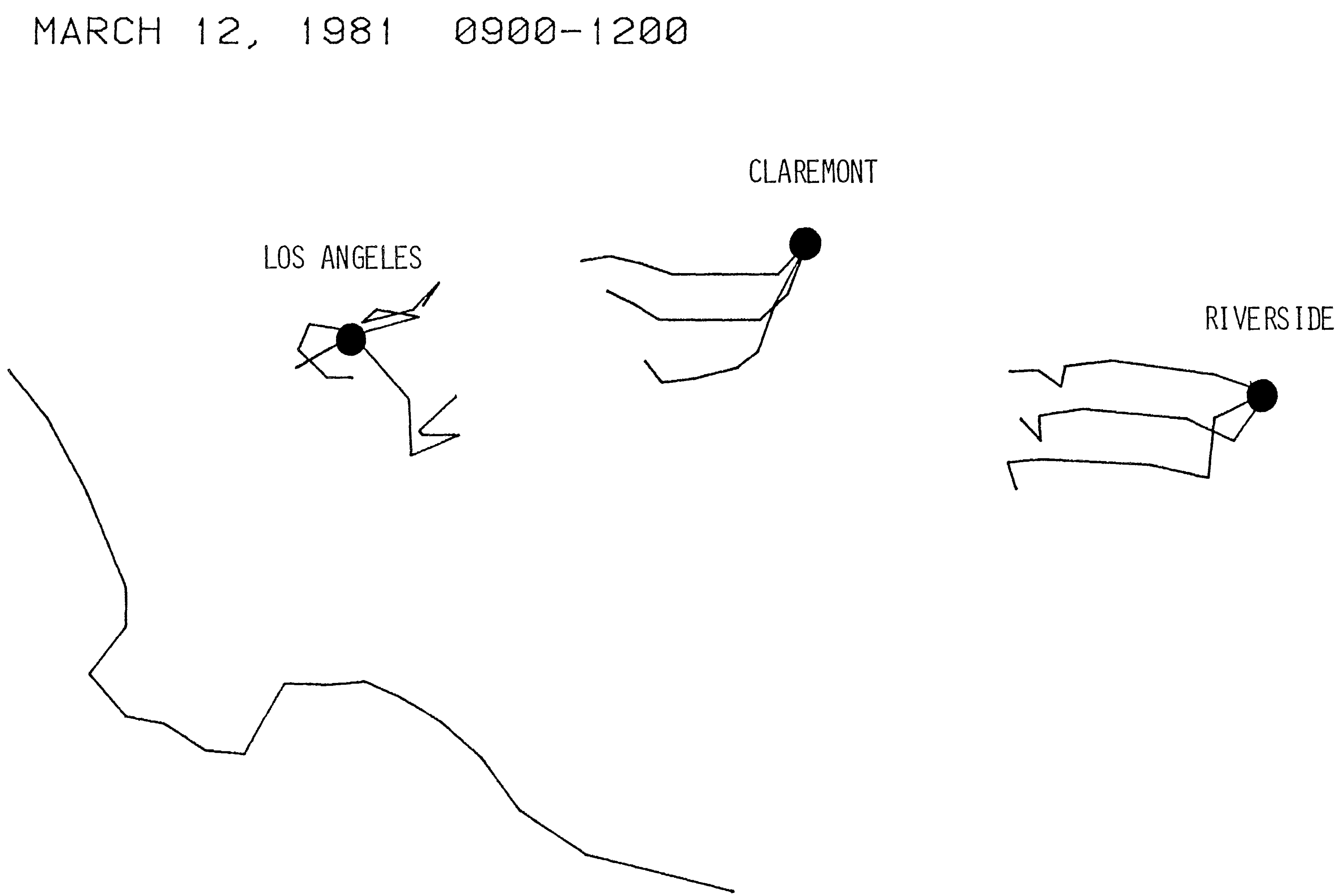



Figure 44. Air mass trajectories for the three-hour sampling period 0900-1200 hours PST, March 12, 1981

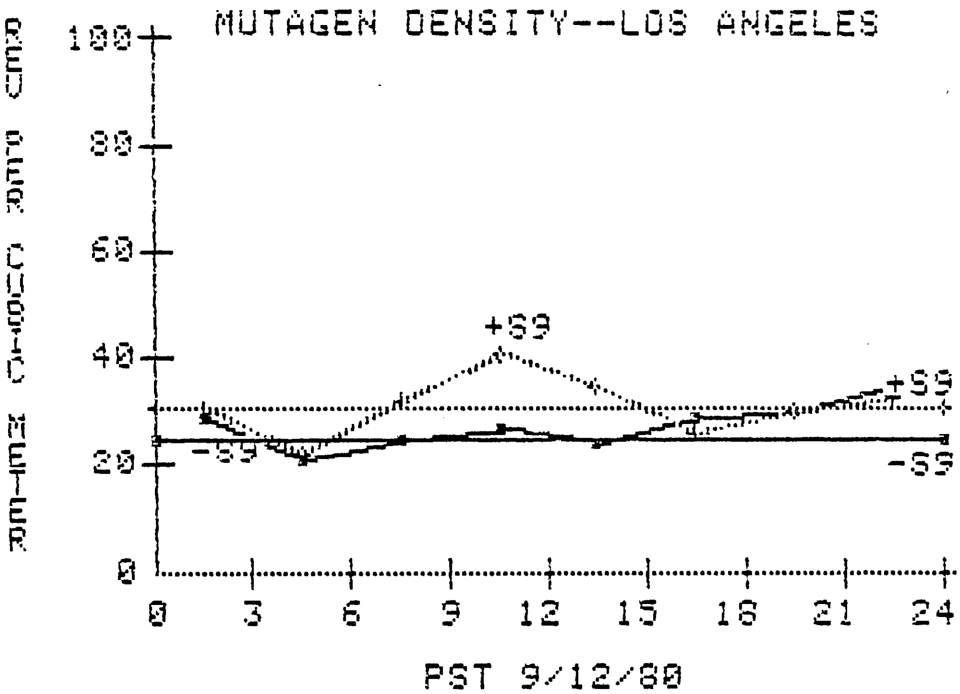



Figure 45. Diurnal variation of mutagen density, September 12, 1980: Los Angeles

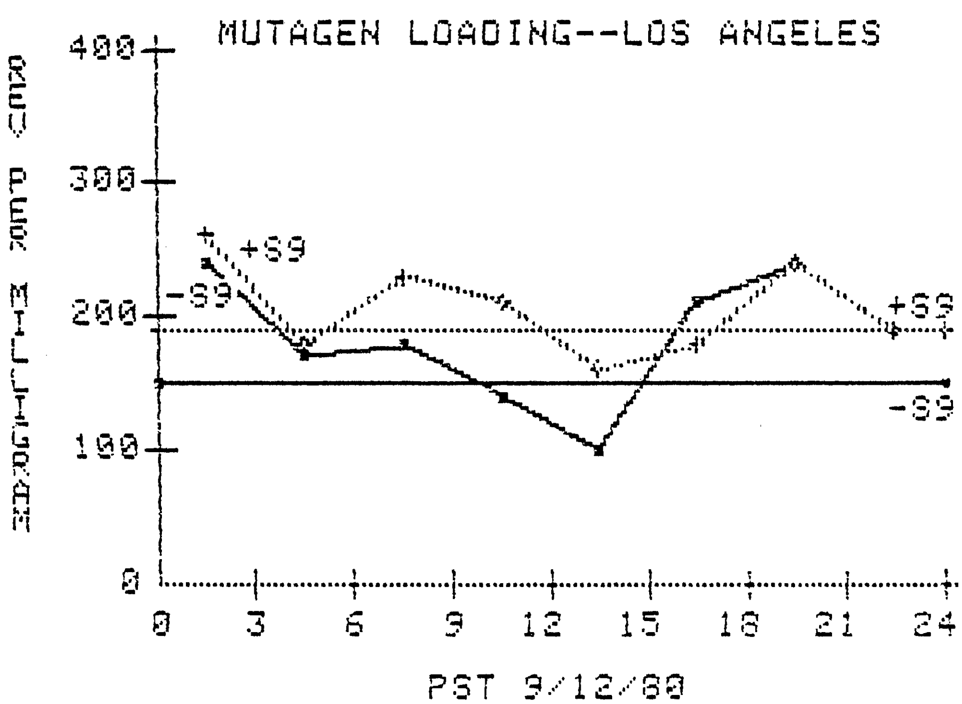



Figure 46. Diurnal variation of mutagen loading, September 12, 1980: Los Angeles

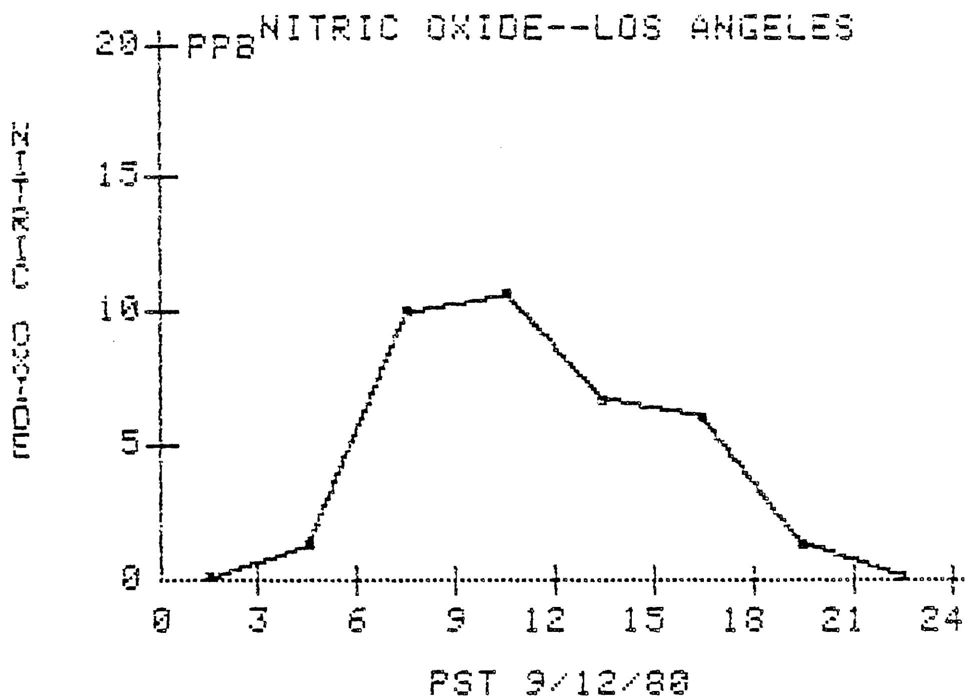



Figure 47. Diurnal variation of nitric oxide concentration, September 12, 1980: Los Angeles

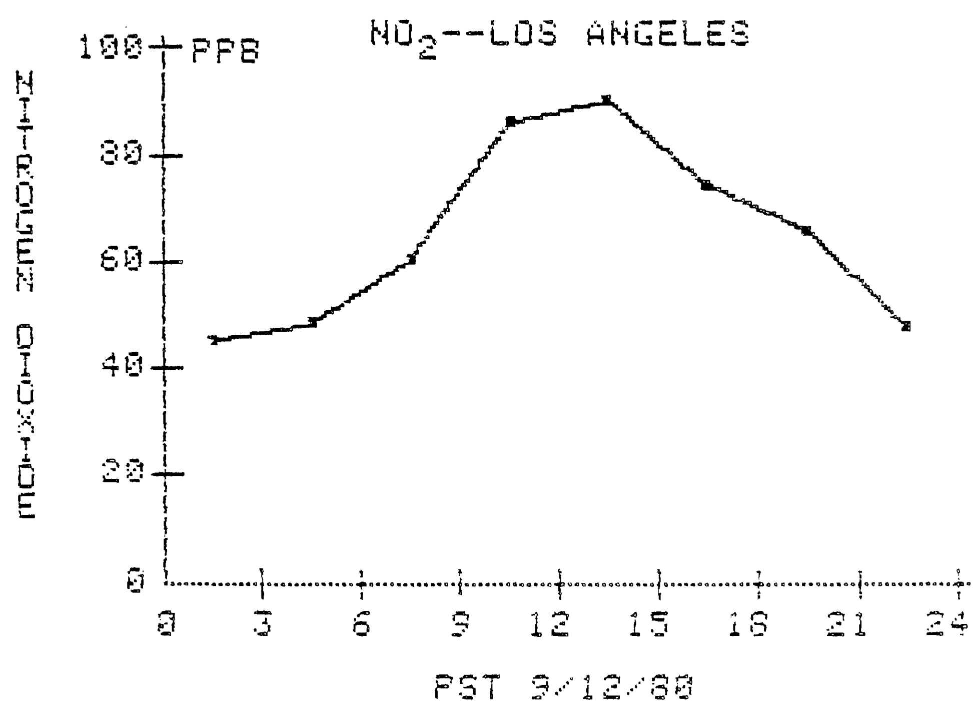



Figure 48. Diurnal variation of nitrogen dioxide concentration, September 12, 1980: Los Angeles

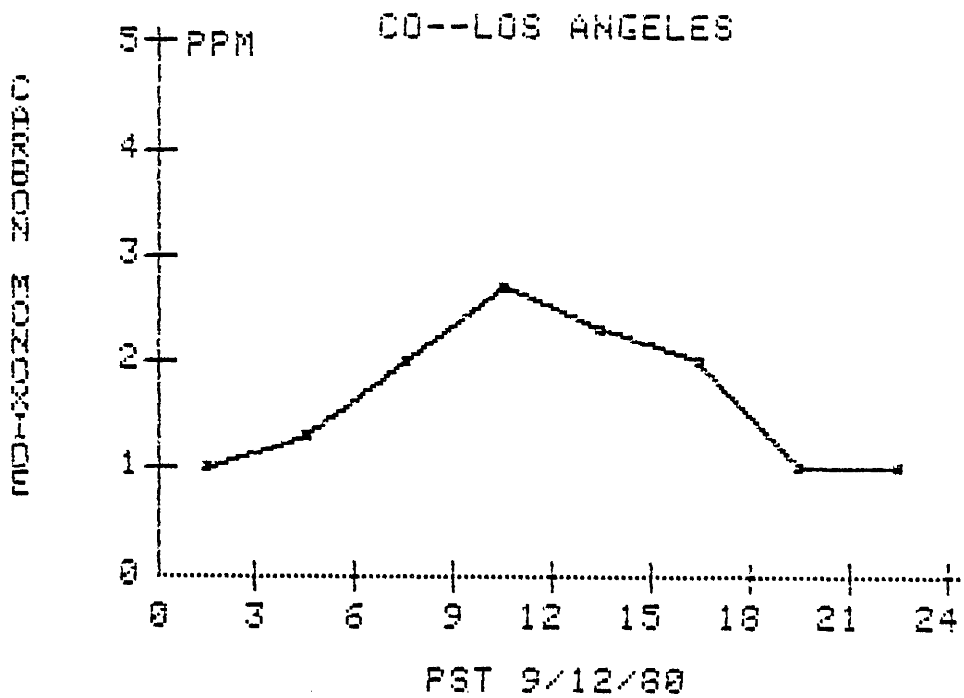



Figure 49. Diurnal variation of carbon monoxide concentration, September 12, 1980: Los Angeles

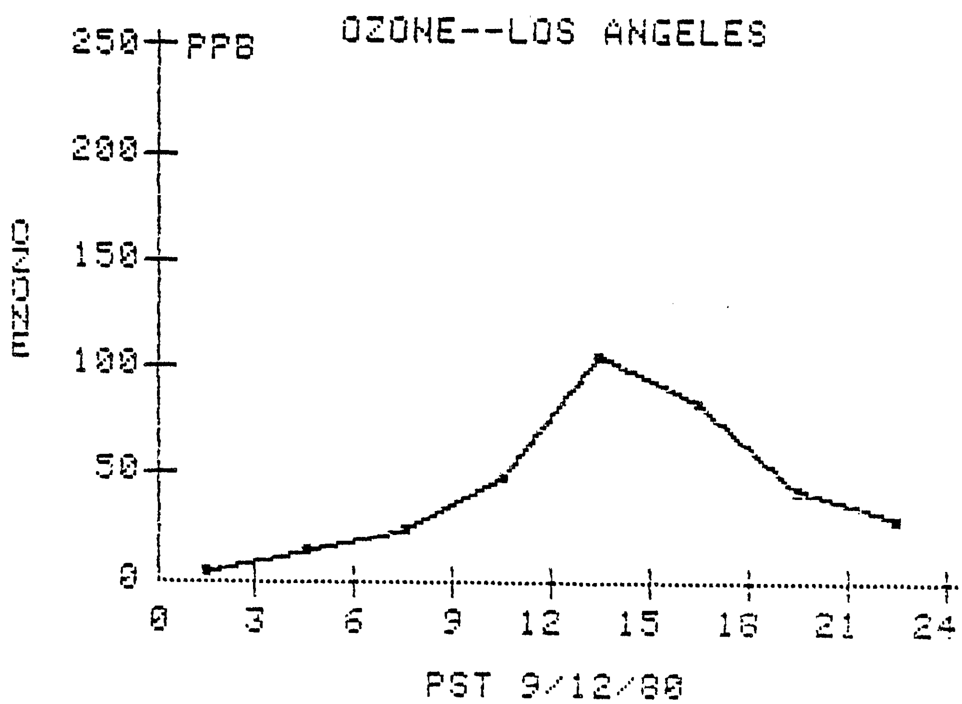



Figure 50. Diurnal variation of ozone concentration, September 12, 1980: Los Angeles

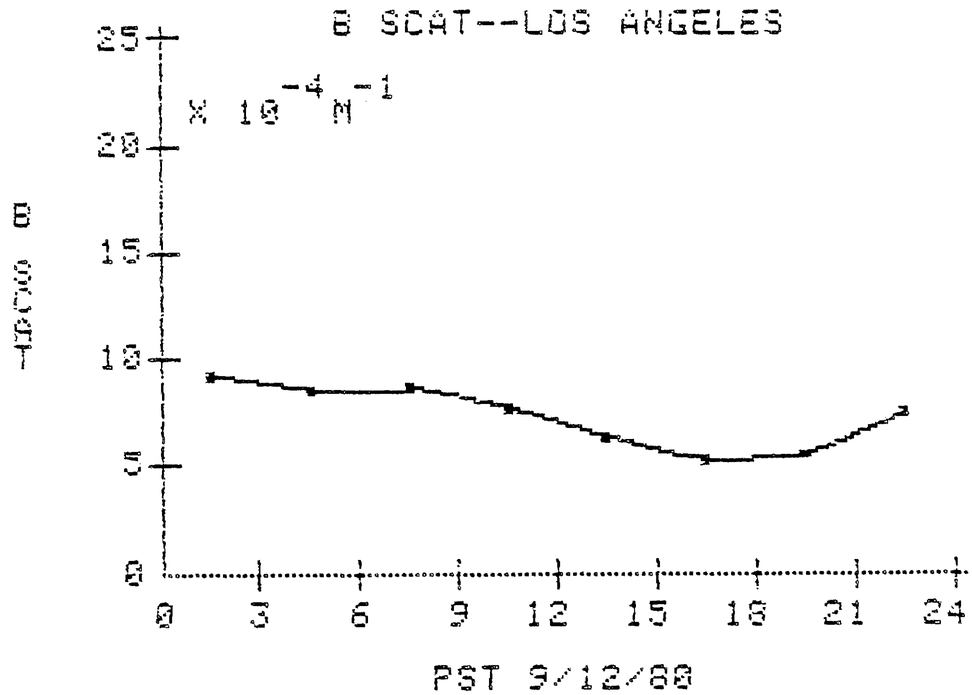



Figure 51. Diurnal variation of $b_{scat}$, September 12, 1980: Los Angeles

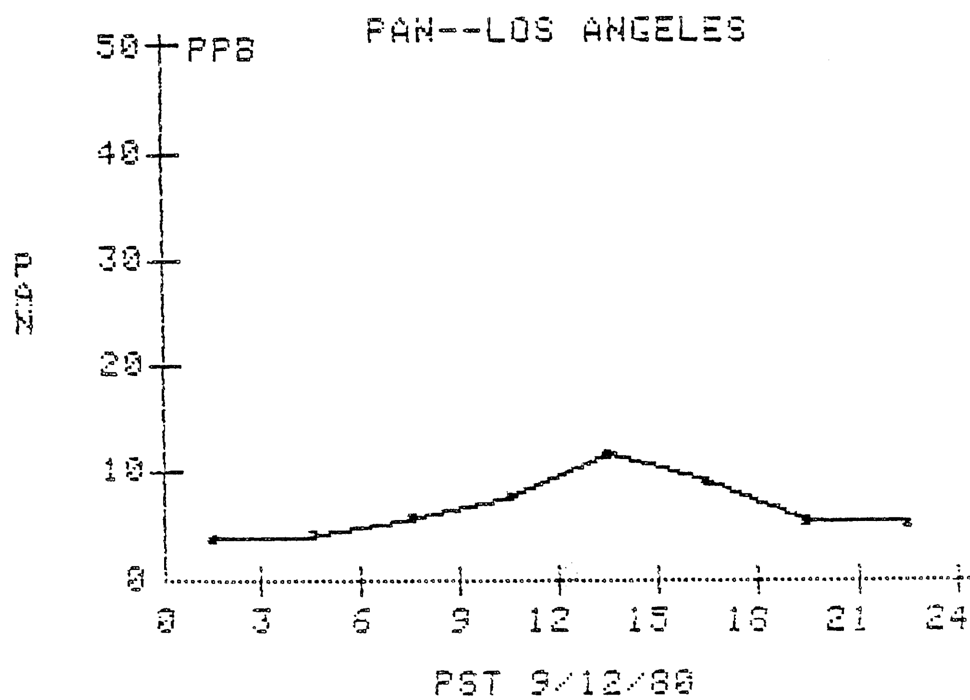



Figure 52. Diurnal variation of peroxyacetyl nitrate concentration, September 12, 1980: Los Angeles

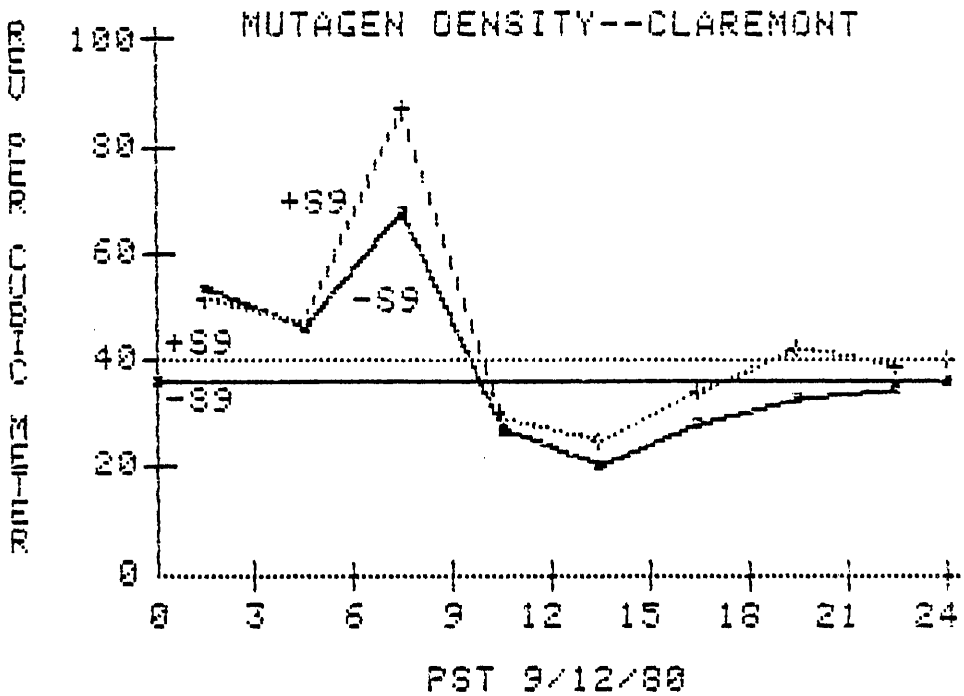



Figure 53. Diurnal variation of mutagen density, September 12, 1980: Claremont

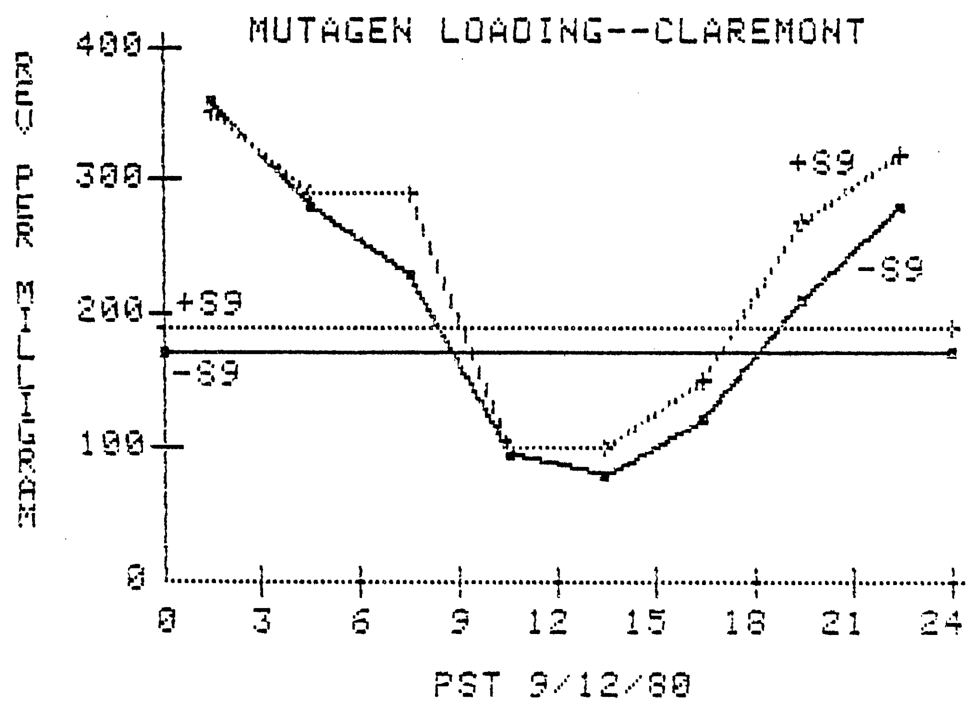



Figure 54. Diurnal variation of mutagen loading, September 12, 1980: Claremont

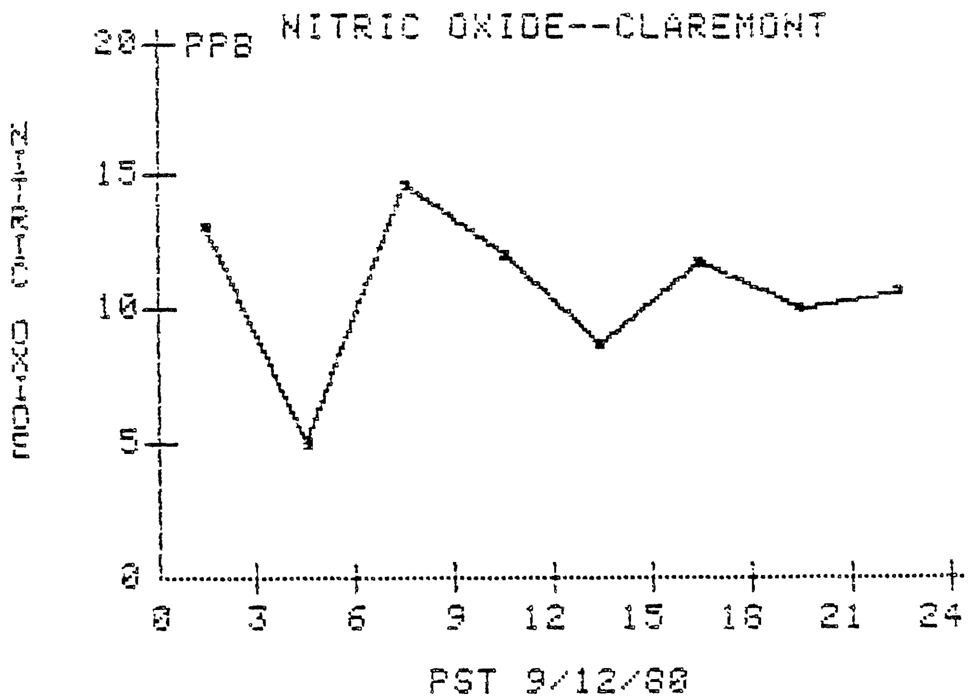



Figure 55. Diurnal variation of nitric oxide concentration, September 12, 1980: Claremont

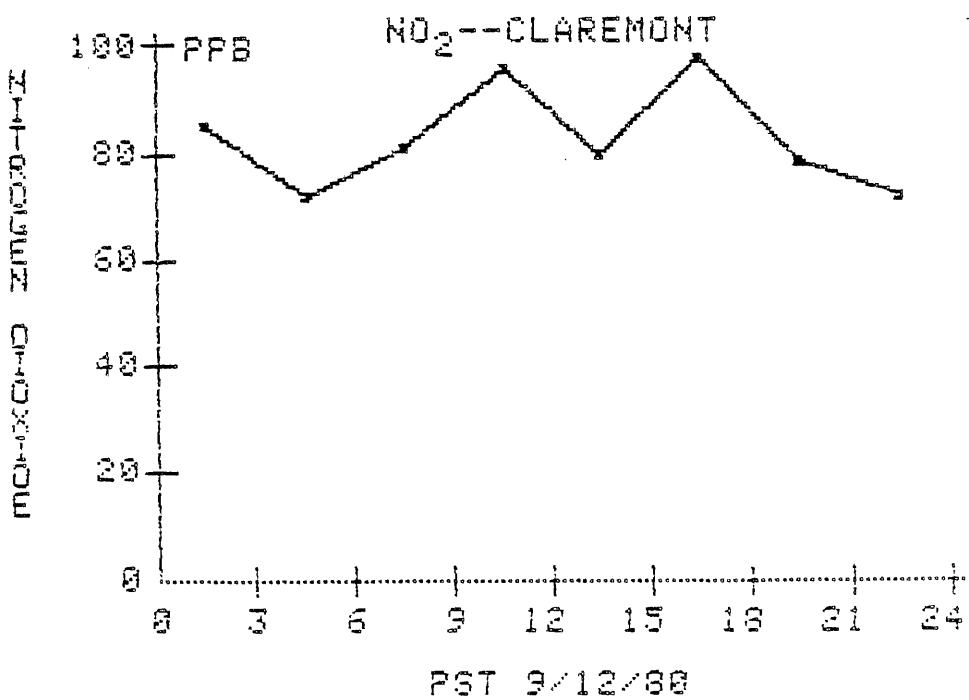



Figure 56. Diurnal variation of nitrogen dioxide concentration, September 12, 1980: Claremont

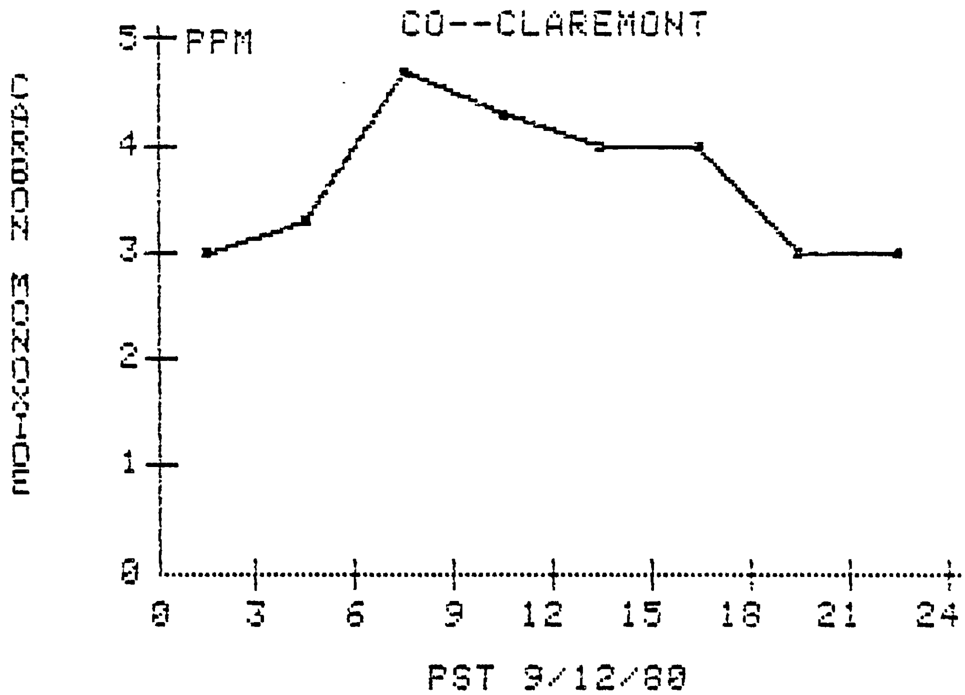



Figure 57. Diurnal variation of carbon monoxide concentration, September 12, 1980: Claremont

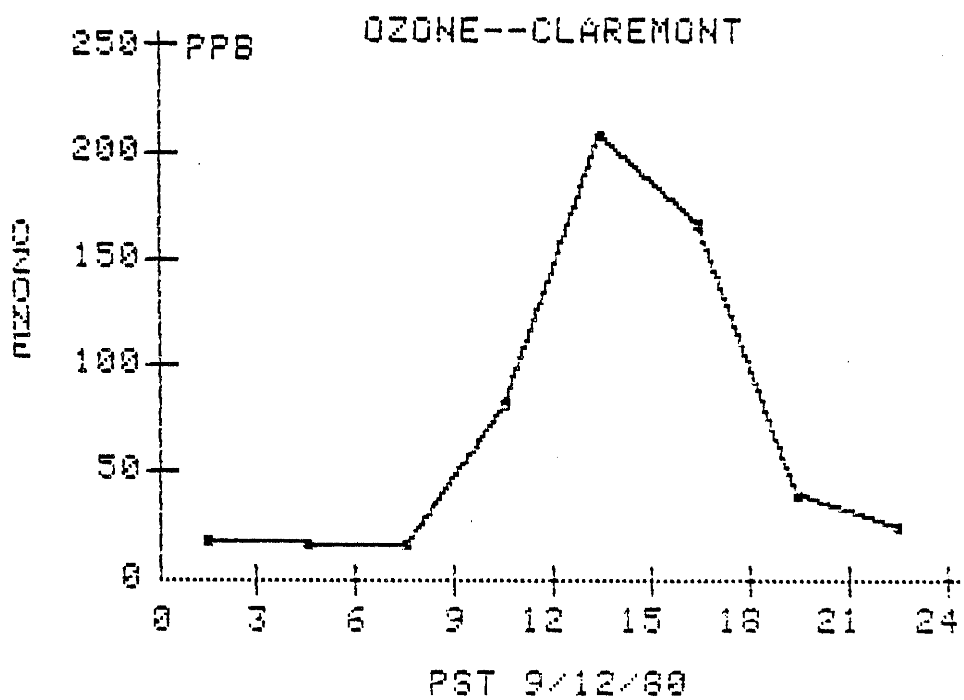



Figure 58. Diurnal variation of ozone concentration, September 12, 1980: Claremont

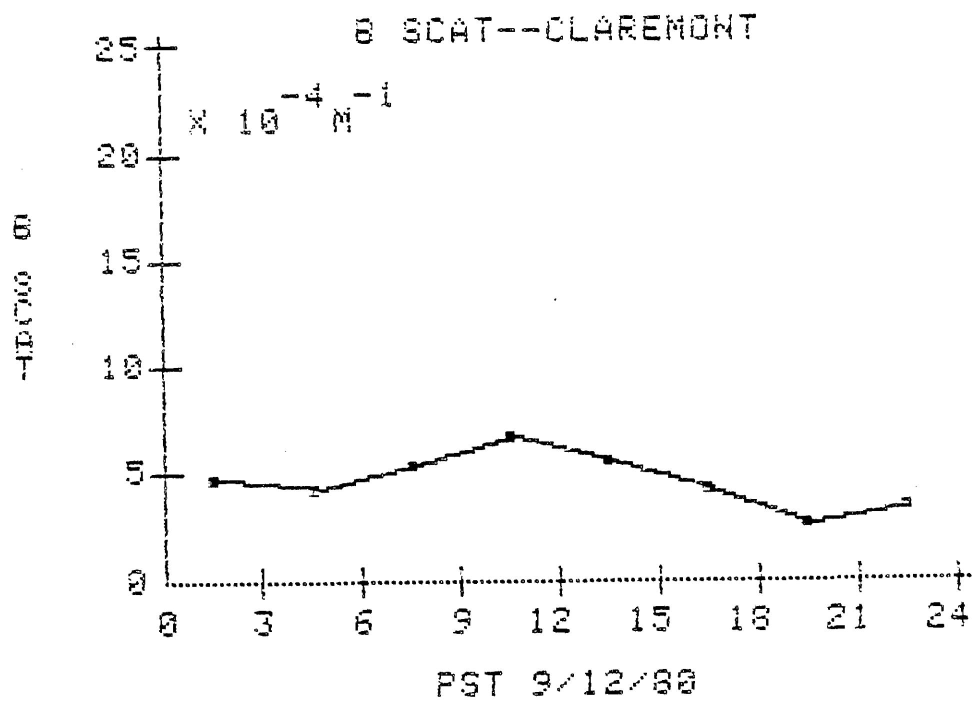



Figure 59. Diurnal variation of $b_{scat}$, September 12, 1980: Claremont

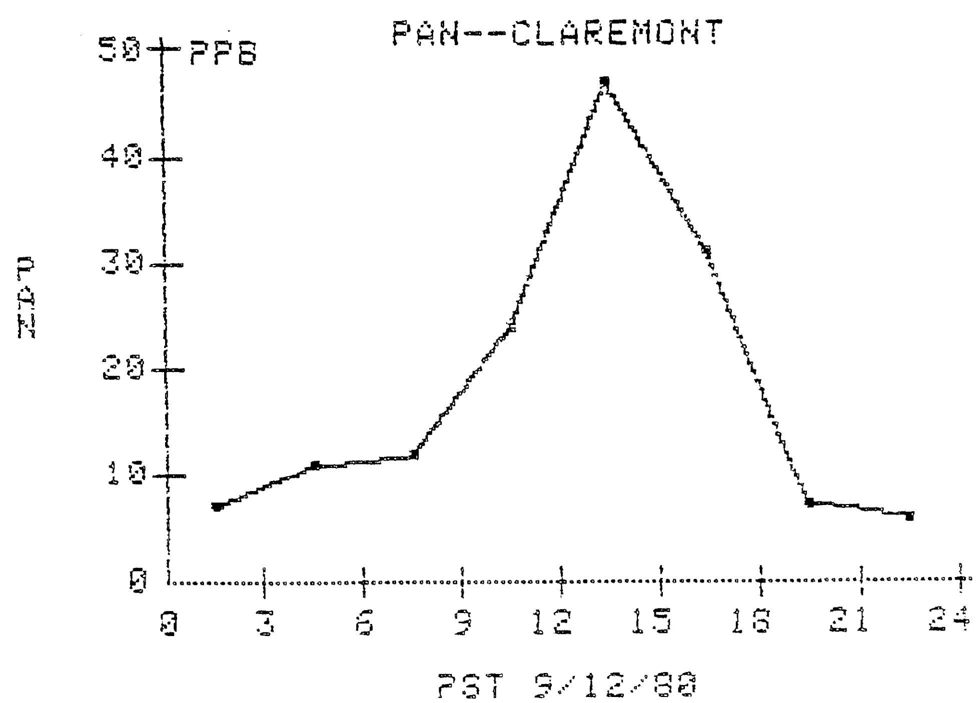



Figure 60. Diurnal variation of peroxyacetyl nitrate concentration, September 12, 1980: Claremont

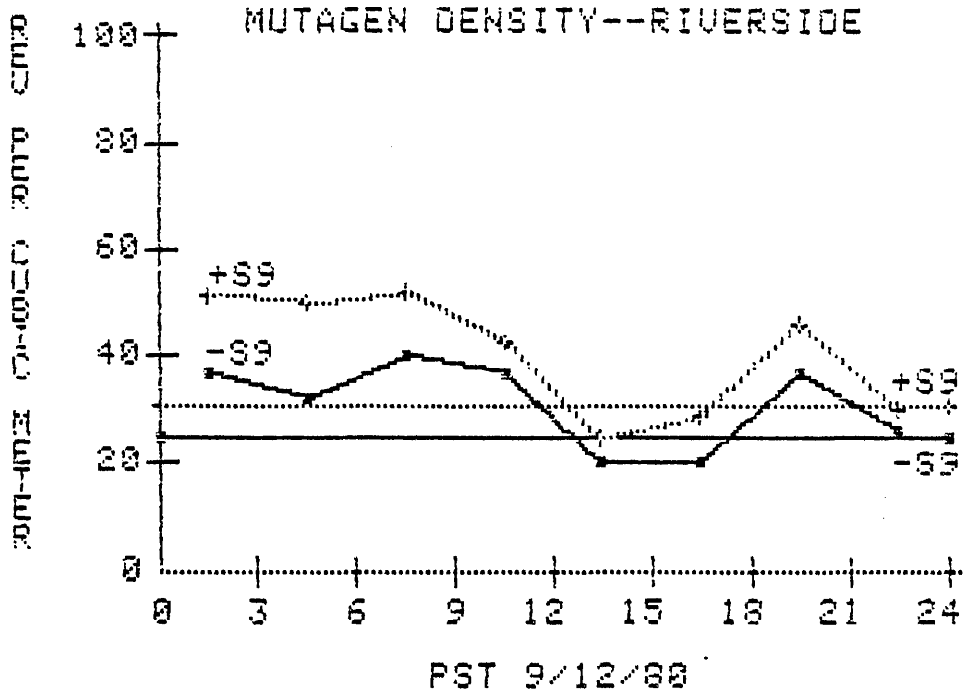



Figure 61. Diurnal variation of mutagen density, September 12, 1980: Riverside

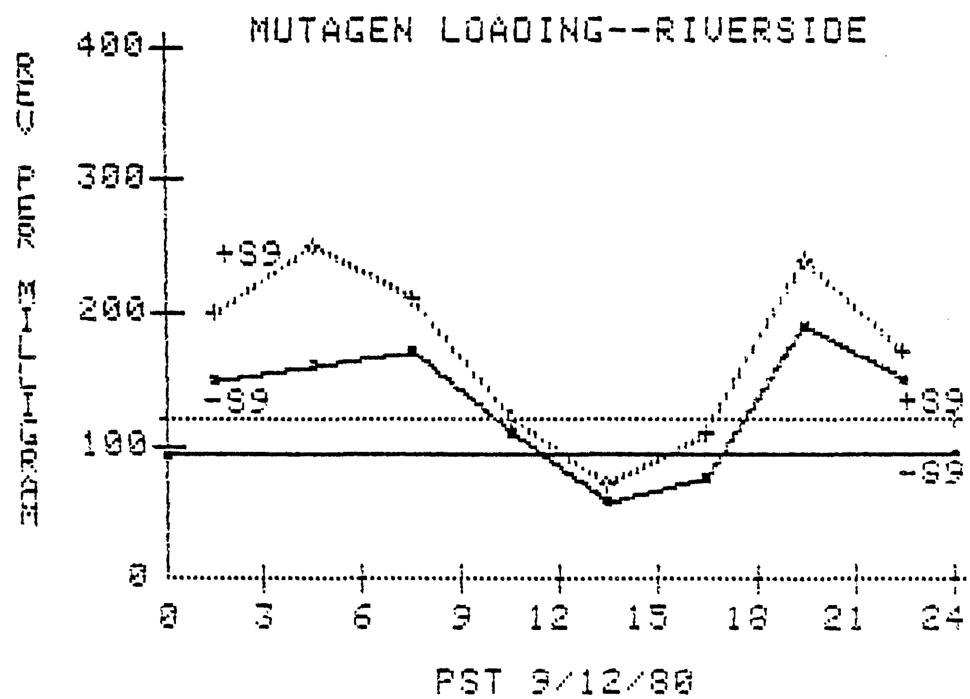



Figure 62. Diurnal variation of mutagen loading, September 12, 1980: Riverside

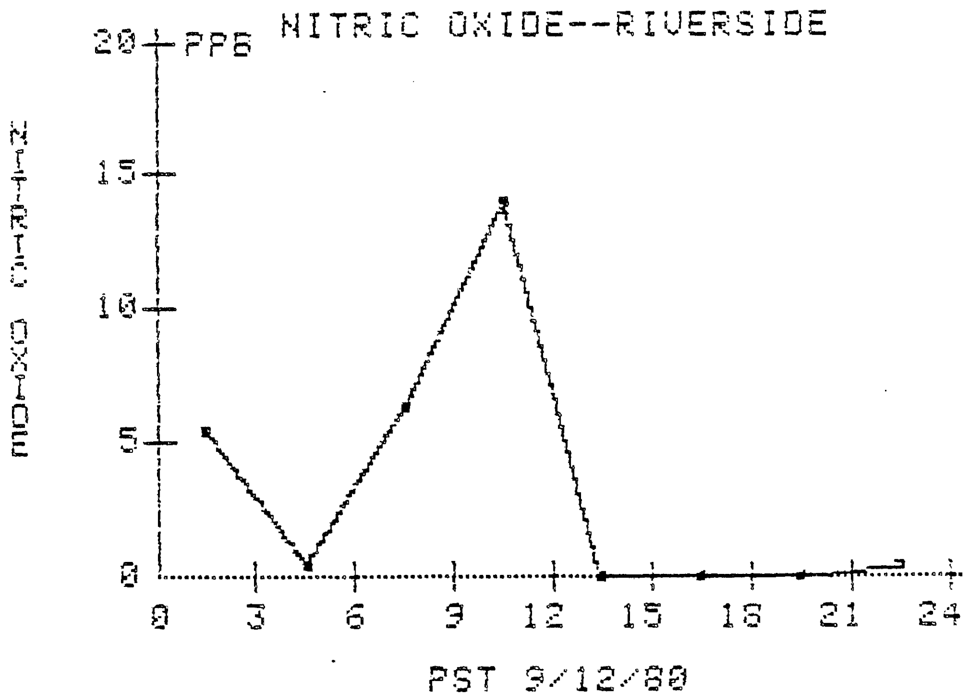



Figure 63. Diurnal variation of nitric oxide concentration, September 12, 1980: Riverside

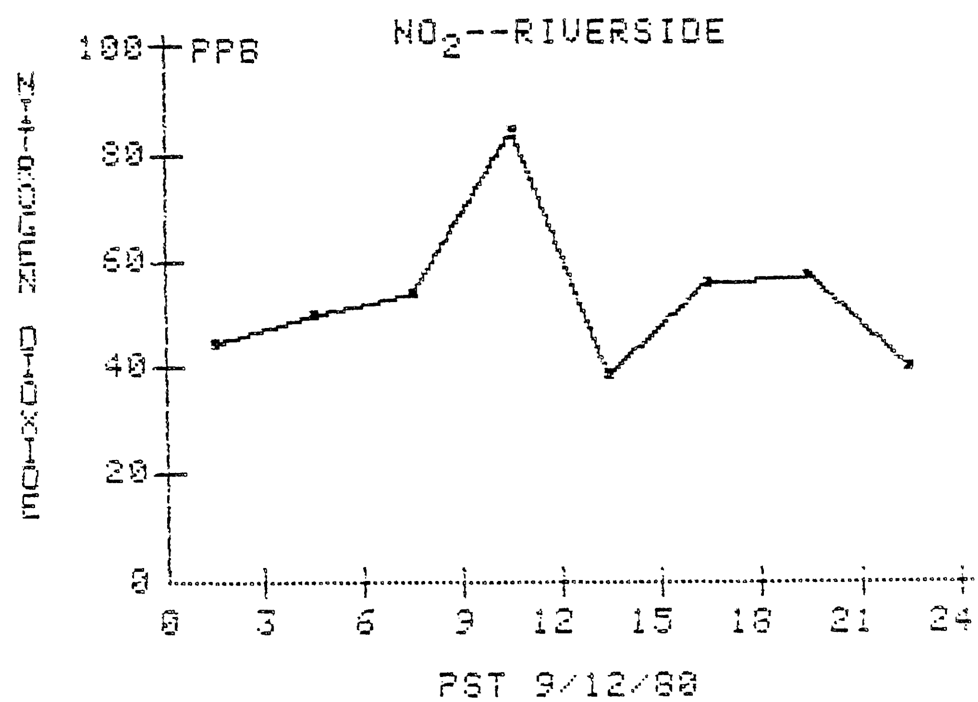



Figure 64. Diurnal variation of nitrogen dioxide concentration, September 12, 1980: Riverside

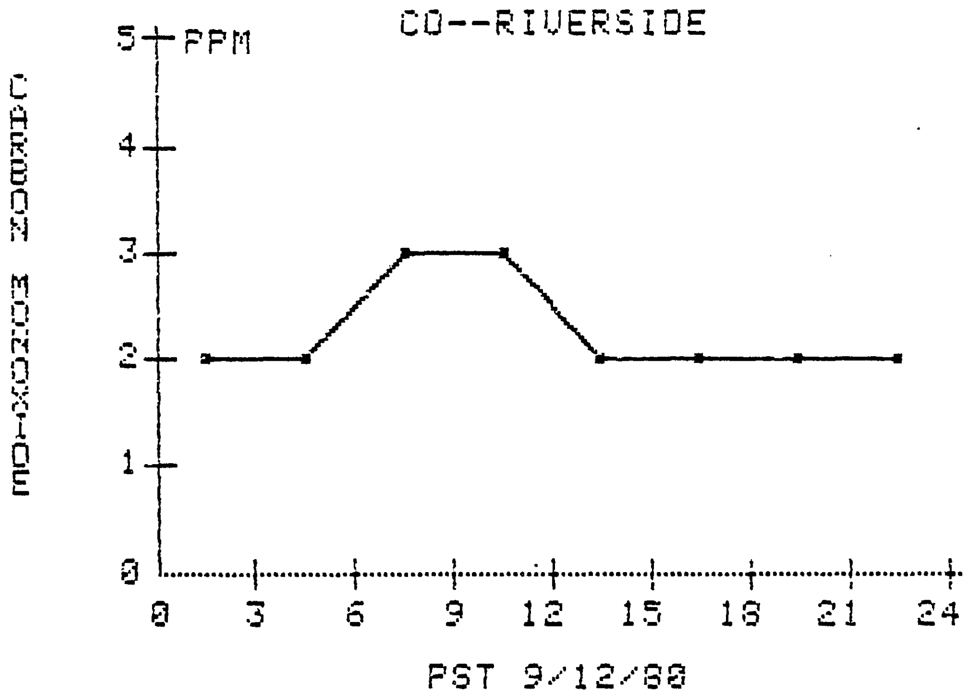



Figure 65. Diurnal variation of carbon monoxide concentration, September 12, 1980: Riverside

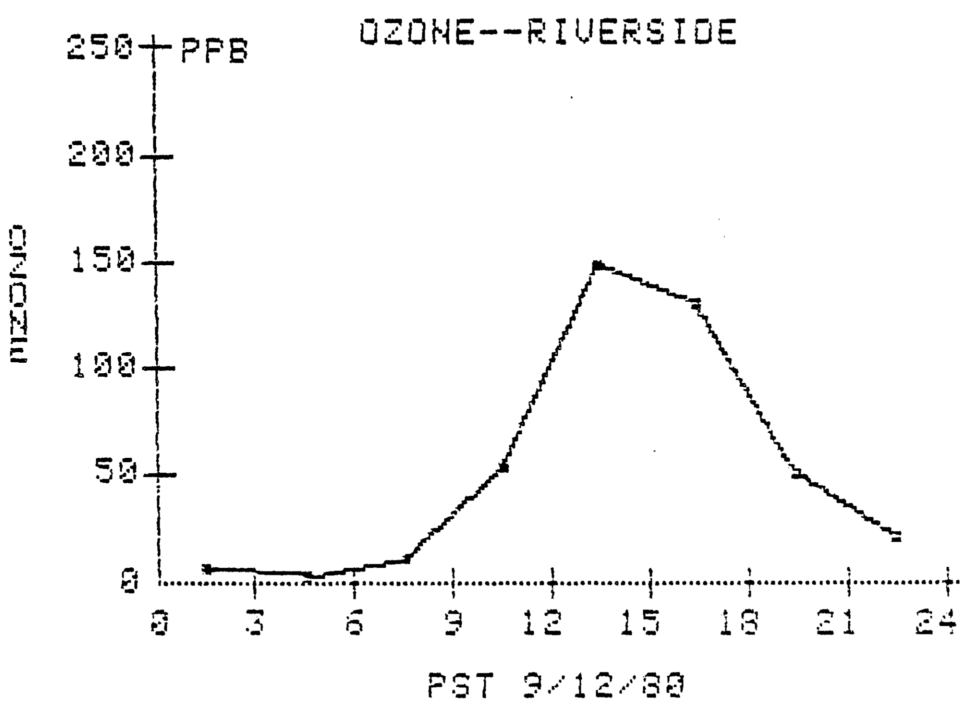



Figure 66. Diurnal variation of ozone concentration, September 12, 1980: Riverside

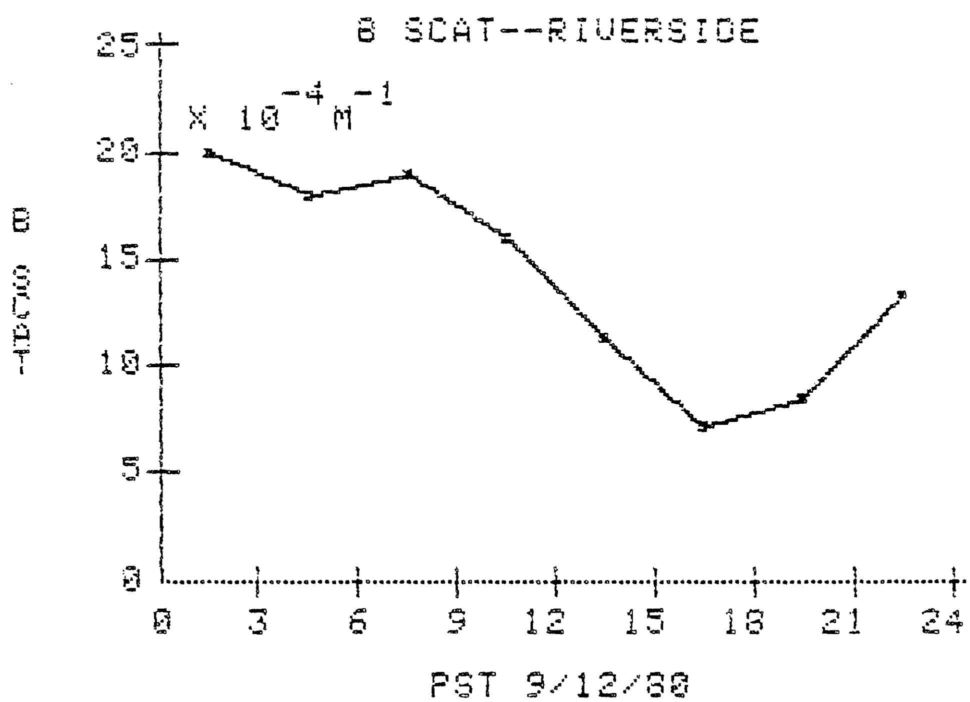



Figure 67. Diurnal variation of $b_{scat}$, September 12, 1980: Riverside

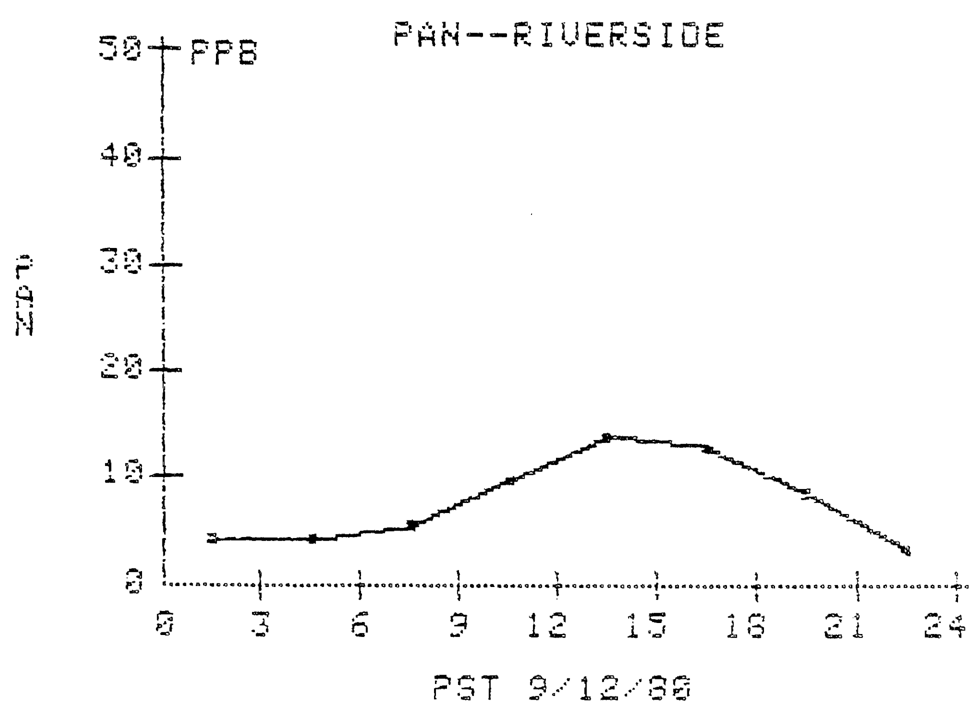



Figure 68. Diurnal variation of peroxyacetyl nitrate concentration, September 12, 1980: Riverside

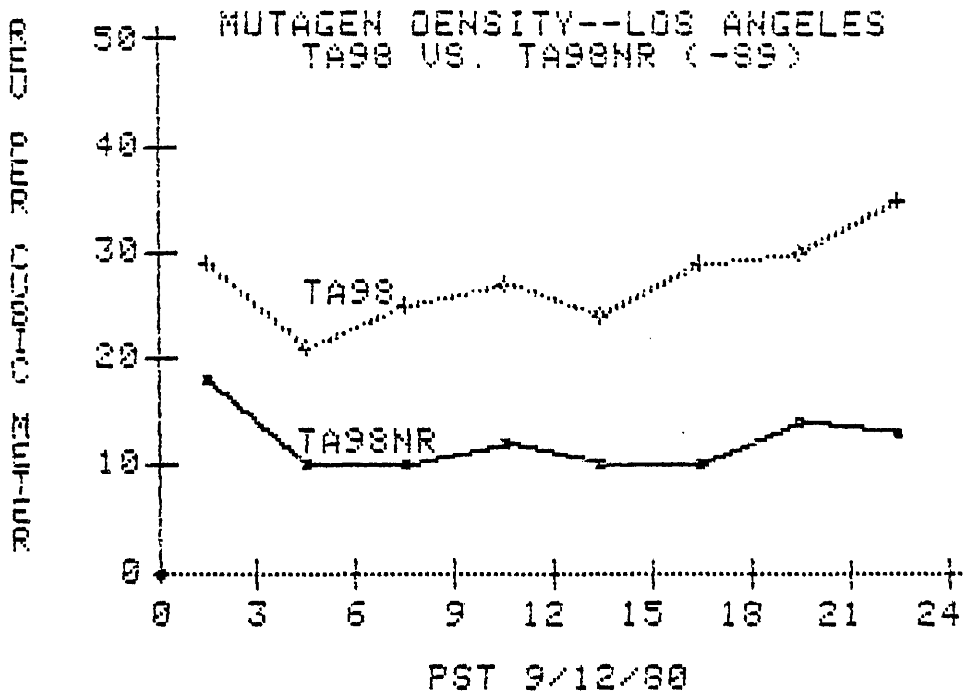



Figure 69. Mutagen density at the Los Angeles site, September 12, 1980: TA98 vs. TA98NR, direct activity

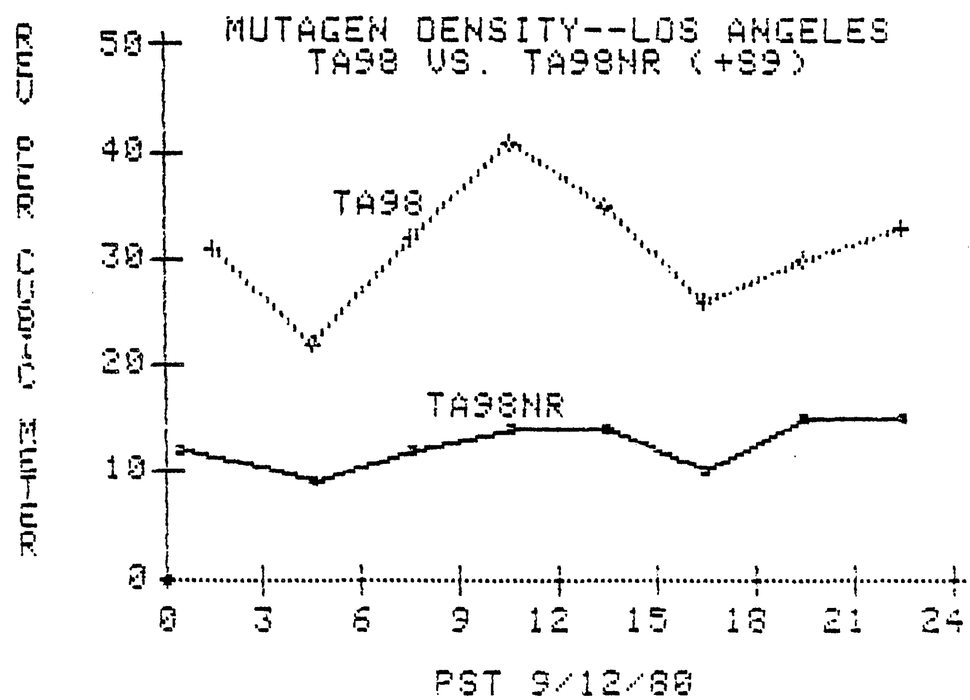



Figure 70. Mutagen density at the Los Angeles site, September 12, 1980: TA98 vs. TA98NR indirect activity

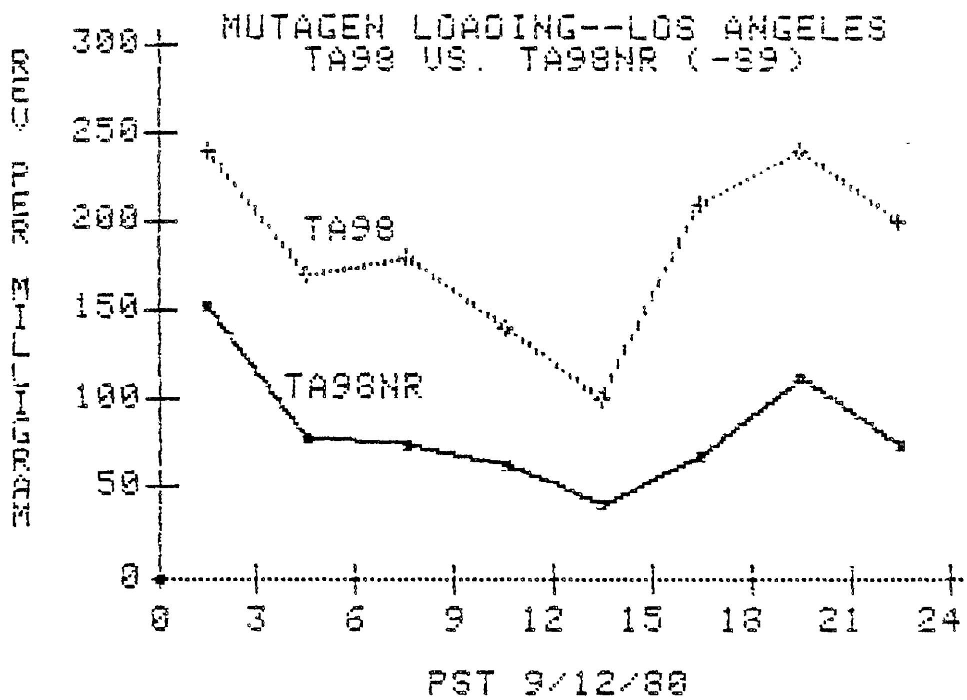



Figure 71. Mutagen loading at the Los Angeles site, September 12, 1980: TA98 vs. TA98NR, direct activity

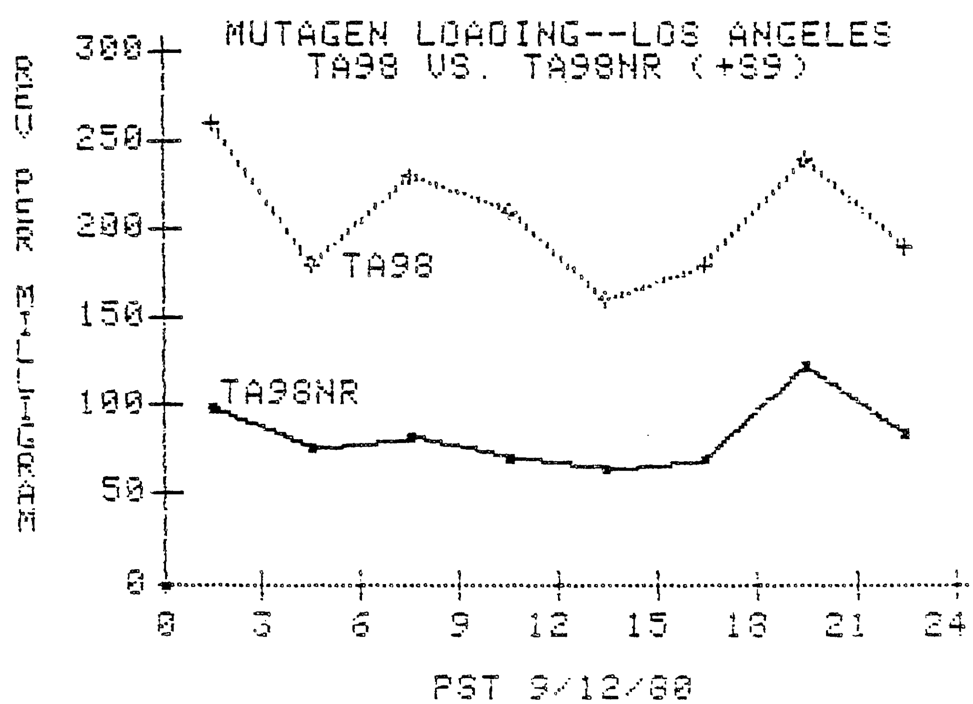



Figure 72. Mutagen loading at the Lost Angeles site, September 12, 1980: TA98 vs. TA98NR, indirect activity

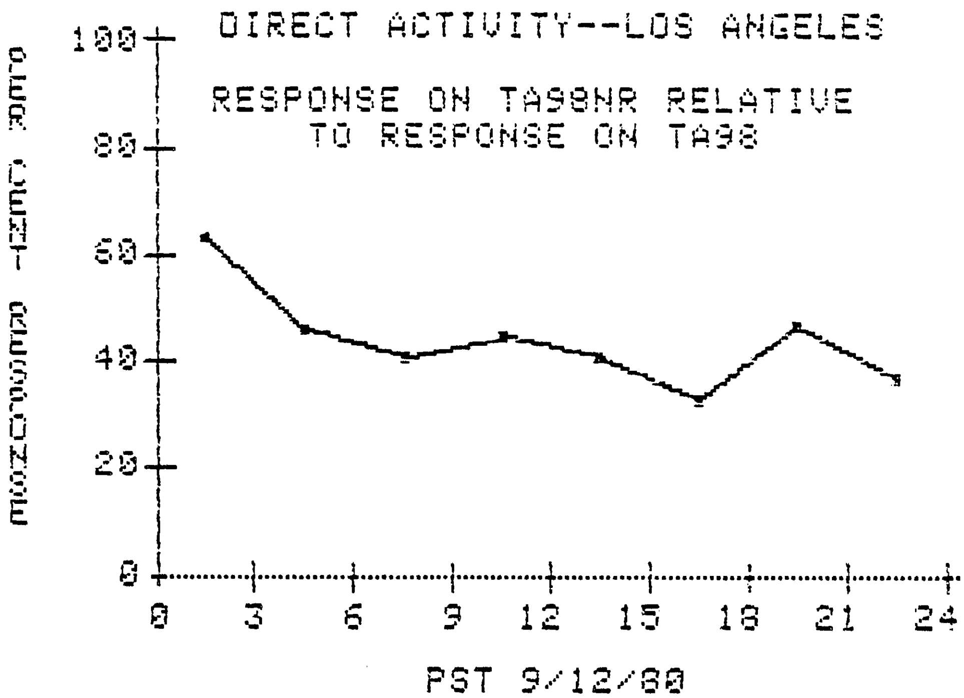



Figure 73. Diurnal variation of the response on strain TA98 relative to the response on strain TA98NR, direct activity, September 12, 1980: Los Angeles

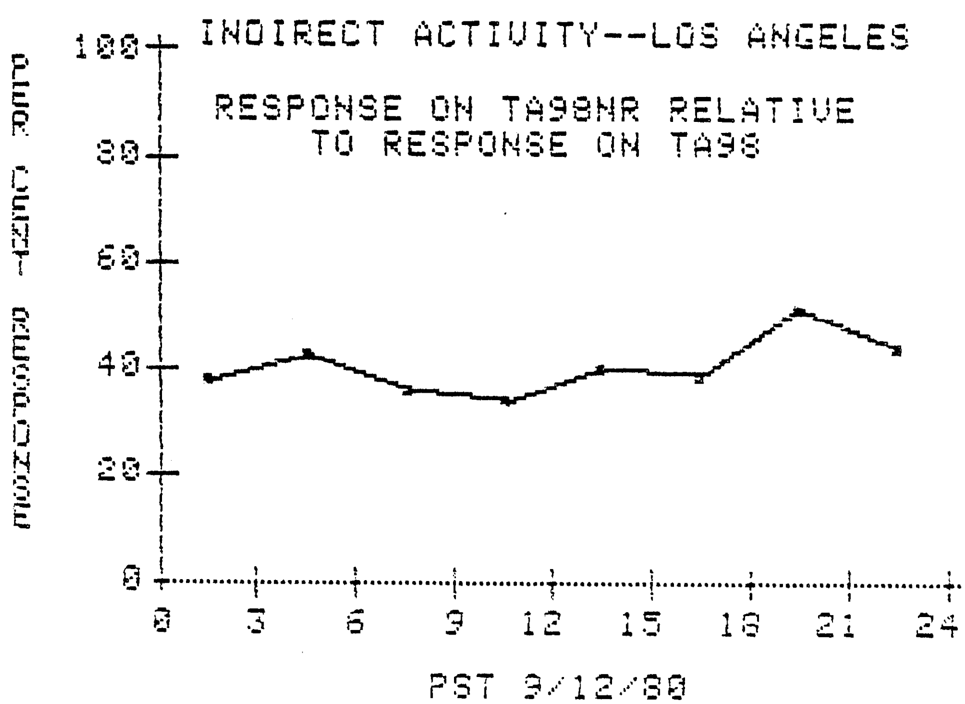



Figure 74. Diurnal variation of the response on strain TA98 relative to the response on strain TA98NR, indirect activity, September 12, 1980: Los Angeles

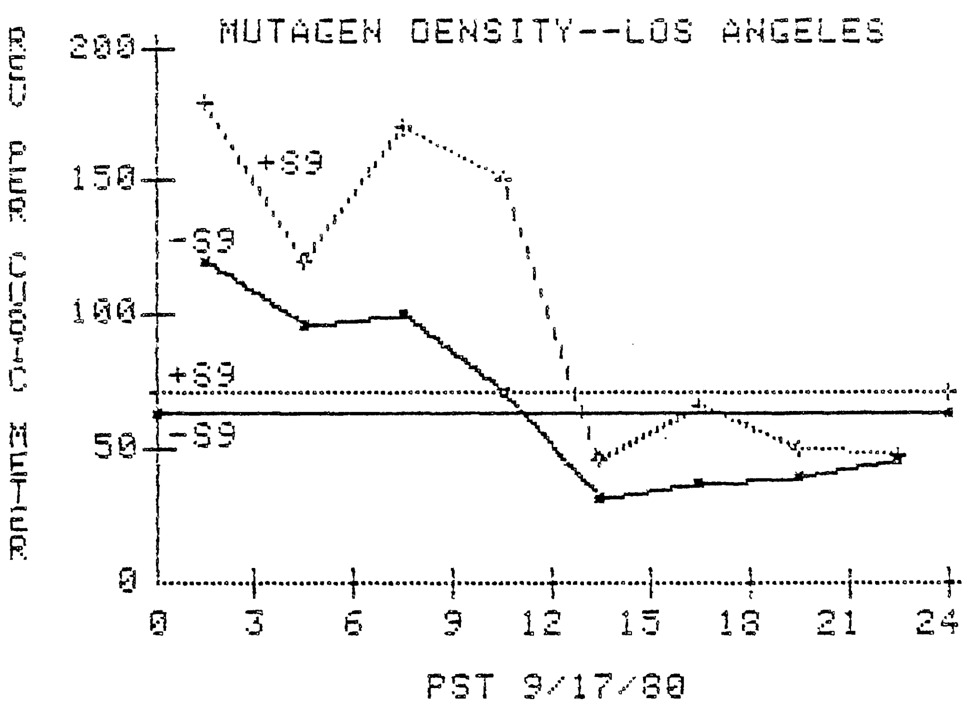



Figure 75. Diurnal variation of mutagen density, September 17, 1980: Los Angeles

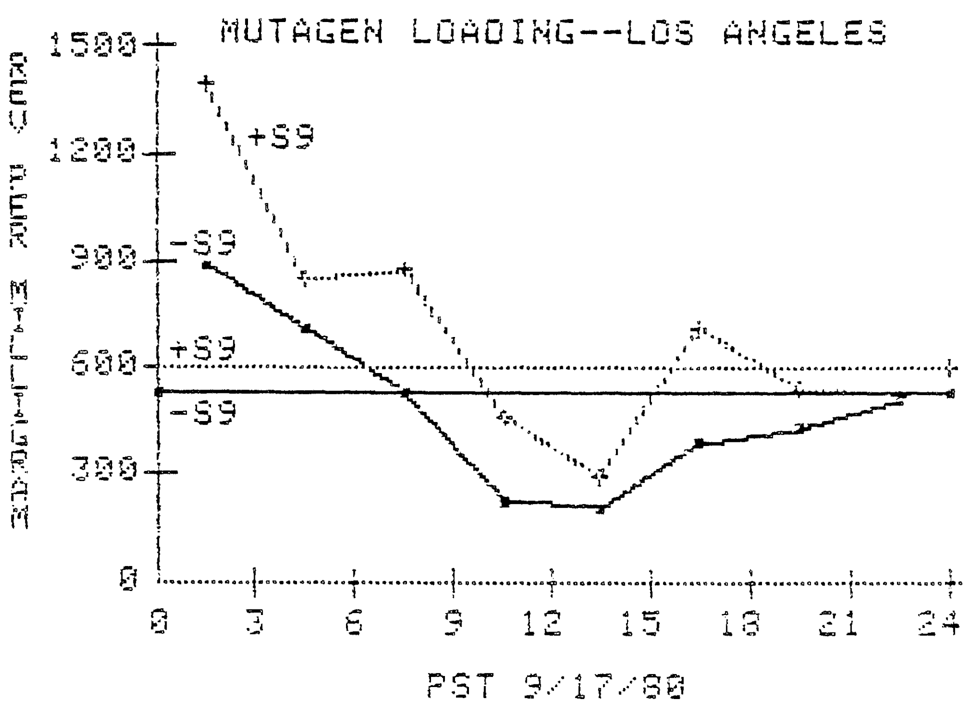



Figure 76. Diurnal variation of mutagen loading, September 17, 1980: Los Angeles

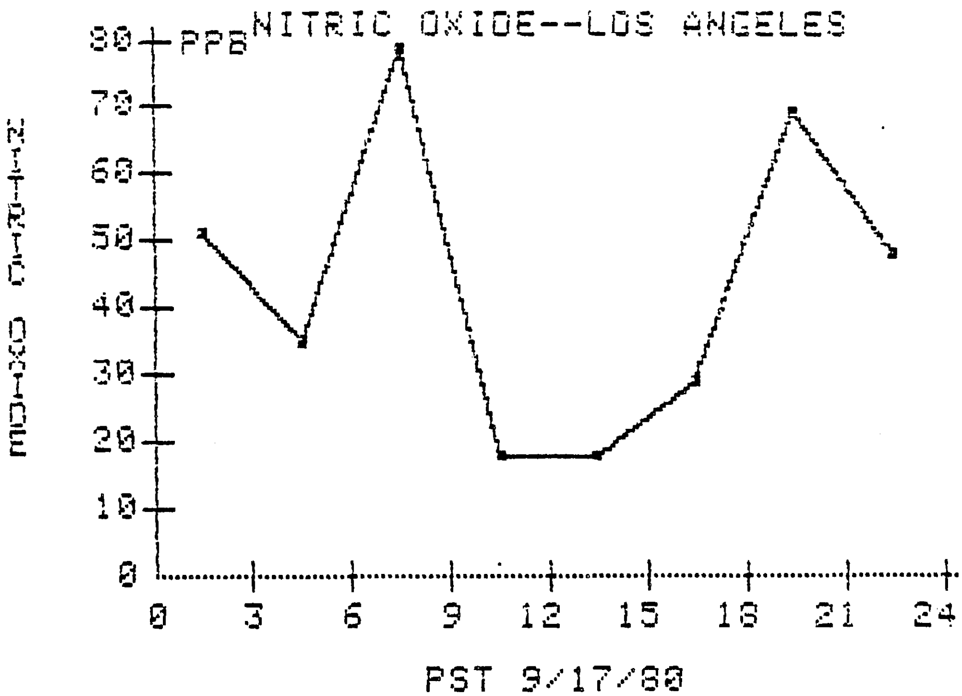



Figure 77. Diurnal variation of nitric oxide concentration, September 17, 1980: Los Angeles

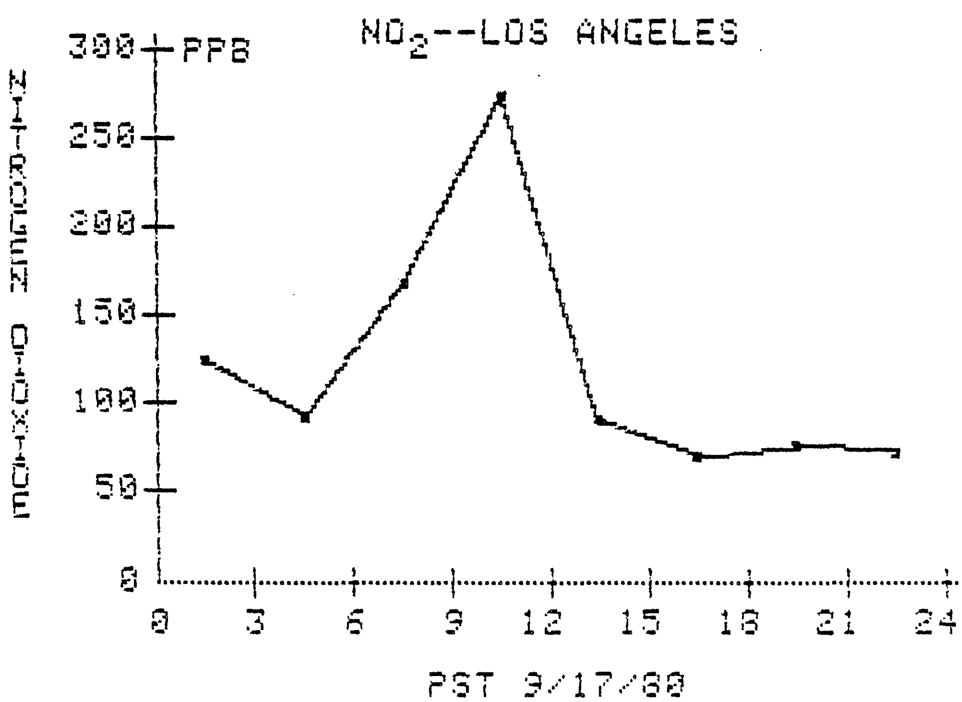



Figure 78. Diurnal variation of nitrogen dioxide concentration, September 17, 1980: Los Angeles

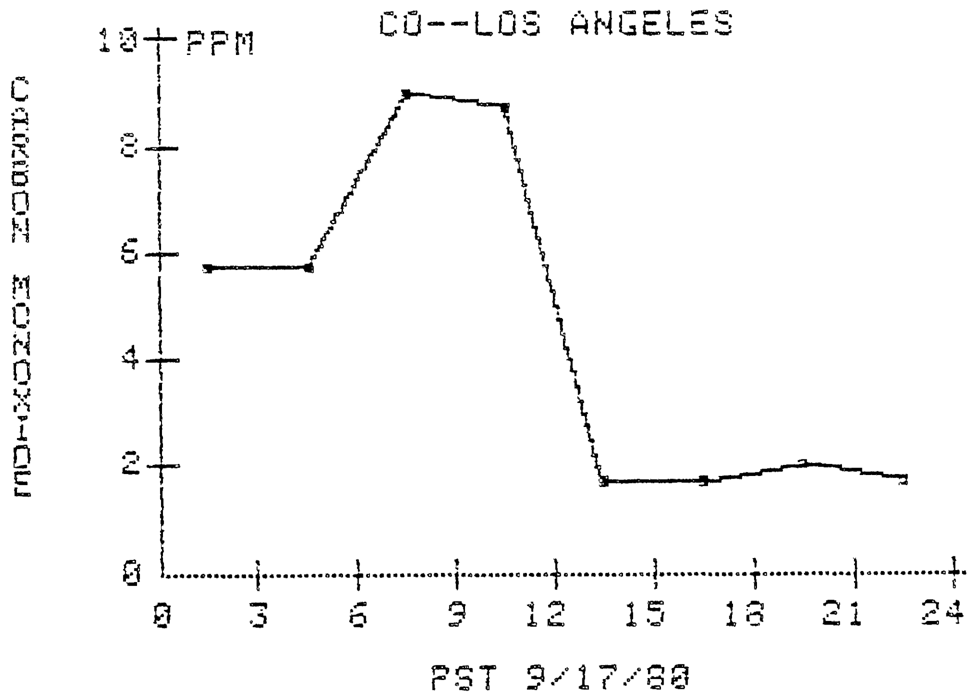



Figure 79. Diurnal variation of carbon monoxide concentration, September 17, 1980: Los Angeles

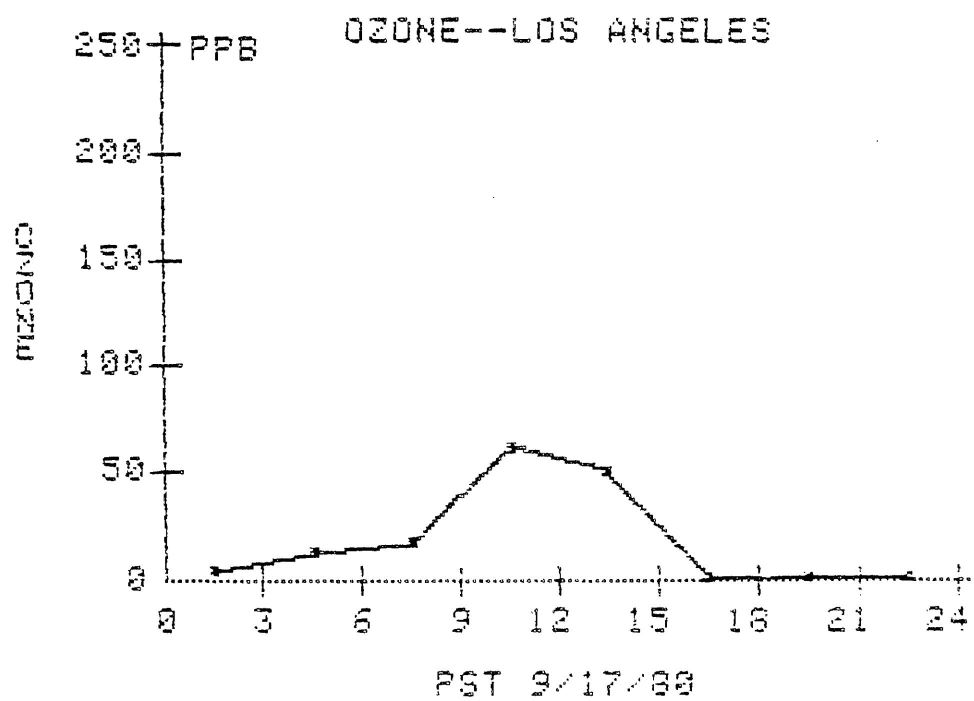



Figure 80. Diurnal variation of ozone concentration, September 17, 1980: Los Angeles

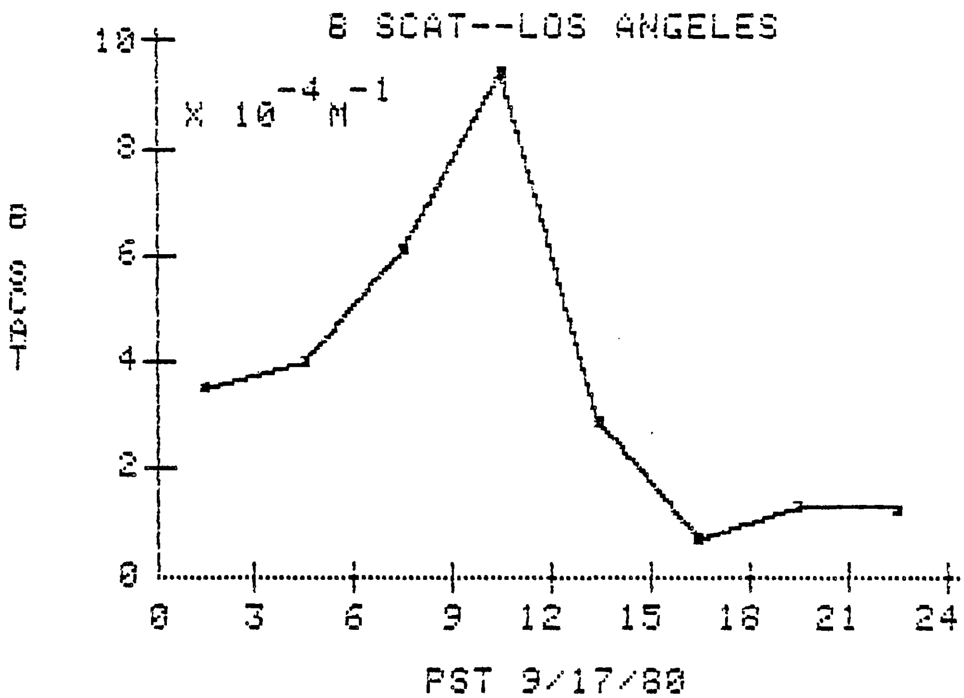



Figure 81. Diurnal variation of $b_{scat}$, September 17, 1980: Los Angeles

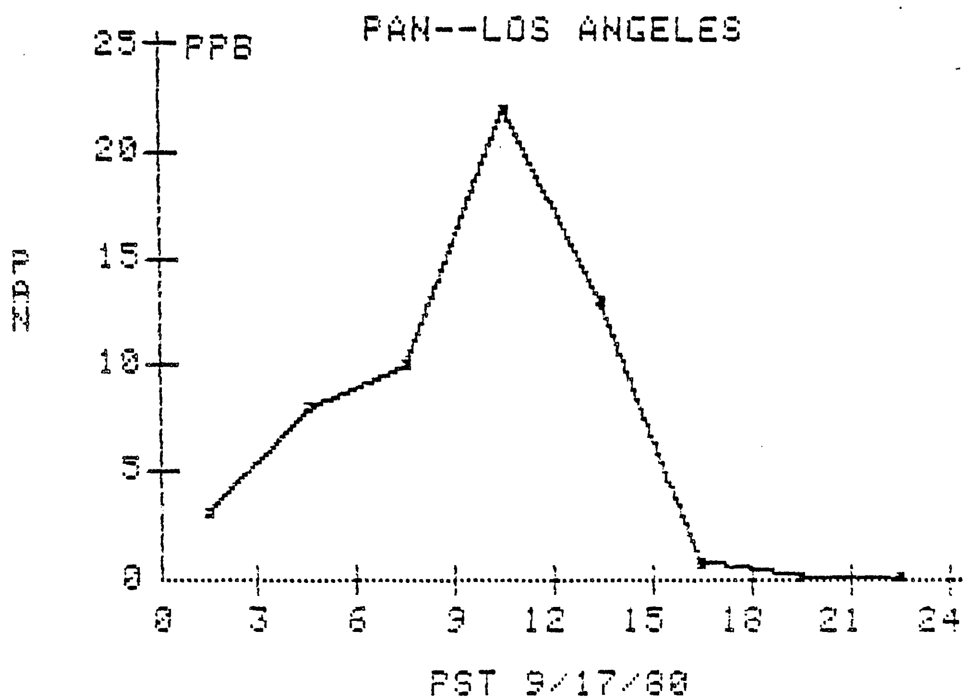



Figure 82. Diurnal variation of peroxyacetyl nitrate concentration, September 17, 1980: Los Angeles

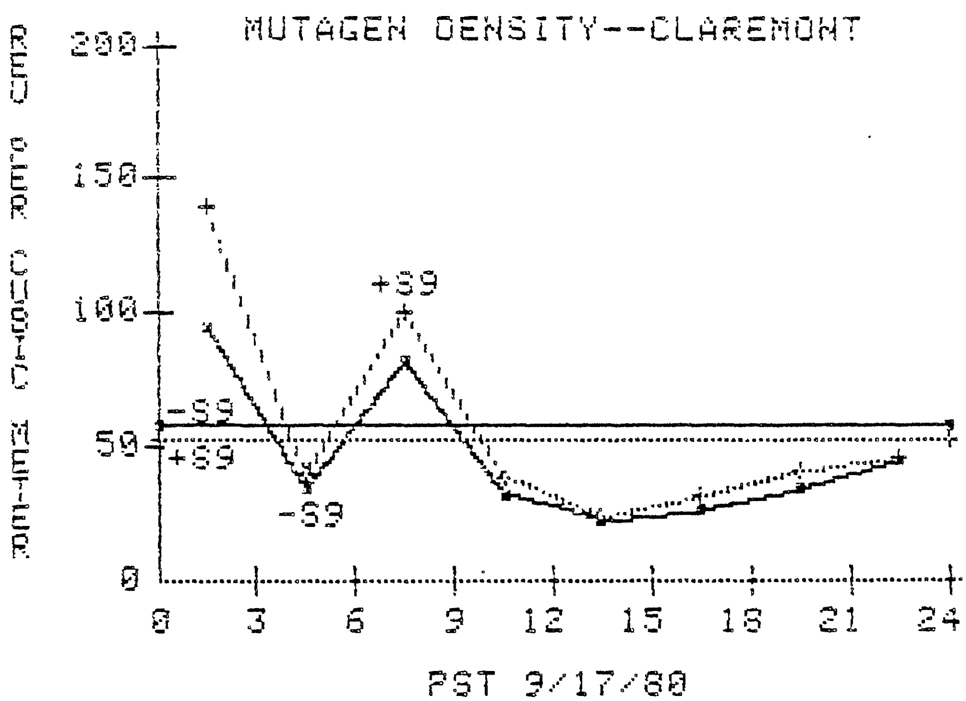



Figure 83. Diurnal variation of mutagen density, September 17, 1980: Claremont

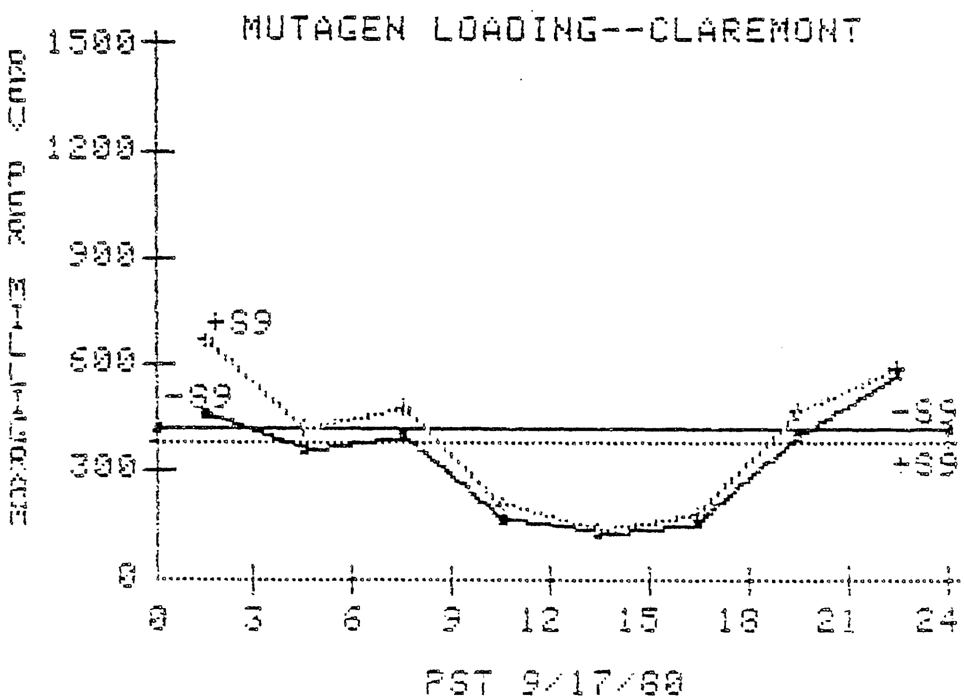



Figure 84. Diurnal variation of mutagen loading, September 17, 1980: Claremont

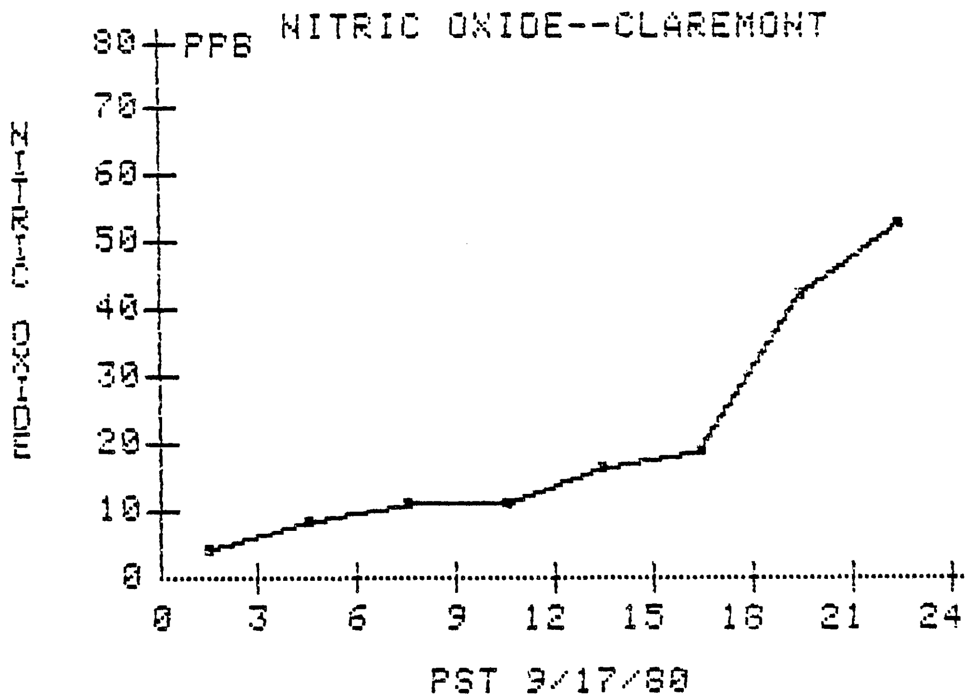



Figure 85. Diurnal variation of nitric oxide concentration, September 17, 1980: Claremont

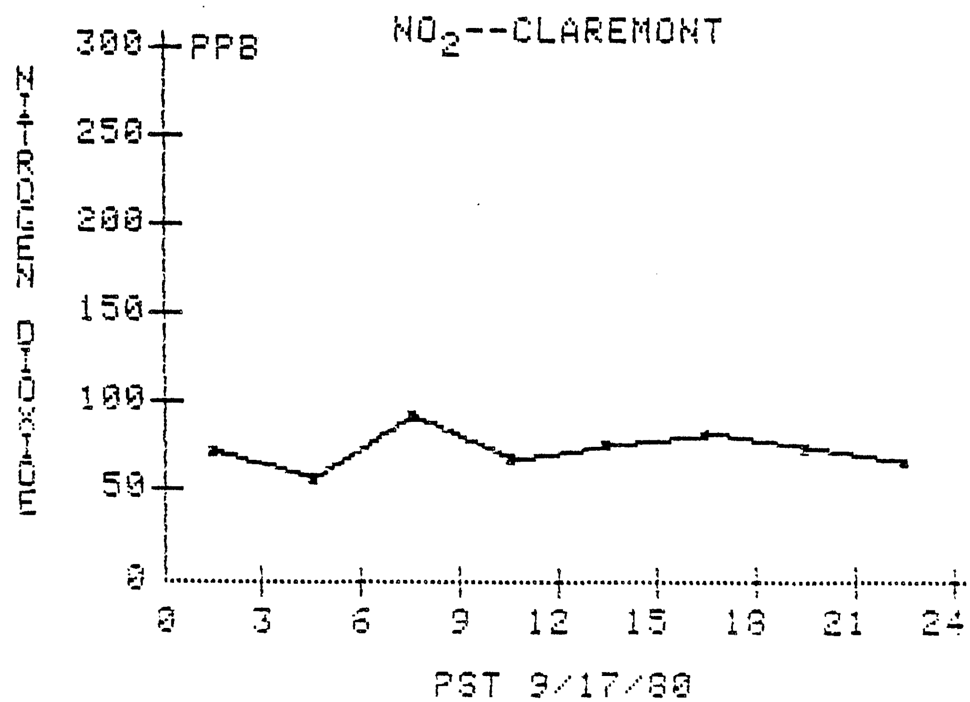



Figure 86. Diurnal variation of nitrogen dioxide concentration, September 17, 1980: Claremont

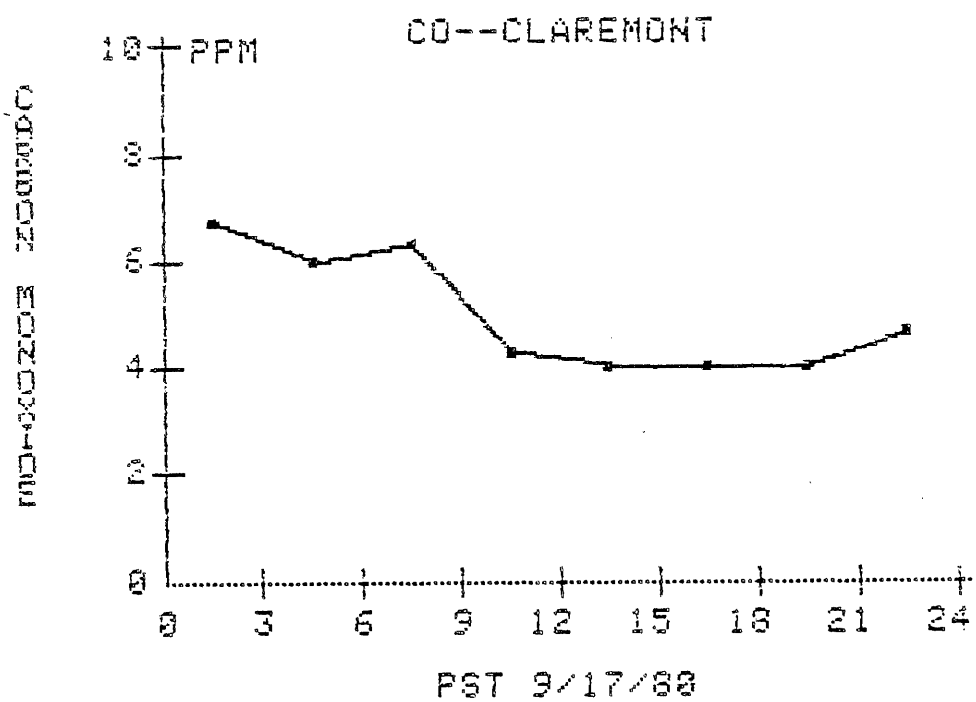



Figure 87. Diurnal variation of carbon monoxide concentration, September 17, 1980: Claremont

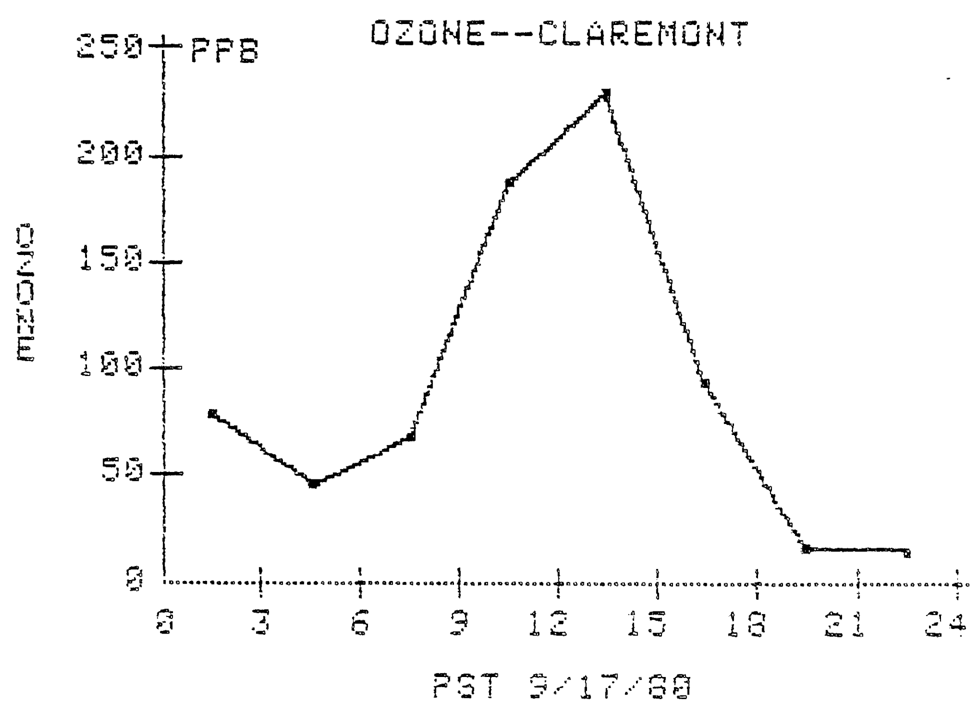



Figure 88. Diurnal variation of ozone concentration, September 17, 1980: Claremont

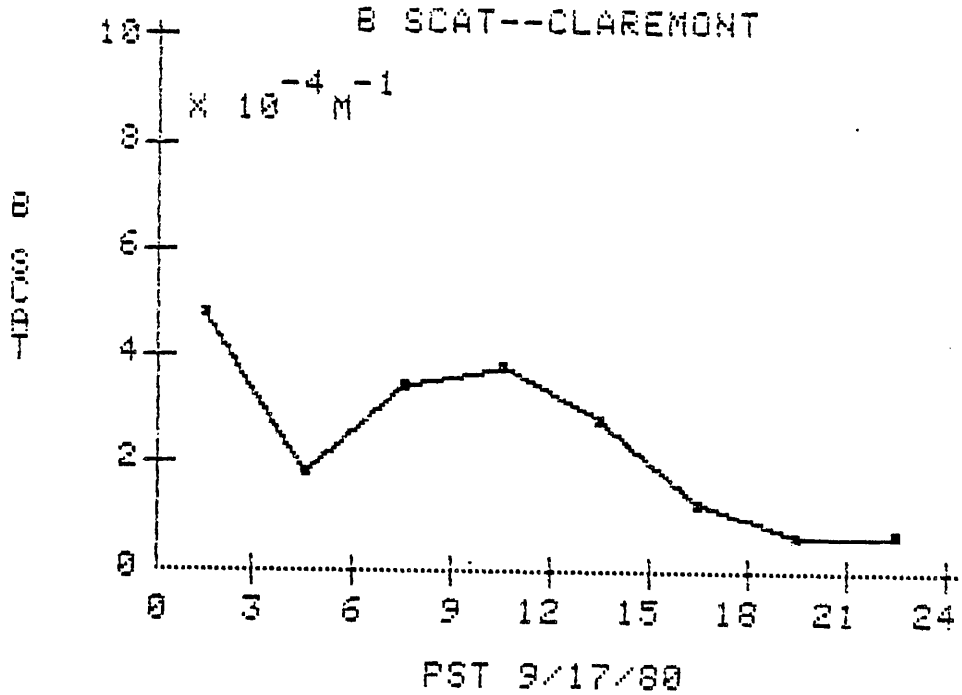



Figure 89. Diurnal variation of $b_{scat}$, September 17, 1980: Claremont

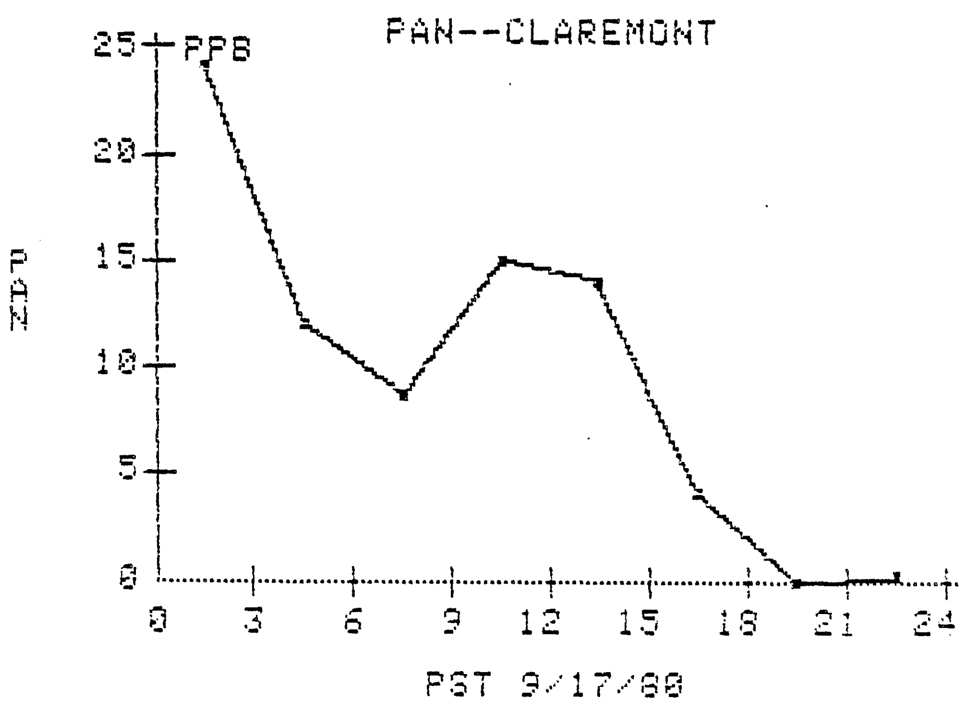



Figure 90. Diurnal variation of peroxyacetyl nitrate concentration, September 17, 1980: Claremont

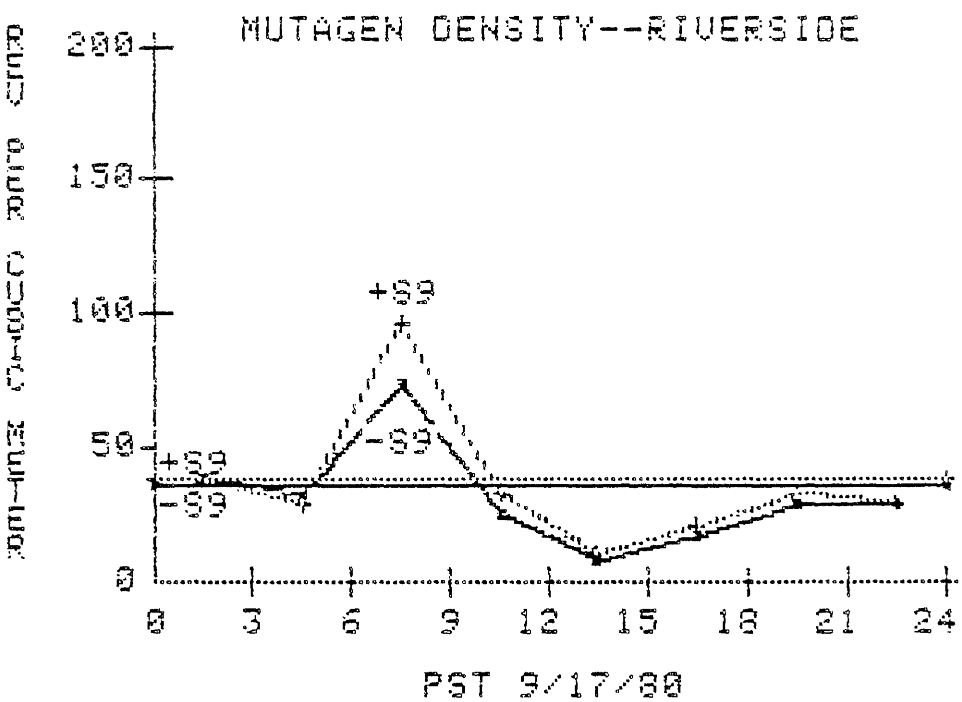



Figure 91. Diurnal variation of mutagen density, September 17, 1980: Riverside

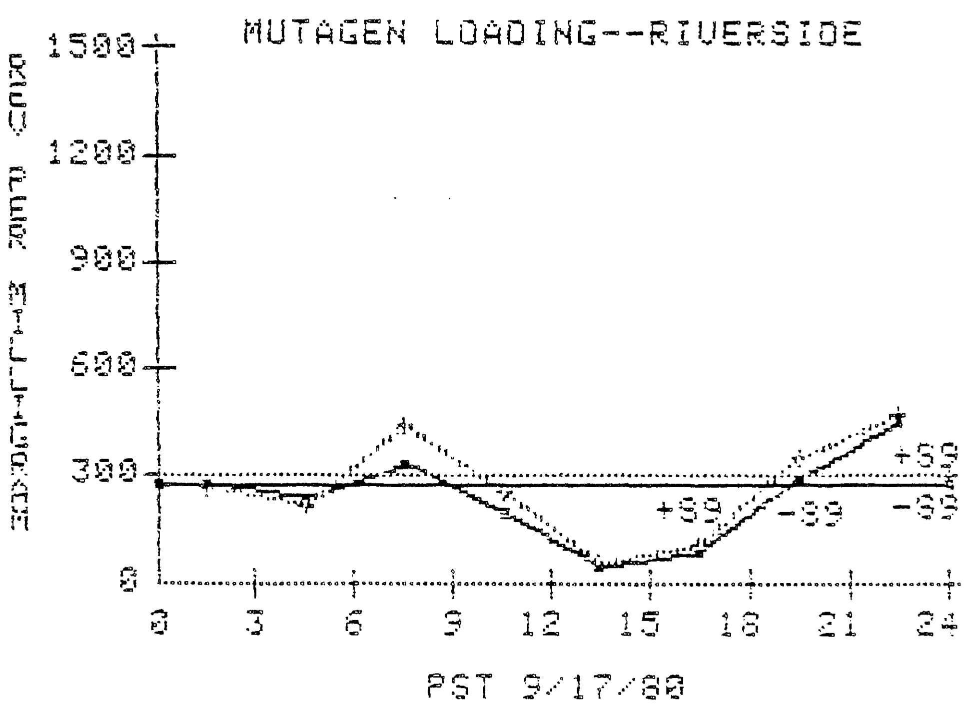



Figure 92. Diurnal variation of mutagen loading, September 17, 1980: Riverside

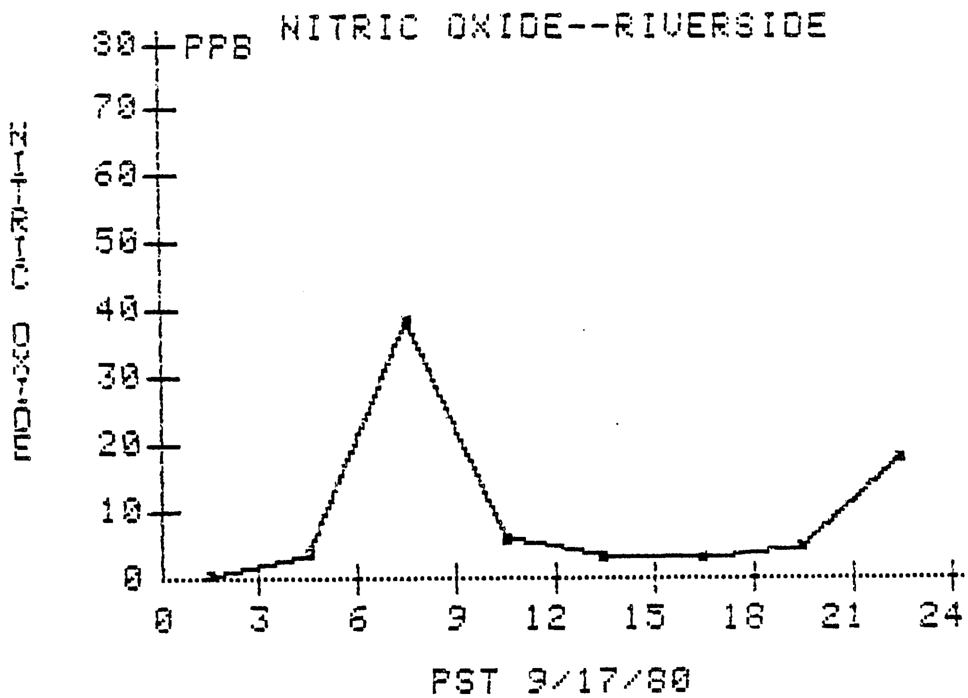



Figure 93. Diurnal variation of nitric oxide concentration, September 17, 1980: Riverside

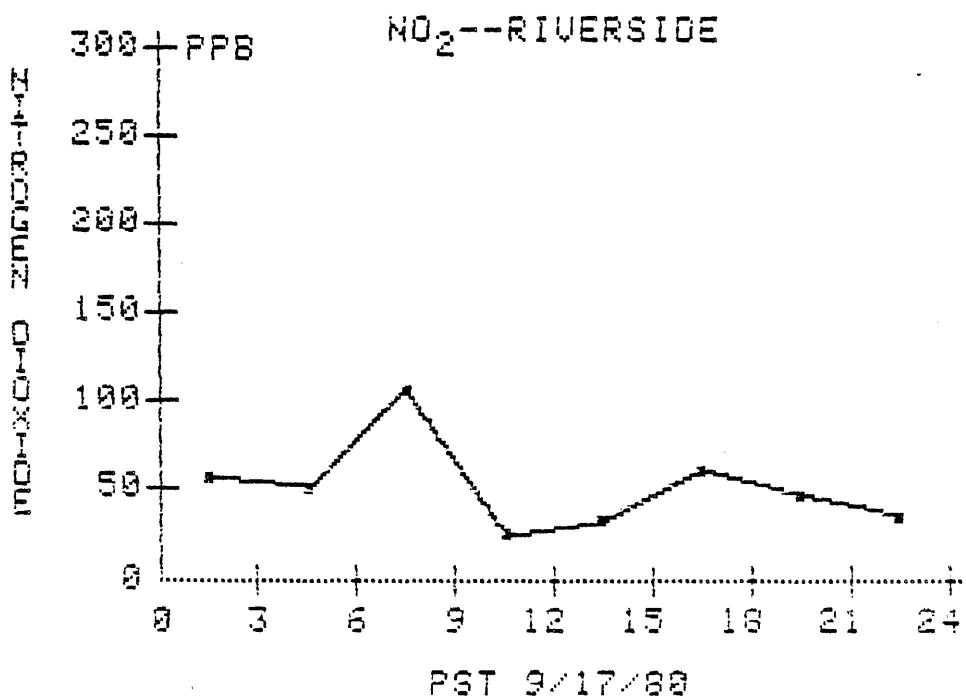



Figure 94. Diurnal variation of nitrogen dioxide concentration, September 17, 1980: Riverside

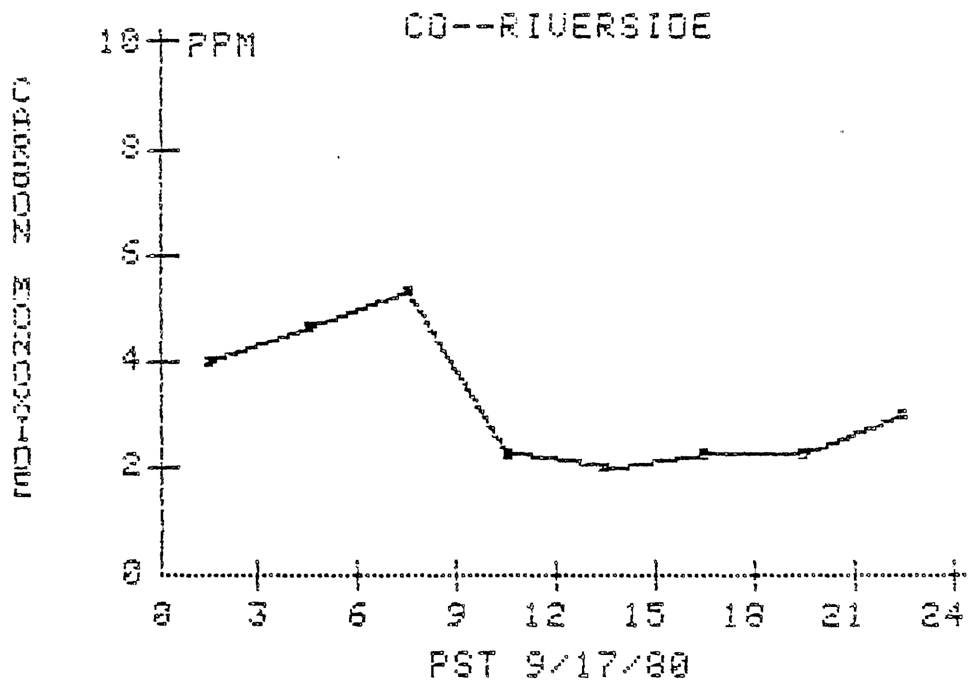



Figure 95. Diurnal variation of carbon monoxide concentration, September 17, 1980: Riverside

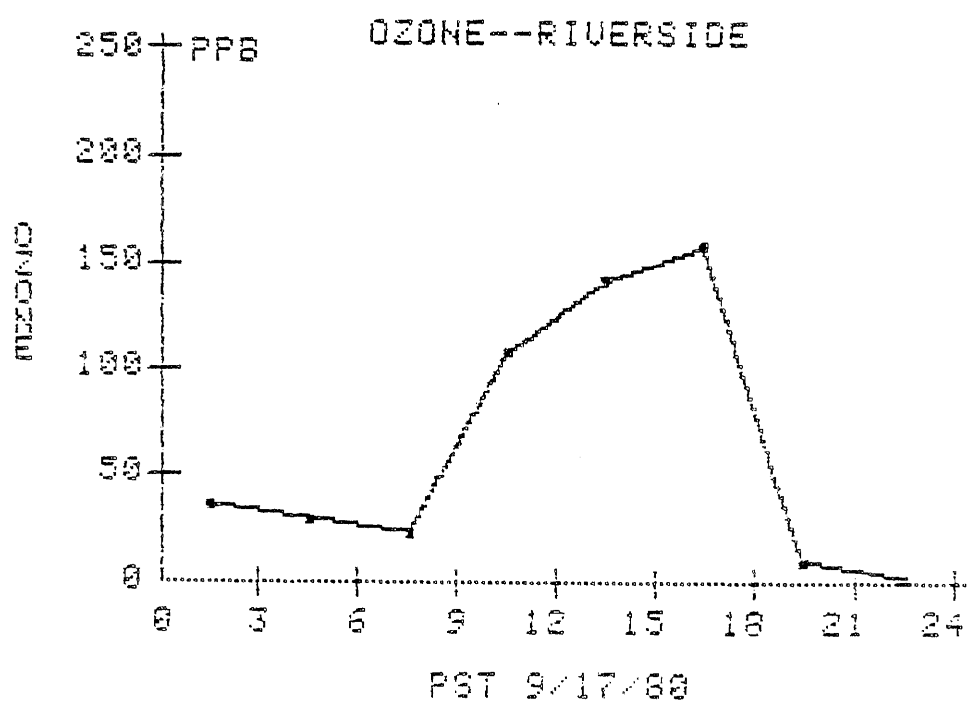



Figure 96. Diurnal variation of ozone concentration, September 17, 1980: Riverside

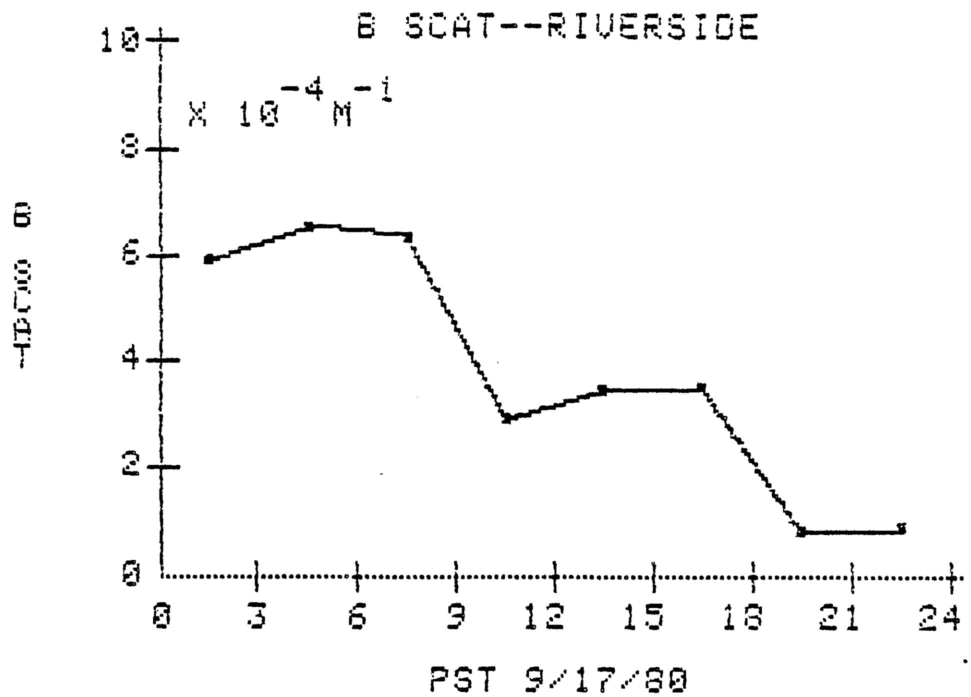



Figure 97. Diurnal variation of $b_{scat}$, September 17, 1980: Riverside

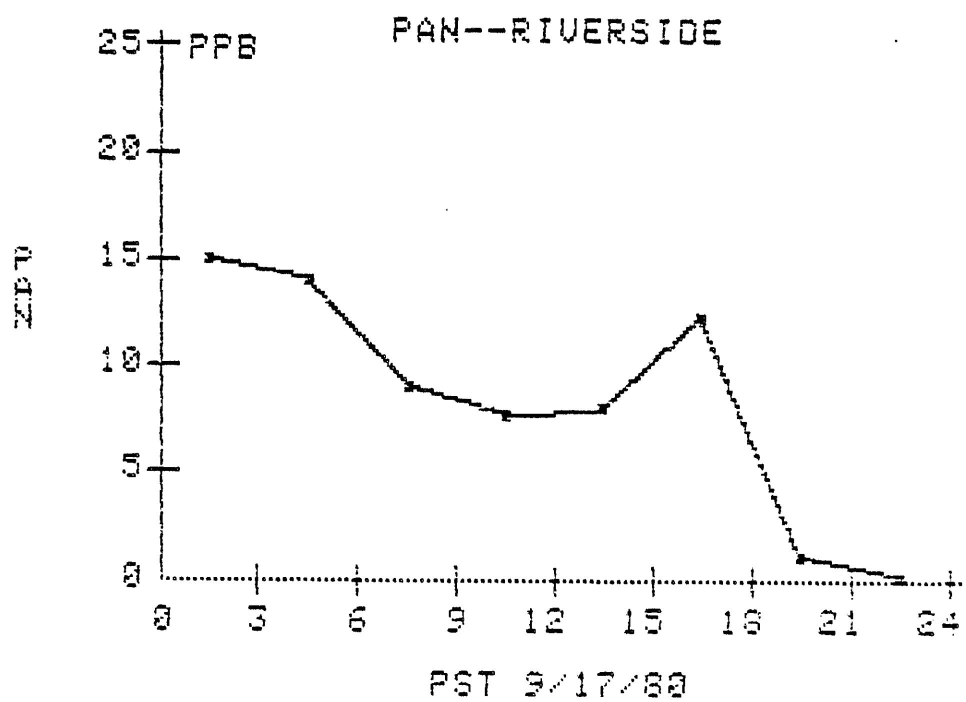



Figure 98. Diurnal variation of peroxyacetyl nitrate concentration, September 17, 1980: Riverside

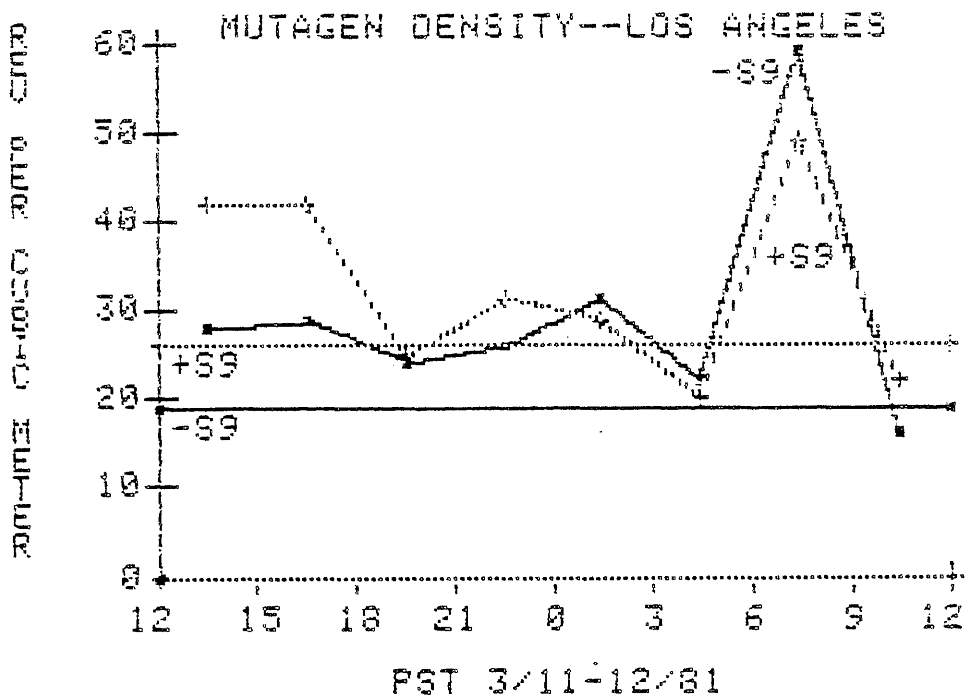



Figure 99. Diurnal variation of mutagen density, March 11-12, 1981: Los Angeles

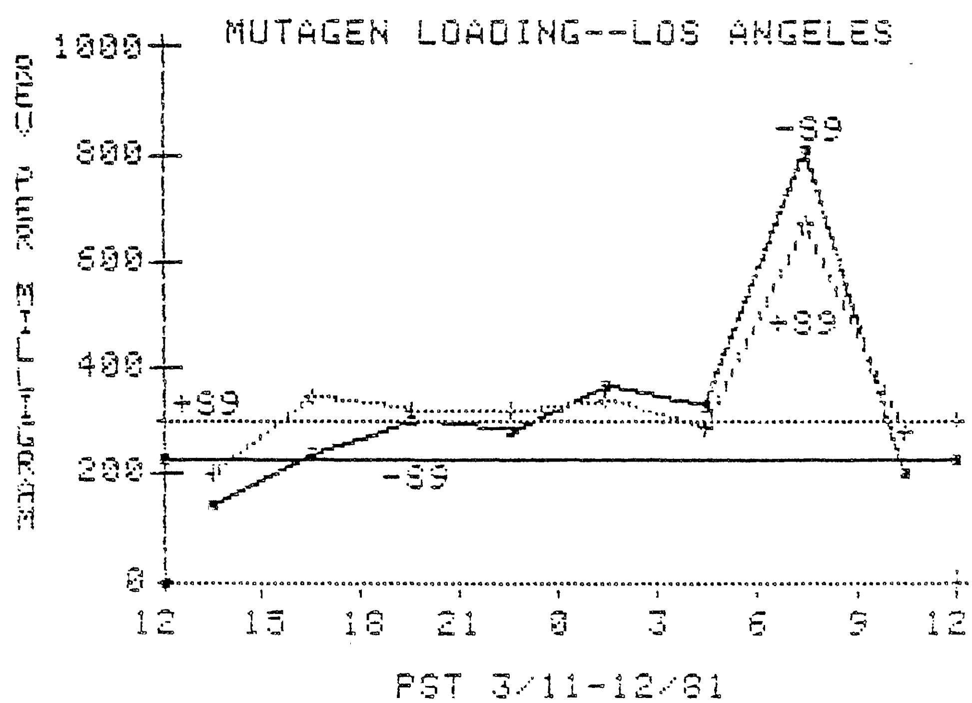



Figure 100. Diurnal variation of mutagen loading, March 11-12, 1981: Los Angeles

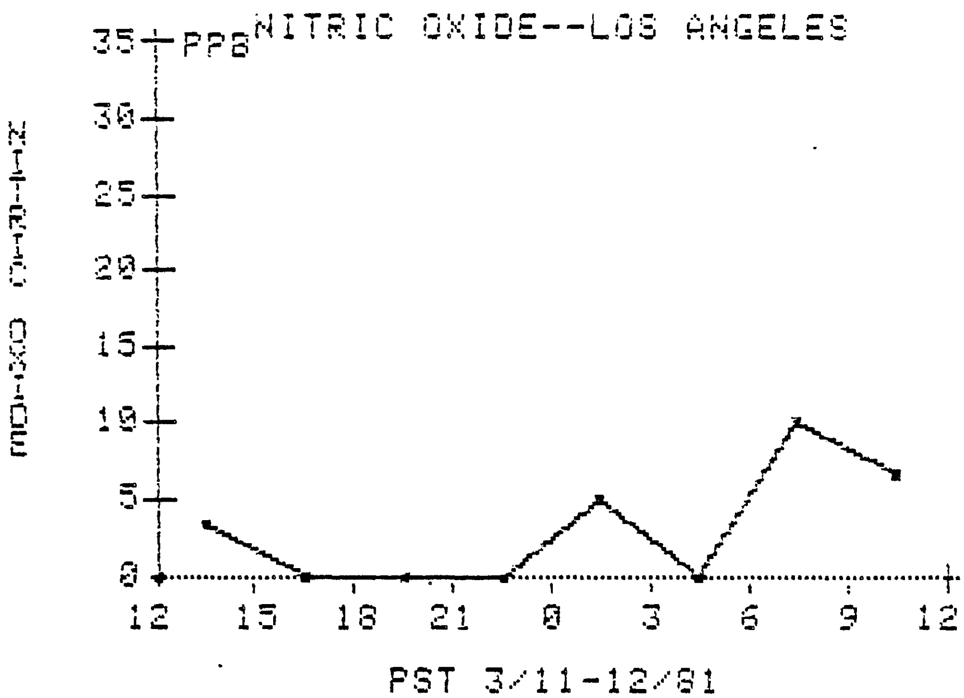



Figure 101. Diurnal variation of nitric oxide concentration, March 11-12, 1981: Los Angeles

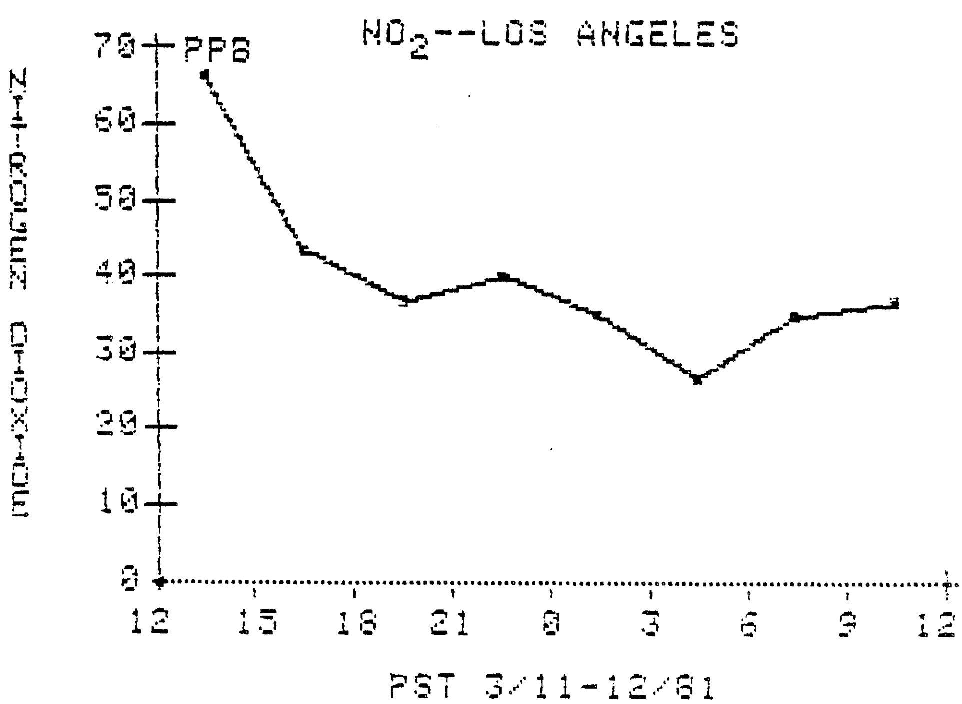



Figure 102. Diurnal variation of nitrogen dioxide concentration, March 11-12, 1981: Los Angeles

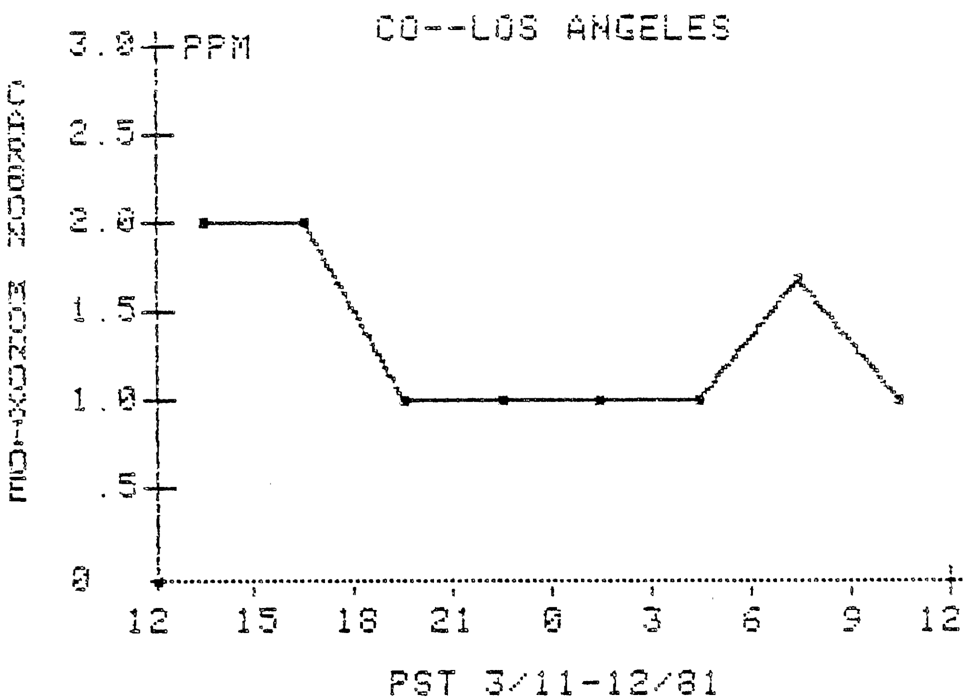



Figure 103. Diurnal variation of carbon monoxide concentration, March 11-12, 1981: Los Angeles

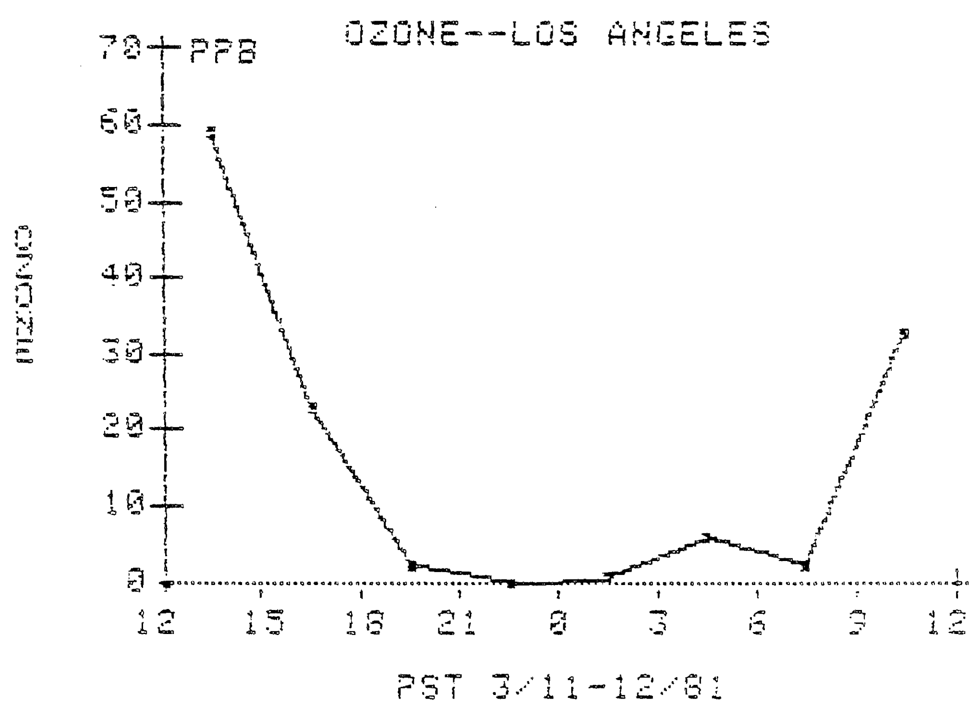



Figure 104. Diurnal variation of ozone concentration, March 11-12, 1981: Los Angeles

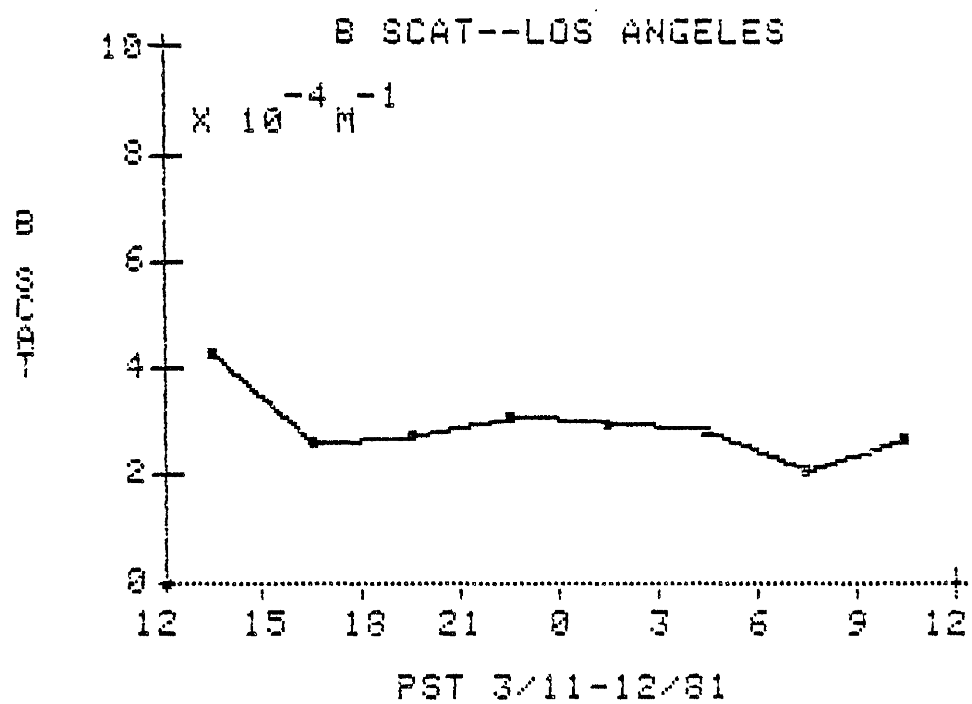



Figure 105. Diurnal variation of $b_{scat}$, March 11-12, 1981: Los Angeles

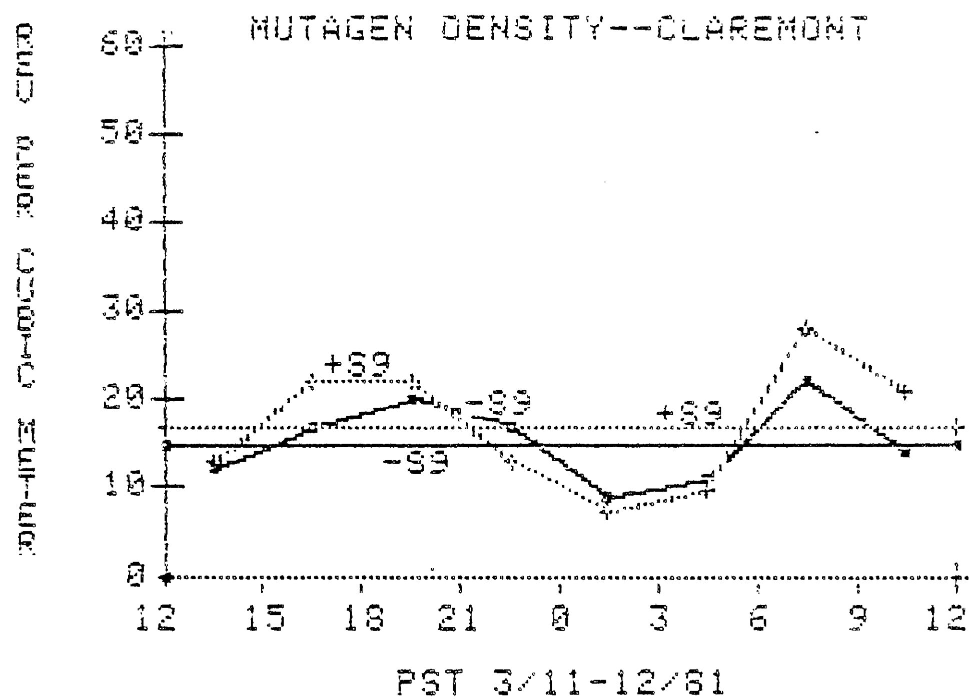



Figure 106. Diurnal variation of mutagen density, March 11-12, 1981: Claremont

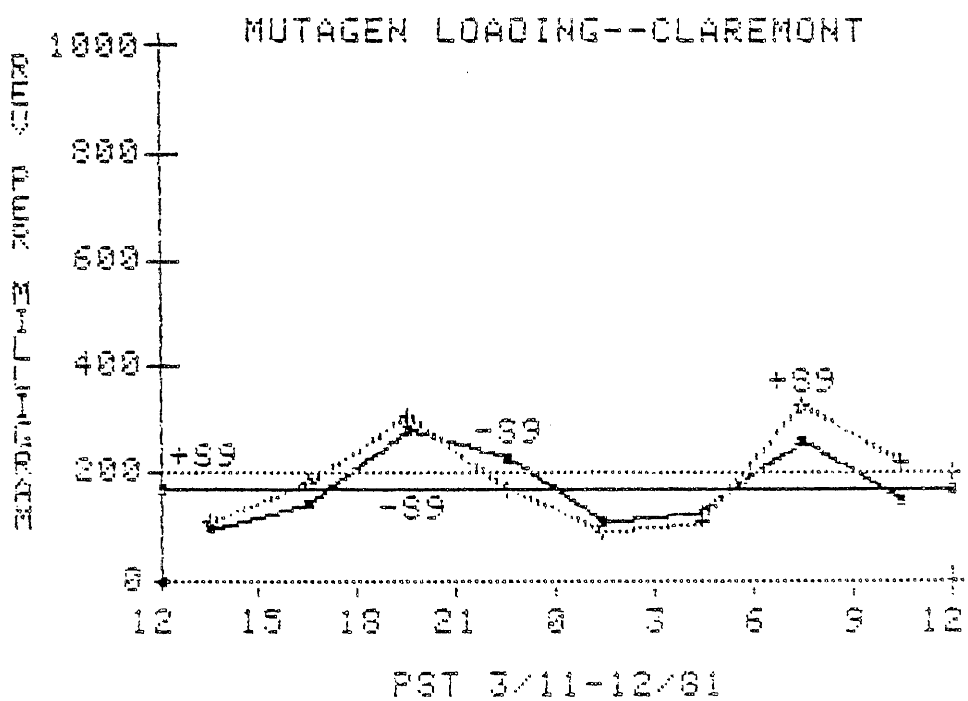



Figure 107. Diurnal variation of mutagen loading, March 11-12, 1981: Claremont

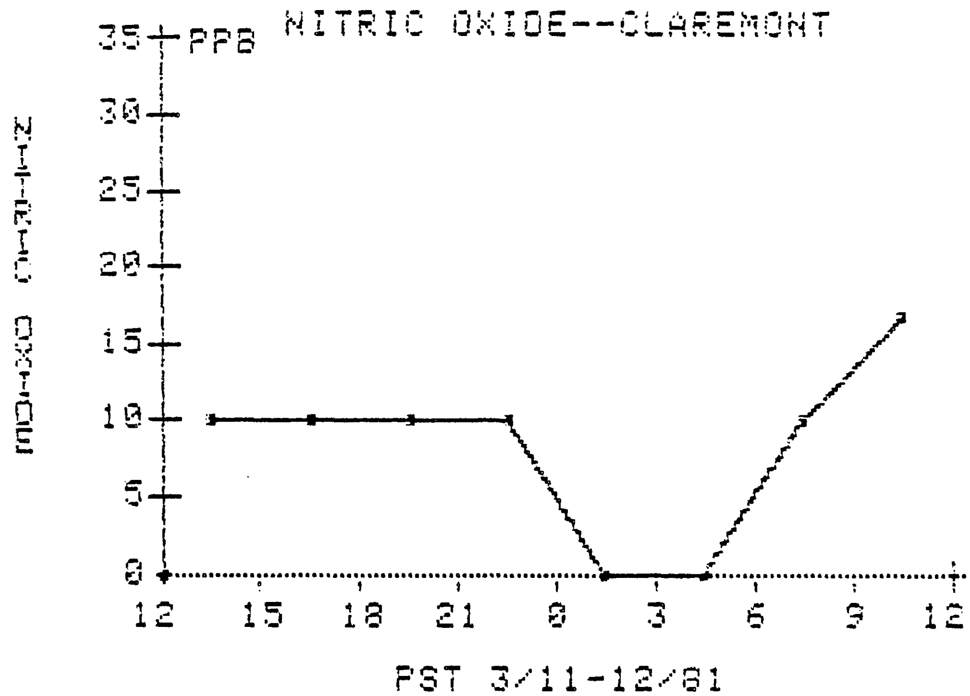



Figure 108. Diurnal variation of nitric oxide concentration, March 11-12, 1981: Claremont

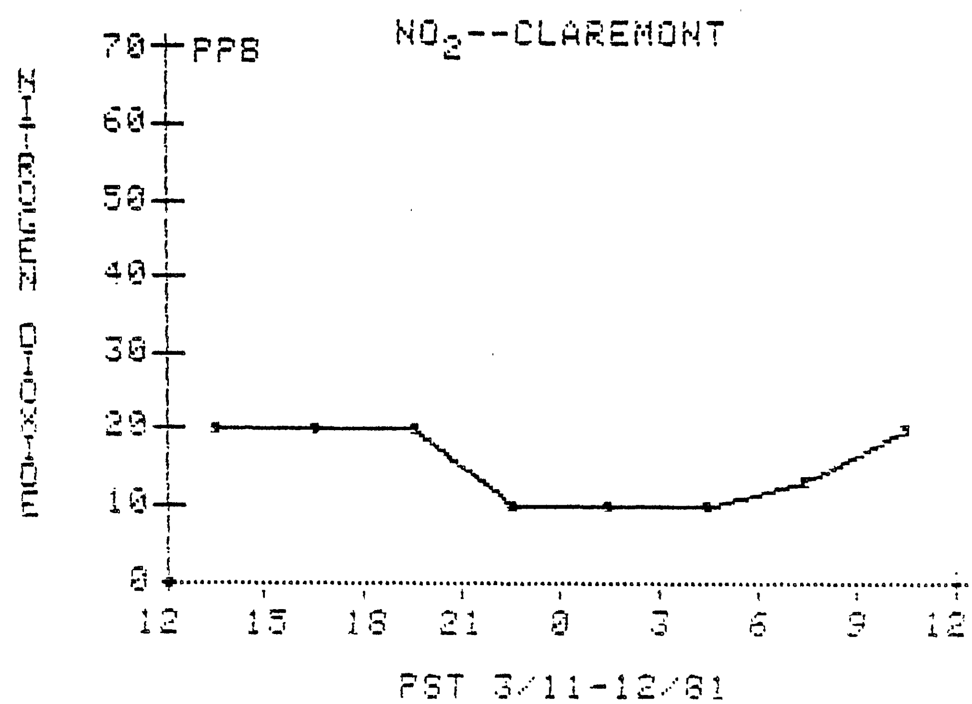



Figure 109. Diurnal variation of nitrogen dioxide concentration, March 11-12, 1981: Claremont

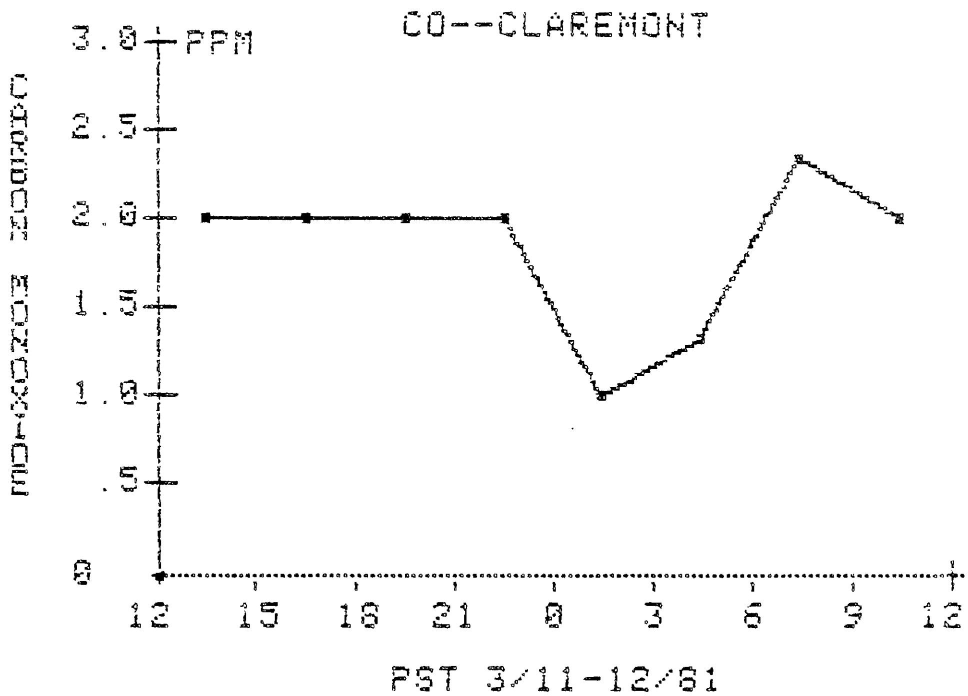



Figure 110. Diurnal variation of carbon monoxide concentration, March 11-12, 1981: Claremont

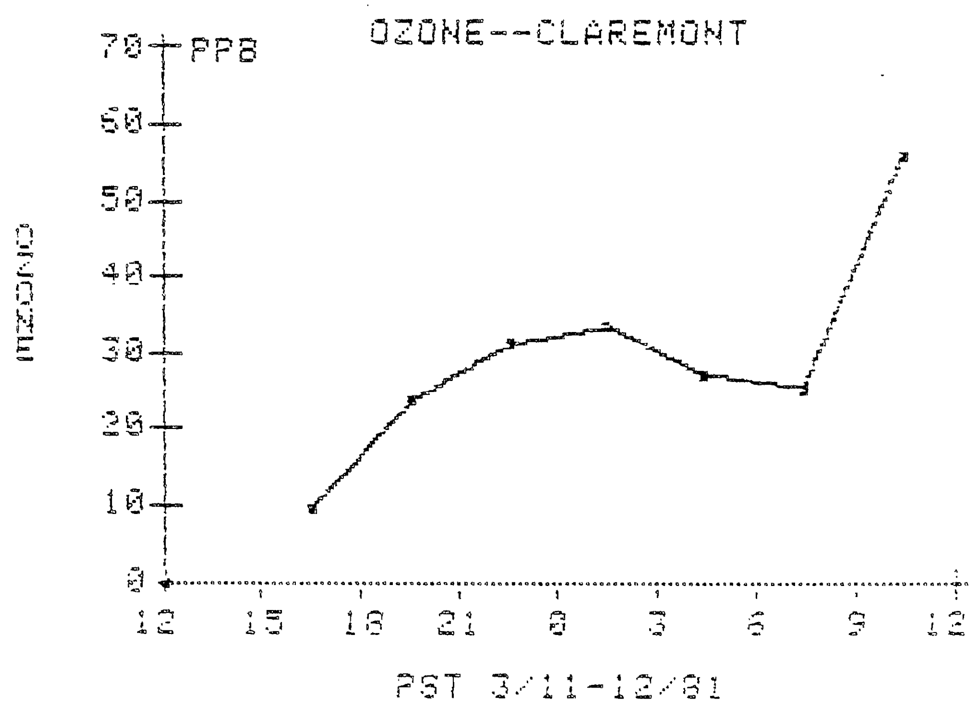



Figure 111. Diurnal variation of ozone concentration, March 11-12, 1981: Claremont

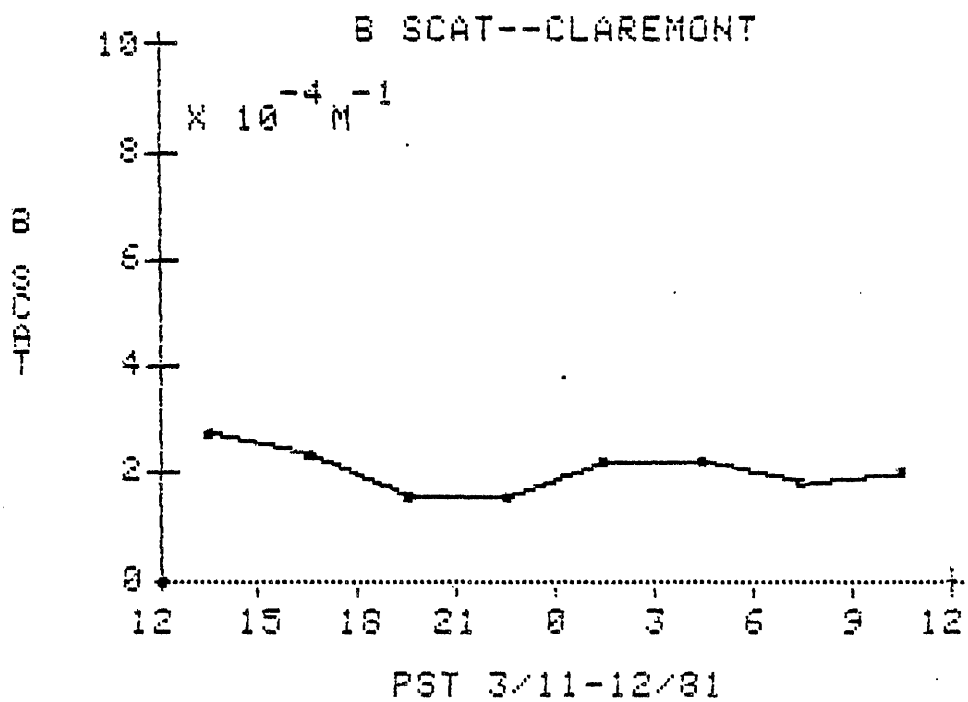



Figure 112. Diurnal variation of $b_{scat}$, March 11-12, 1981: Claremont

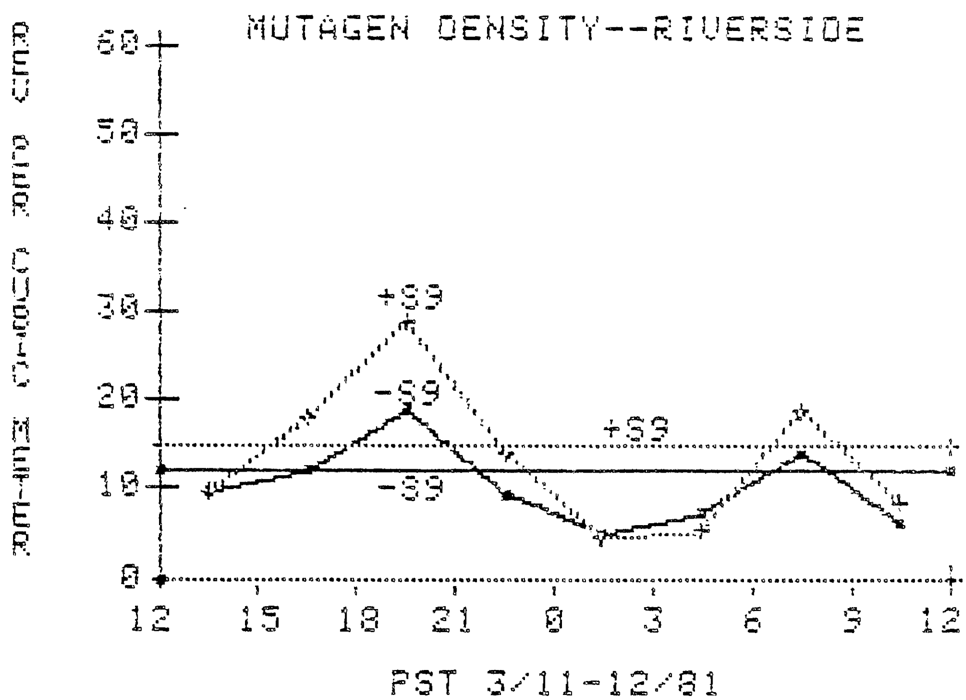



Figure 113. Diurnal variation of mutagen density, March 11-12, 1981: Riverside

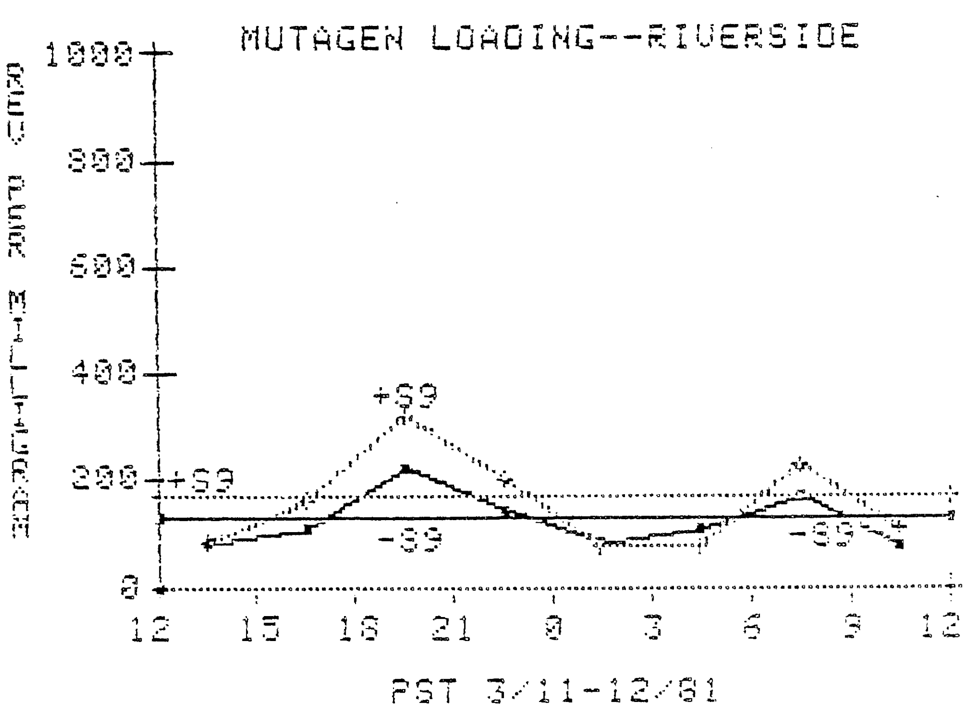



Figure 114. Diurnal variation of mutagen loading, March 11-12, 1981: Riverside

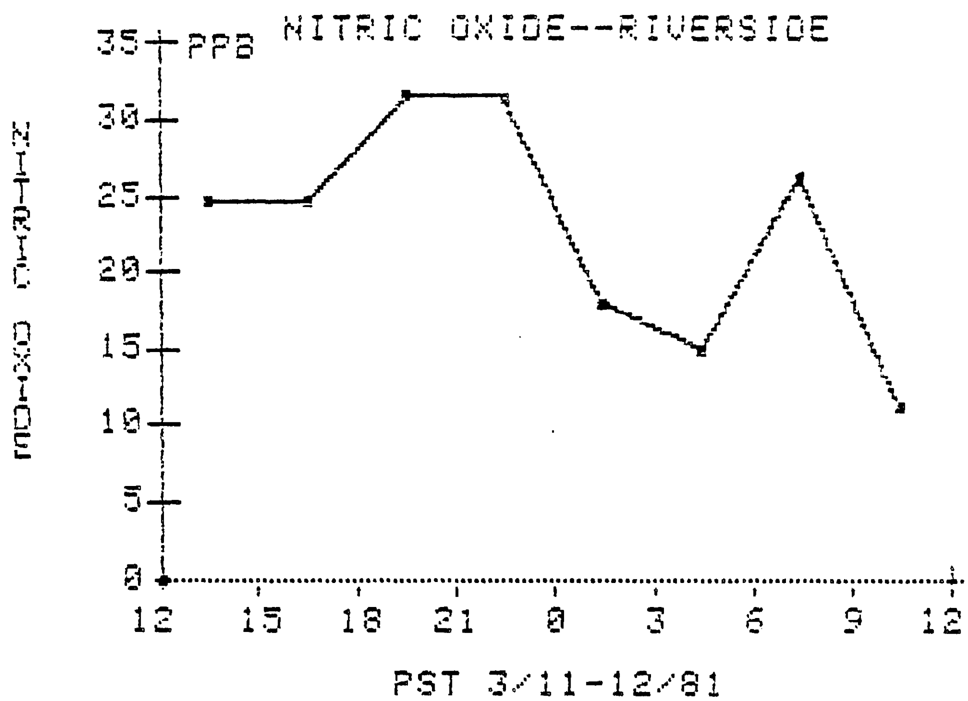



Figure 115. Diurnal variation of nitric oxide concentration, March 11-12, 1981: Riverside

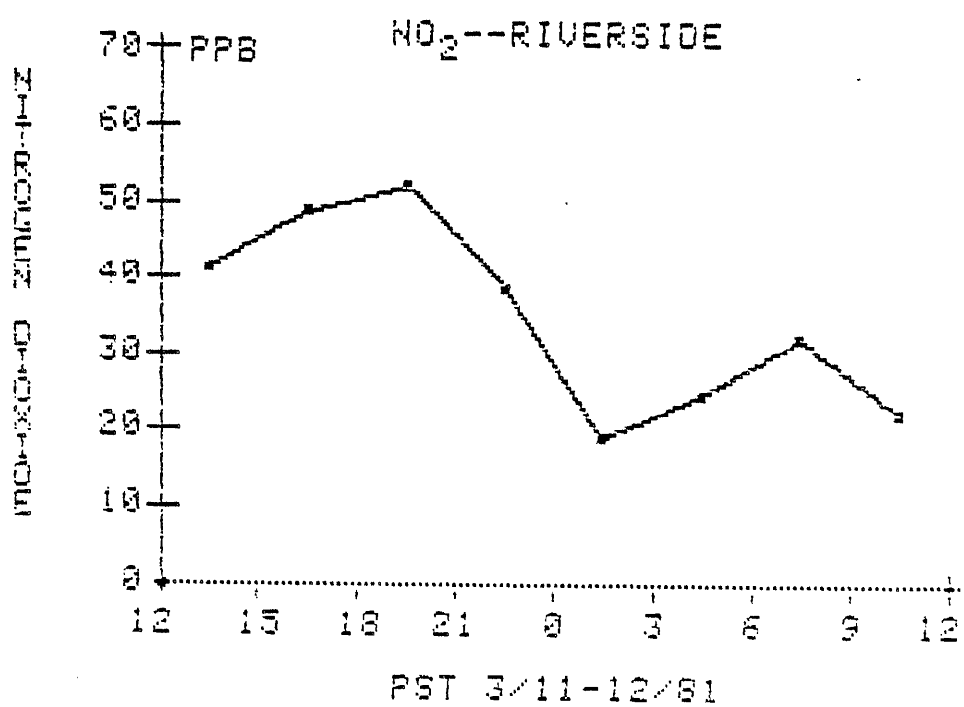



Figure 116. Diurnal variation of nitrogen dioxide concentration, March 11-12, 1981: Riverside

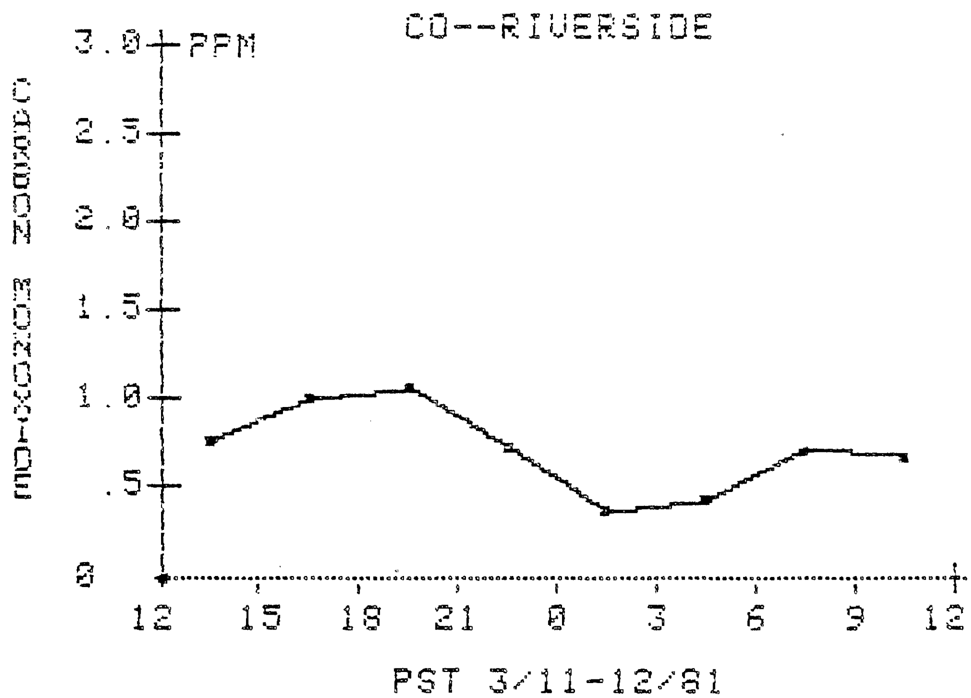



Figure 117. Diurnal variation of carbon monoxide concentration, March 11-12, 1981: Riverside

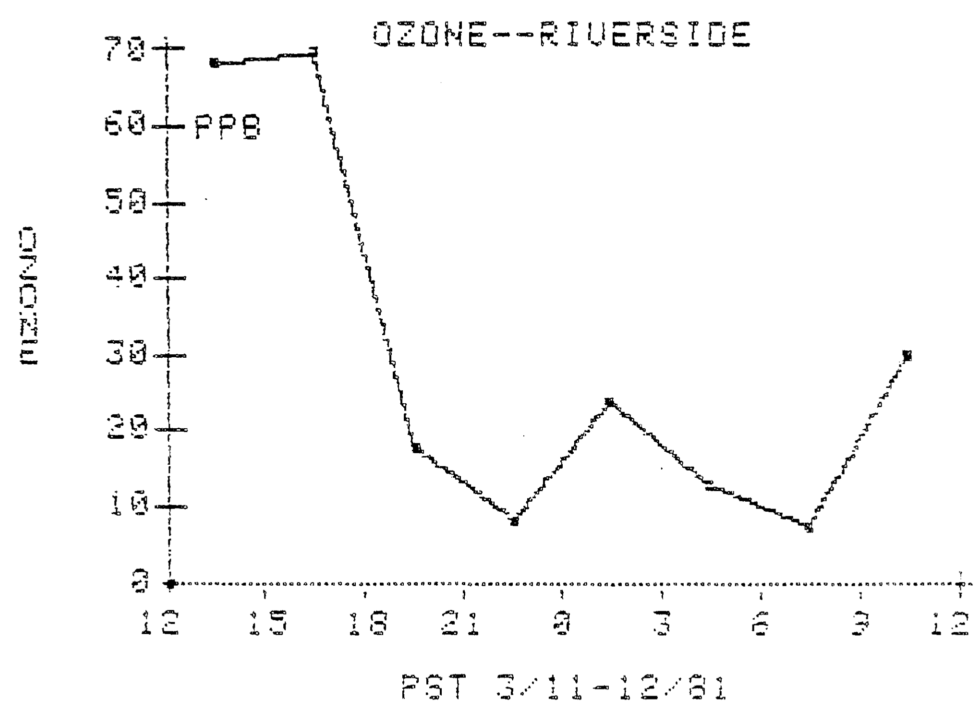



Figure 118. Diurnal variation of ozone concentration, March 11-12, 1981: Riverside

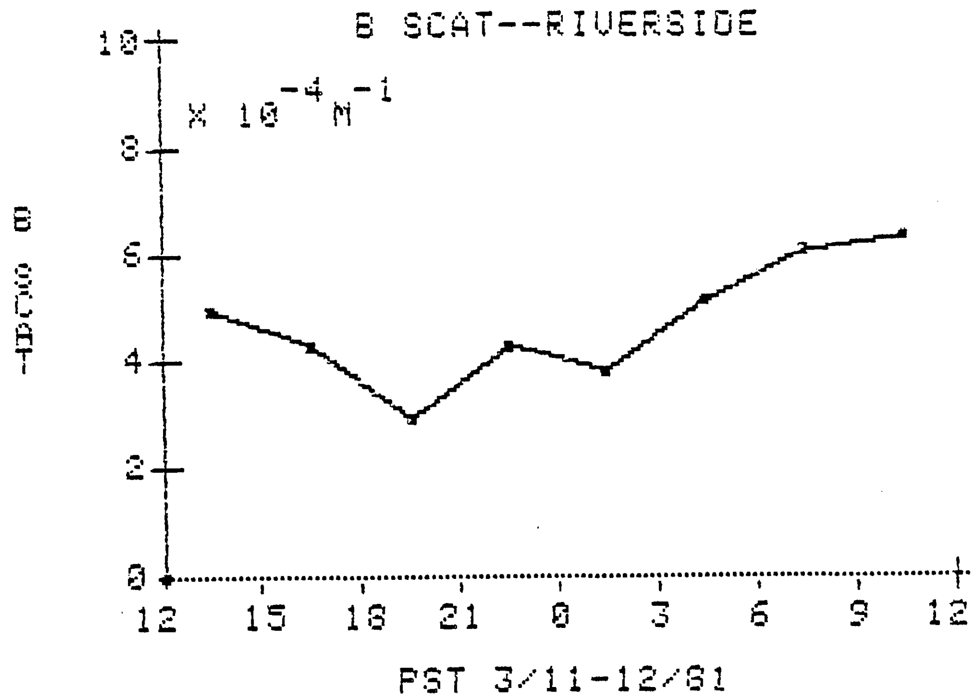



Figure 119. Diurnal variation of $b_{scat}$, March 11-12, 1981: Riverside

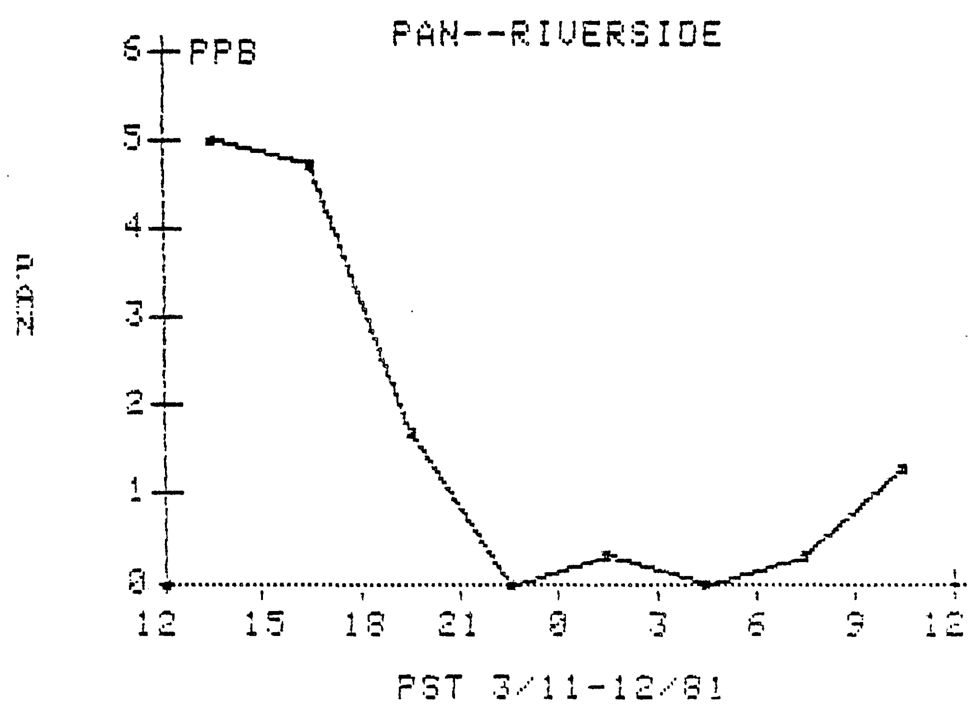



Figure 120. Diurnal variation of peroxyacetyl nitrate concentration, March 11-12, 1981: Riverside

## IV. PATTERNS OF PARTICULATE MUTAGENICITY IN THE SOUTH COAST AIR BASIN: CORRELATIONS WITH SELECTED AIR QUALITY PARAMETERS

### A. Introduction

Simple Pearson correlation coefficients relating the air quality and mutagenicity measurements obtained during the sampling periods were calculated using several different groups of the data points. This procedure was carried out in order to uncover relationships between particulate mutagenicity and the levels of routinely monitored pollutants which might enable prediction of periods of high mutagenic activity without the need for actual measurement, and which might be interpretable in terms of emission rates, atmospheric chemistry, meteorology, etc.

### B. February 4-7, 1980 Collections

Table 29 shows the correlation coefficients when the data from all the sites were divided into two groups: 1) day (0600-1800 PST) and 2) night (1800-0600 PST). Table 30 shows the correlation coefficients where data from each collection period at all sites are pooled. Values above a 95% confidence level are shown in boldface type. Mutagen density correlated directly with NO, $NO_2$ and CO, while specific activity correlated inversely with ozone. Mutagen loading seems to be closely linked to the primary pollutants NO and CO. All mutagen parameters showed some degree of negative correlation with ozone.

Table 31 shows the correlation coefficients with air quality parameters for the data grouped according to sampling site. The correlation values representing a 95% confidence level are shown in boldface type. With the data grouped this way, the correlations were expected to reveal the influence of localized sources of mutagenic activity peculiar to each site. Indeed, at El Monte and CSULA airborne particulate mutagenicity shows a high correlation with $SO_2$ which is not observed at the other sites, possibly indicating a localized input of pollutants containing significant amounts of both $SO_2$ and mutagenic activity.

(Text begins again on page 157)

Table 29. Correlation Coefficients* Between Gas Phase Data and Mutagen Assays, February 4-7, 1980

| | NO | $NO_2$ | $O_3$ | CO | $SO_2$ |
|---|---|---|---|---|---|
| All Location Days | | | | | |
| Nitrogen Oxide | | **0.80** | -0.02 | **0.75** | **0.68** |
| Nitrogen Dioxide | | | 0.28 | **0.86** | **0.56** |
| Ozone | | | | **0.49** | -0.12 |
| Carbon Monoxide | | | | | **0.44** |
| Extract Mass | **0.49** | **0.68** | **0.78** | **0.82** | 0.30 |
| Specific Activity (-S9) | **0.42** | 0.39 | 0.34 | 0.20 | 0.34 |
| Specific Activity (+S9) | 0.08 | 0.00 | **-0.48** | -0.16 | 0.02 |
| Mutagen Density (-S9) | **0.69** | **0.81** | 0.28 | **0.85** | **0.46** |
| Mutagen Density (+S9) | **0.74** | **0.82** | 0.24 | **0.77** | **0.45** |
| Mutagen Loading (-S9) | **0.70** | **0.76** | -0.01 | **0.58** | **0.45** |
| Mutagen Loading (+S9) | **0.74** | **0.75** | -0.08 | **0.50** | **0.42** |
| All Locations Nights | | | | | |
| Nitrogen Oxide | | **0.69** | -0.41 | **0.80** | 0.35 |
| Nitrogen Dioxide | | | -0.33 | **0.74** | **0.46** |
| Ozone | | | | -0.24 | -0.17 |
| Carbon Monoxide | | | | | 0.37 |
| Extract Mass | **0.45** | **0.67** | -0.21 | **0.67** | 0.14 |
| Specific Activity (-S9) | **0.59** | 0.31 | **-0.52** | **0.46** | 0.09 |
| Specific Activity (+S9) | **0.52** | 0.32 | **-0.59** | 0.33 | 0.03 |
| Mutagen Density (-S9) | **0.76** | **0.73** | -0.36 | **0.89** | 0.29 |
| Mutagen Density (+S9) | **0.76** | **0.78** | -0.39 | **0.85** | 0.28 |
| Mutagen Loading (-S9) | **0.79** | **0.64** | **-0.49** | **0.84** | 0.33 |
| Mutagen Loading (+S9) | **0.78** | **0.70** | **-.055** | **0.80** | 0.33 |

*Values above a 95% confidence level are shown in boldface type.

Table 30. Correlation Coefficients* Between Gas Phase Data and Mutagen Assays, February 4-7, 1980, All Mutagen Data Pooled

| | NO | $NO_2$ | $O_3$ | CO | $SO_2$ |
|---|---|---|---|---|---|
| <u>Days and Nights, All Locations</u> | | | | | |
| Nitrogen Oxide | | **0.44** | **-0.38** | **0.74** | 0.27 |
| Nitrogen Dioxide | | | 0.20 | **0.69** | **0.54** |
| Ozone | | | | 0.07 | 0.04 |
| Carbon Monoxide | | | | | **0.34** |
| Extract Mass | **0.31** | **0.67** | **0.44** | **0.70** | 0.25 |
| Specific Activity (-S9) | **0.59** | 0.22 | **-0.47** | **0.38** | 0.12 |
| Specific Activity (+S9) | **0.44** | 0.09 | **-0.51** | 0.15 | -0.01 |
| Mutagen Density (-S9) | **0.66** | **0.68** | -0.06 | **0.87** | **0.33** |
| Mutagen Density (+S9) | **0.69** | **0.70** | -0.11 | **0.83** | **0.31** |
| Mutagen Loading (-S9) | **0.78** | **0.51** | **-0.34** | **0.73** | 0.28 |
| Mutagen Loading (+S9) | **0.79** | **0.51** | **-0.39** | **0.68** | 0.26 |

*Values above a 95% confidence level are shown in boldface type.

Table 31. Correlation Coefficients* Between Gas Phase Data and Mutagen Assays; February 4-7, 1980, Individual Sites

| | NO | $NO_2$ | $O_3$ | CO | $SO_2$ |
|---|---|---|---|---|---|
| Day and Night, West Los Angeles | | | | | |
| Nitrogen Oxide | | 0.45 | 0.62 | **0.97** | 0.60 |
| Nitrogen Dioxide | | | 0.20 | 0.56 | **0.91** |
| Ozone | | | | 0.40 | 0.13 |
| Carbon Monoxide | | | | | 0.73 |
| Extract Mass | **0.91** | 0.73 | -0.24 | **0.97** | **0.84** |
| Specific Activity (-S9) | **0.93** | 0.71 | -0.39 | **0.94** | 0.76 |
| Specific Activity (+S9) | **0.85** | 0.69 | -0.50 | **0.81** | 0.76 |
| Mutagen Density (-S9) | **0.93** | 0.66 | -0.29 | **0.99** | 0.80 |
| Mutagen Density (+S9) | **0.94** | 0.68 | -0.33 | **0.99** | 0.80 |
| Mutagen Loading (-S9) | **0.97** | 0.63 | -0.43 | **0.98** | 0.73 |
| Mutagen Loading (+S9) | **0.97** | 0.63 | 0.48 | **0.96** | 0.72 |
| Day and Night, Westwood | | | | | |
| Nitrogen Oxide | | 0.45 | -0.62 | **0.97** | 0.60 |
| Nitrogen Dioxide | | | 0.19 | 0.56 | **0.91** |
| Ozone | | | | -0.40 | 0.13 |
| Carbon Monoxide | | | | | 0.73 |
| Extract Mass | 0.72 | **0.93** | -0.02 | **0.81** | **0.91** |
| Specific Activity (-S9) | **0.91** | 0.37 | -0.58 | **0.86** | 0.53 |
| Specific Activity (+S9) | 0.67 | 0.46 | -0.55 | 0.58 | 0.59 |
| Mutagen Density (-S9) | **0.90** | 0.77 | -0.28 | **0.95** | **0.84** |
| Mutagen Density (+S9) | **0.82** | **0.87** | -0.19 | **0.87** | **0.89** |
| Mutagen Loading (-S9) | **0.97** | 0.55 | -0.58 | **0.93** | 0.60 |
| Mutagen Loading (+S9) | **0.91** | 0.65 | -0.56 | **0.86** | 0.63 |

Table 31 (continued) - 2

| | NO | $NO_2$ | $O_3$ | CO | $SO_2$ |
|---|---|---|---|---|---|
| <u>Day and Night, Long Beach</u> | | | | | |
| Nitrogen Oxide | | 0.63 | -0.77 | **0.97** | 0.37 |
| Nitrogen Dioxide | | | -0.17 | 0.76 | 0.78 |
| Ozone | | | | -0.62 | -0.01 |
| Carbon Monoxide | | | | | 0.55 |
| Extract Mass | **0.85** | **0.88** | -0.45 | **0.95** | 0.75 |
| Specific Activity (-S9) | **0.86** | 0.28 | **-0.88** | 0.74 | -0.15 |
| Specific Activity (+S9) | 0.46 | 0.04 | -0.74 | 0.29 | -0.54 |
| Mutagen Density (-S9) | **0.97** | 0.72 | -0.65 | **0.98** | 0.45 |
| Mutagen Density (+S9) | **0.96** | 0.78 | -0.64 | **0.98** | 0.52 |
| Mutagen Loading (-S9) | **0.91** | 0.35 | -0.85 | **0.86** | 0.21 |
| Mutagen Loading (+S9) | **0.90** | 0.38 | **-0.88** | **0.85** | 0.24 |
| <u>Day and Night, Costa Mesa</u> | | | | | |
| Nitrogen Oxide | | 0.35 | -0.79 | 0.91 | -0.83 |
| Nitrogen Dioxide | | | 0.52 | -0.25 | 0.42 |
| Ozone | | | | -0.31 | 0.67 |
| Carbon Monoxide | | | | | 0.39 |
| Extract Mass | 0.43 | 0.16 | -0.17 | 0.63 | -0.05 |
| Specific Activity (-S9) | **1.00** | -0.02 | -0.53 | 0.87 | 0.17 |
| Specific Activity (+S9) | **1.00** | 0.21 | -0.43 | 0.71 | 0.22 |
| Mutagen Density (-S9) | **0.92** | -0.04 | -0.42 | **0.96** | 0.21 |
| Mutagen Density (+S9) | **0.90** | 0.23 | -0.31 | **0.91** | 0.30 |
| Mutagen Loading (-S9) | **0.96** | -0.35 | -0.32 | **1.00** | 0.39 |
| Mutagen Loading (+S9) | **0.95** | -.21 | -0.24 | **0.98** | 0.50 |

Table 31 (continued) - 3

| | NO | $NO_2$ | $O_3$ | CO | $SO_2$ |
|---|---|---|---|---|---|
| Day and Night, CSULA | | | | | |
| Nitrogen Oxide | | 0.40 | -0.35 | **0.87** | 0.83 |
| Nitrogen Dioxide | | | 0.38 | **0.80** | 0.71 |
| Ozone | | | | 0.03 | -0.26 |
| Carbon Monoxide | | | | | **0.90** |
| Extract Mass | 0.69 | **0.91** | 0.05 | **0.92** | **0.93** |
| Specific Activity (-S9) | 0.80 | **0.81** | 0.12 | **0.97** | 0.79 |
| Specific Activity (+S9) | **0.81** | 0.43 | 0.11 | 0.80 | 0.52 |
| Mutagen Density (-S9) | 0.71 | **0.92** | 0.20 | **0.96** | **0.82** |
| Mutagen Density (+S9) | 0.79 | **0.87** | 0.14 | **0.99** | **0.87** |
| Mutagen Loading (-S9) | 0.78 | **0.88** | 0.09 | **0.98** | **0.87** |
| Mutagen Loading (+S9) | **0.85** | **0.82** | 0.03 | **1.00** | **0.91** |
| Day and Night, El Monte | | | | | |
| Nitrogen Oxide | | 0.45 | -0.64 | ND | 0.04 |
| Nitrogen Dioxide | | | -0.30 | ND | **0.83** |
| Ozone | | | | | -0.08 |
| Carbon Monoxide | | | | | ND |
| Extract Mass | 0.29 | **0.93** | -0.15 | ND | **0.95** |
| Specific Activity (-S9) | -0.18 | 0.69 | 0.08 | ND | 0.80 |
| Specific Activity (+S9) | -0.68 | 0.44 | 0.01 | ND | 0.43 |
| Mutagen Density (-S9) | 0.16 | **0.86** | -0.04 | ND | **0.93** |
| Mutagen Density (+S9) | 0.16 | **0.95** | -0.17 | ND | **0.92** |
| Mutagen Loading (-S9) | 0.09 | 0.76 | -0.19 | ND | **0.94** |
| Mutagen Loading (+S9) | -0.01 | 0.70 | -0.46 | ND | **0.83** |

Table 31 (continued) - 4

| | NO | $NO_2$ | $O_3$ | CO | $SO_2$ |
|---|---|---|---|---|---|
| <u>Day and Night, Claremont</u> | | | | | |
| Nitrogen Oxide | | 0.62 | -0.30 | 0.80 | **0.81** |
| Nitrogen Dioxide | | | 0.41 | **0.92** | **0.95** |
| Ozone | | | | 0.43 | 0.24 |
| Carbon Monoxide | | | | | **0.98** |
| Extract Mass | 0.49 | **0.95** | 0.57 | **0.88** | 0.90 |
| Specific Activity (-S9) | 0.60 | -0.24 | -0.74 | -0.06 | 0.03 |
| Specific Activity (+S9) | 0.30 | -0.56 | -0.14 | -0.62 | -0.54 |
| Mutagen Density (-S9) | 0.80 | **0.87** | 0.15 | **0.89** | **0.93** |
| Mutagen Density (+S9) | 0.68 | **0.84** | 0.26 | 0.82 | **0.86** |
| Mutagen Loading (-S9) | **0.91** | 0.41 | -0.41 | 0.63 | 0.59 |
| Mutagen Loading (+S9) | **0.85** | 0.51 | -0.26 | 0.83 | 0.61 |
| <u>Day and Night, Fontana</u> | | | | | |
| Nitrogen Oxide | | 0.59 | 0.07 | 0.53 | 0.74 |
| Nitrogen Dioxide | | | 0.19 | **0.92** | **0.85** |
| Ozone | | | | 0.18 | 0.48 |
| Carbon Monoxide | | | | | 0.69 |
| Extract Mass | -0.08 | 0.83 | 0.61 | 0.87 | 0.57 |
| Specific Activity (-S9) | 1.14 | -0.09 | 0.85 | 0.16 | -0.51 |
| Specific Activity (+S9) | -0.14 | -0.15 | **-0.94** | 0.00 | -0.52 |
| Mutagen Density (-S9) | -0.17 | 0.38 | -0.33 | 0.71 | -0.14 |
| Mutagen Density (+S9) | -0.19 | 0.28 | -0.50 | 0.59 | -0.25 |
| Mutagen Loading (-S9) | 0.17 | 0.04 | **-0.86** | 0.21 | -0.42 |
| Mutagen Loading (+S9) | 0.18 | -0.02 | **-0.92** | 0.09 | -0.44 |

Table 31 (continued) - 5

| | NO | $NO_2$ | $O_3$ | CO | $SO_2$ |
|---|---|---|---|---|---|
| Day and Night, Riverside | | | | | |
| Nitrogen Oxide | | 0.38 | -0.51 | 0.69 | **-0.86** |
| Nitrogen Dioxide | | | 0.54 | **0.92** | 0.01 |
| Ozone | | | 0.20 | **0.84** | |
| Carbon Monoxide | | | | | -0.32 |
| Extract Mass | 0.45 | **0.94** | 0.53 | **0.91** | 0.03 |
| Specific Activity (-S9) | 0.35 | -0.23 | -0.64 | -0.13 | -0.69 |
| Specific Activity (+S9) | 0.42 | -0.22 | -0.68 | -0.09 | -0.74 |
| Mutagen Density (-S9) | 0.73 | **0.85** | 0.09 | **0.98** | -0.39 |
| Mutagen Density (+S9) | **0.82** | 0.73 | -0.07 | **0.94** | -0.50 |
| Mutagen Loading (-S9) | 0.66 | 0.28 | -0.51 | 0.43 | **-0.82** |
| Mutagen Loading (+S9) | 0.78 | 0.28 | -0.59 | 0.48 | **-0.90** |

*Values above a 95% confidence level are shown in boldface type.

C. <u>September 12 and 17, 1980</u>

Correlation values were calculated between the mutagen and air quality data for the two collection days during September. Since the days were similar with regard to pollutant levels and air trajectories, the data for these two days were pooled for analysis. The data for each site were grouped into day (0600-1800 hrs PST) and night (0000-0600, 1800-2400 hrs PST) periods. Carbon monoxide data were obtained for the Los Angeles and Claremont sites at the SCAQMD monitoring stations at downtown Los Angeles and Pomona, respectively. The results are shown in Tables 32 and 33. Temperature and relative humidity were not found to correlate with any of the mutagen assay parameters and are not included in the tables.

Although these correlations are based on only eight data points, the following trends were noted:

- All three sites showed a strong positive correlation between mutagen parameters and ambient CO levels.

- All three sites showed a negative correlation with mutagen density and ambient $O_3$ levels, with the strongest negative correlation recorded at the final receptor site, Riverside.

- At the Los Angeles and Riverside sites the best correlations were between mutagen parameters and $NO_x$ levels for the day sampling periods: NO appeared to be most strongly related to mutagen loading.

- At the Los Angeles and Riverside sites, significant correlations between mutagen density and $NO_2$ levels were observed for the night sampling periods.

Correlation coefficients were also determined with the data for each 24-hour collection period divided by sampling site only; these values are shown in Table 34 for September 12, 1980 and Table 35 for September 17, 1980. In these tables, the correlation between mutagen parameters and CO levels is not as pronounced; however, the negative correlation with $O_3$ is still apparent. The high correlation with $NO_x$ is lost; however, at the Riverside site mutagen parameters still correlated positively with $NO_x$.

(Text begins again on page 166)

Table 32. Correlation Coefficients* Between Gas Phase Data and Mutagen Assays, September 12 and 17, 1980, Days

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Los Angeles (CSULA) | | | | | | |
| Nitrogen Oxide | | 0.35 | -0.56 | 0.15 | -0.05 | 0.67 |
| Nitrogen Dioxide | | | 0.06 | 0.46 | **0.81** | **0.90** |
| Ozone | | | | 0.30 | 0.52 | -0.13 |
| $b_{scat}$ | | | | | 0.53 | 0.45 |
| PAN | | | | | | 0.60 |
| Carbon Monoxide | | | | | | |
| Extract Mass | 0.27 | **0.97** | 0.17 | 0.62 | **0.86** | **0.88** |
| Specific Activity (-S9) | 0.69 | -0.05 | **-0.72** | -0.65 | -0.52 | 0.17 |
| Specific Activity (+S9) | 0.68 | 0.14 | **-0.75** | -0.58 | -0.38 | 0.28 |
| Total Activity (-S9) | **0.87** | **0.75** | -0.33 | 0.18 | 0.38 | **0.94** |
| Total Activity (+S9) | **0.77** | **0.86** | -0.32 | 0.22 | 0.48 | **0.96** |
| Mutagen Density (-S9) | **0.86** | **0.76** | -0.32 | 0.18 | 0.39 | **0.94** |
| Mutagen Density (+S9) | **0.76** | **0.85** | -0.32 | 0.21 | 0.47 | **0.96** |
| Mutagen Loading (-S9) | **0.92** | 0.24 | -0.69 | -0.36 | -0.24 | 0.52 |
| Mutagen Loading (+S9) | **0.90** | 0.39 | -0.70 | -0.32 | -0.13 | 0.61 |
| Claremont (HMC) | | | | | | |
| Nitrogen Oxide | | -0.12 | -0.26 | -0.64 | -0.70 | -0.23 |
| Nitrogen Dioxide | | | -0.38 | 0.31 | 0.18 | 0.25 |
| Ozone | | | | -0.16 | 0.48 | -0.53 |
| $b_{scat}$ | | | | | 0.61 | 0.00 |
| PAN | | | | | | -0.39 |
| Carbon Monoxide | | | | | | |
| Extract Mass | -0.66 | -0.10 | -0.07 | **0.71** | 0.49 | 0.26 |
| Specific Activity (-S9) | 0.24 | 0.22 | **-0.72** | -0.35 | -0.70 | **0.84** |
| Specific Activity (+S9) | -0.59 | 0.32 | 0.18 | 0.69 | **0.86** | -0.24 |
| Total Activity (-S9) | -0.08 | 0.19 | **-0.71** | 0.51 | -0.45 | **0.91** |
| Total Activity (+S9) | -0.08 | 0.14 | **-0.71** | 0.58 | -0.45 | **0.87** |
| Mutagen Density (-S9) | -0.06 | 0.18 | **-0.71** | 0.05 | -0.46 | **0.90** |
| Mutagen Density (+S9) | -0.07 | 0.15 | **-0.71** | 0.05 | -0.44 | **0.88** |
| Mutagen Loading (-S9) | 0.00 | 0.08 | -0.66 | -0.23 | -0.59 | **0.95** |
| Mutagen Loading (+S9) | -0.04 | 0.10 | -0.56 | -0.21 | -0.54 | **0.94** |

Table 32 (continued) - 2

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| <u>Riverside (UCR)</u> | | | | | | |
| Nitrogen Oxide | | **0.82** | -0.69 | 0.02 | -0.28 | **0.95** |
| Nitrogen Dioxide | | | -0.60 | 0.25 | 0.03 | **0.87** |
| Ozone | | | | -0.61 | 0.67 | -0.65 |
| $b_{scat}$ | | | | | -0.25 | 0.08 |
| PAN | | | | | | -0.07 |
| CO | | | | | | |
| Extract Mass | -0.19 | -0.23 | 0.03 | 0.31 | -0.14 | -0.28 |
| Specific Activity (-S9) | **0.89** | 0.70 | -0.64 | -0.05 | -0.24 | **0.89** |
| Specific Activity (+S9) | **0.88** | 0.67 | -0.64 | -0.08 | -0.25 | **0.89** |
| Total Activity (-S9) | **0.92** | **0.82** | **-0.84** | 0.32 | -0.29 | **0.94** |
| Total Activity (+S9) | **0.92** | **0.79** | **-0.83** | 0.26 | -0.30 | **0.95** |
| Mutagen Density (-S9) | **0.92** | **0.80** | **-0.84** | 0.30 | -0.32 | **0.94** |
| Mutagen Density (+S9) | **0.92** | **0.78** | **-0.83** | 0.26 | -0.32 | **0.95** |
| Mutagen Loading (-S9) | **0.87** | 0.59 | -0.74 | 0.01 | -0.45 | **0.85** |
| Mutagen Loading (+S9) | **0.86** | 0.57 | -0.70 | -0.50 | -0.42 | **0.85** |

*Values above a 95% confidence level are shown in boldface type.

Table 33. Correlation Coefficients* Between Gas Phase Data and Mutagen Assays, September 12 and 17, 1980, Nights

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Los Angeles (CSULA) | | | | | | |
| Nitrogen Oxide | | 0.70 | -0.68 | **-0.91** | -0.57 | 0.53 |
| Nitrogen Dioxide | | | -0.32 | -0.63 | -0.02 | **0.89** |
| Ozone | | | | 0.41 | 0.60 | -0.32 |
| $b_{scat}$ | | | | | 0.51 | -0.40 |
| PAN | | | | | | 0.30 |
| Carbon Monoxide | | | | | | |
| Extract Mass | 0.18 | 0.67 | -0.14 | -0.09 | 0.59 | **0.92** |
| Specific Activity (-S9) | **0.79** | **0.95** | -0.50 | **-0.71** | -0.18 | **0.84** |
| Specific Activity (+S9) | **0.73** | **0.97** | -0.47 | -0.58 | -0.13 | **0.86** |
| Total Activity (-S9) | 0.57 | **0.94** | -0.35 | -0.46 | 0.16 | **0.97** |
| Total Activity (+S9) | 0.57 | **0.96** | -0.36 | -0.43 | 0.12 | **0.95** |
| Mutagen Density (-S9) | 0.53 | **0.93** | -0.30 | -0.42 | 0.21 | **0.97** |
| Mutagen Density (+S9) | 0.54 | **0.94** | -0.32 | -0.40 | 0.16 | **0.95** |
| Mutagen Loading (-S9) | **0.72** | **0.96** | -0.47 | -0.63 | -0.02 | **0.93** |
| Mutagen Loading (+S9) | 0.67 | **0.97** | -0.45 | -0.54 | -0.03 | **0.92** |
| Claremont (HMC) | | | | | | |
| Nitrogen Oxide | | **-0.91** | -0.52 | **0.80** | **-0.74** | -0.02 |
| Nitrogen Dioxide | | | -0.24 | 0.45 | -0.13 | -0.64 |
| Ozone | | | | 0.36 | **0.87** | **0.74** |
| $b_{scat}$ | | | | | 0.69 | -0.08 |
| PAN | | | | | | 0.61 |
| Carbon Monoxide | | | | | | |
| Extract Mass | -0.70 | 0.18 | 0.70 | **0.85** | **0.93** | 0.37 |
| Specific Activity (-S9) | 0.96 | -0.13 | -0.35 | -0.69 | -0.55 | 0.17 |
| Specific Activity (+S9) | -0.35 | 0.38 | -0.48 | 0.55 | -0.10 | -0.67 |
| Total Activity (-S9) | -0.25 | 0.15 | 0.66 | 0.58 | **0.76** | 0.56 |
| Total Activity (+S9) | -0.27 | 0.06 | **0.79** | 0.50 | **0.80** | 0.64 |
| Mutagen Density (-S9) | -0.28 | 0.14 | 0.67 | 0.59 | **0.78** | 0.58 |
| Mutagen Density (+S9) | -0.30 | 0.06 | **0.80** | 0.51 | **0.82** | 0.65 |
| Mutagen Loading (-S9) | 0.66 | -0.36 | 0.17 | -0.44 | -0.02 | 0.68 |
| Mutagen Loading (+S9) | 0.40 | -0.33 | 0.46 | -0.18 | 0.31 | **0.81** |

Table 33 (continued) - 2

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Riverside (UCR) | | | | | | |
| Nitrogen Oxide | | **-0.75** | -0.57 | -0.45 | -0.52 | -0.53 |
| Nitrogen Dioxide | | | **0.73** | 0.10 | **0.73** | 0.69 |
| Ozone | | | | -0.16 | **0.71** | 0.69 |
| $b_{scat}$ | | | | | -0.02 | 0.35 |
| PAN | | | | | | 0.98 |
| Carbon Monoxide | | | | | | |
| Extract Mass | -0.62 | 0.41 | 0.11 | **0.93** | 0.35 | **0.77** |
| Specific Activity (-S9) | **0.81** | -0.53 | -0.40 | **-0.78** | -0.54 | **-0.71** |
| Specific Activity (+S9) | **0.76** | -0.50 | -0.43 | **-0.73** | -0.62 | **-0.77** |
| Total Activity (-S9) | -0.37 | **0.72** | 0.44 | 0.35 | 0.69 | **0.77** |
| Total Activity (+S9) | -0.40 | 0.45 | 0.00 | **0.72** | -0.02 | 0.22 |
| Mutagen Density (-S9) | -0.37 | **0.74** | 0.48 | 0.31 | 0.59 | **0.73** |
| Mutagen Density (+S9) | -0.37 | 0.44 | -0.02 | **0.73** | -0.01 | 0.25 |
| Mutagen Loading (-S9) | **0.83** | -0.43 | -0.25 | **-0.82** | -0.22 | -0.35 |
| Mutagen Loading (+S9) | **0.82** | -0.45 | -0.42 | -0.70 | -0.47 | -0.55 |

*Values above a 95% confidence level are shown in boldface type.

Table 34. Correlation Coefficients* between Gas Phase Data and Mutagen Assays, September 12, 1980, Individual Sites

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Los Angeles (CSULA) | | | | | | |
| Nitrogen Oxide | | **0.72** | 0.43 | -0.05 | 0.58 | **0.94** |
| Nitrogen Dioxide | | | **0.85** | -0.56 | **0.90** | **0.85** |
| Ozone | | | | **-0.77** | **0.97** | 0.60 |
| $b_{scat}$ | | | | | -0.60 | -0.15 |
| PAN | | | | | | 0.75 |
| Carbon Monoxide | | | | | | |
| Extract Mass | **0.75** | **0.81** | 0.59 | -0.03 | **0.75** | **0.88** |
| Specific Activity (-S9) | **-0.71** | -0.62 | -0.42 | -0.15 | -0.58 | **-0.80** |
| Specific Activity (+S9) | -0.41 | -0.44 | -0.53 | 0.13 | -0.58 | -0.58 |
| Total Activity (-S9) | -0.15 | -0.04 | 0.00 | -0.29 | -0.07 | -0.18 |
| Total Activity (+S9) | 0.69 | 0.66 | 0.29 | 0.11 | 0.47 | **0.72** |
| Mutagen Density (-S9) | -0.38 | -0.24 | -0.09 | -0.27 | -0.18 | -0.42 |
| Mutagen Density (+S9) | 0.52 | 0.53 | 0.23 | 0.05 | 0.37 | 0.53 |
| Mutagen Loading (-S9) | -0.60 | -0.66 | -0.54 | -0.01 | -0.68 | **-0.75** |
| Mutagen Loading (+S9) | -0.17 | -0.42 | -0.65 | 0.39 | -0.63 | -0.39 |
| Claremont (HMC) | | | | | | |
| Nitrogen Oxide | | 0.50 | -0.11 | 0.27 | -0.13 | 0.41 |
| Nitrogen Dioxide | | | 0.46 | 0.50 | 0.43 | 0.51 |
| Ozone | | | | 0.32 | **0.96** | 0.38 |
| $b_{scat}$ | | | | | 0.53 | **0.75** |
| PAN | | | | | | 0.54 |
| Carbon Monoxide | | | | | | |
| Extract Mass | 0.14 | 0.17 | 0.45 | 0.69 | 0.64 | **0.84** |
| Specific Activity (-S9) | 0.18 | -0.45 | **-0.88** | -0.54 | **-0.93** | -0.63 |
| Specific Activity (+S9) | -0.58 | -0.45 | -0.05 | 0.04 | 0.00 | -0.48 |
| Total Activity (-S9) | 0.39 | -0.28 | **-0.75** | -0.04 | -0.65 | 0.06 |
| Total Activity (+S9) | 0.46 | -0.26 | -0.62 | -0.04 | -0.54 | 0.25 |
| Mutagen Density (-S9) | 0.38 | -0.26 | **-0.73** | -0.01 | -0.63 | 0.10 |
| Mutagen Density (+S9) | 0.45 | -0.23 | -0.62 | -0.02 | -0.52 | 0.27 |
| Mutagen Loading (-S9) | 0.23 | -0.43 | **-0.84** | -0.40 | **-0.85** | -0.49 |
| Mutagen Loading (+S9) | 0.07 | -0.60 | **-0.85** | -0.58 | **-0.89** | -0.59 |

Table 34 (continued) - 2

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Riverside (UCR) | | | | | | |
| Nitrogen Oxide | | **0.77** | -0.26 | 0.51 | -0.05 | **0.84** |
| Nitrogen Dioxide | | | -0.04 | 0.02 | 0.21 | 0.69 |
| Ozone | | | | **-0.75** | **0.96** | -0.23 |
| $b_{scat}$ | | | | | -0.68 | 0.42 |
| PAN | | | | | | -0.03 |
| Carbon Monoxide | | | | | | |
| Extract Mass | 0.23 | -0.15 | 0.16 | 0.49 | 0.22 | 0.25 |
| Specific Activity (-S9) | 0.23 | 0.39 | -0.58 | 0.05 | -0.47 | 0.16 |
| Specific Activity (+S9) | 0.10 | 0.31 | -0.66 | 0.12 | -0.54 | 0.04 |
| Total Activity (-S9) | 0.61 | 0.48 | **-0.76** | 0.62 | -0.55 | 0.53 |
| Total Activity (+S9) | 0.39 | 0.31 | **-0.79** | 0.66 | -0.60 | 0.32 |
| Mutagen Density (-S9) | 0.59 | 0.45 | **-0.76** | 0.62 | -0.57 | 0.56 |
| Mutagen Density (+S9) | 0.40 | 0.29 | **-0.80** | 0.69 | 0.62 | 0.38 |
| Mutagen Loading (-S9) | 0.01 | 0.01 | **-0.86** | 0.39 | **-0.80** | 0.09 |
| Mutagen Loading (+S9) | -0.13 | -0.07 | **-0.83** | 0.40 | **-0.77** | -0.06 |

*Values above a 95% confidence level are shown in boldface type.

Table 35. Correlation Coefficients* Between Gas Phase and Bromine/Lead Data and Mutagen Assays, September 17, 1980, Individual Sites

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO | Pb | Br |
|---|---|---|---|---|---|---|---|---|
| Los Angeles (CSULA) | | | | | | | | |
| Nitrogen Oxide | | -0.16 | -0.60 | -0.16 | -0.48 | 0.17 | -0.08 | 0.13 |
| Nitrogen Dioxide | | | 0.71 | **0.96** | **0.84** | **0.84** | **0.98** | **0.94** |
| Ozone | | | | **0.73** | **0.95** | 0.39 | 0.64 | 0.58 |
| $b_{scat}$ | | | | | **0.89** | **0.90** | **0.97** | **0.9[illegible]** |
| PAN | | | | | | 0.64 | **0.80** | **0.75** |
| Carbon Monoxide | | | | | | | **0.88** | **0.86** |
| Extract Mass | -0.21 | **0.98** | **0.75** | **0.99** | **0.90** | **0.86** | **0.96** | **0.9[illegible]** |
| Specific Activity (-S9) | 0.45 | -0.47 | **-0.82** | -0.45 | **-0.72** | -0.10 | -0.34 | -0.37 |
| Specific Activity (+S9) | 0.32 | -0.22 | -0.64 | -0.25 | -0.52 | 0.08 | -0.15 | -0.1[illegible] |
| Total Activity (-S9) | 0.36 | 0.40 | -0.08 | 0.51 | 0.17 | **0.78** | 0.53 | 0.48 |
| Total Activity (+S9) | 0.21 | **0.71** | 0.20 | **0.75** | 0.44 | **0.93** | **0.77** | **0.7[illegible]** |
| Mutagen Density (-S9) | 0.33 | 0.38 | -0.08 | 0.49 | 0.16 | **0.76** | 0.51 | 0.45 |
| Mutagen Density (+S9) | 0.22 | 0.66 | 0.16 | **0.71** | 0.40 | **0.90** | **0.74** | 0.6[illegible] |
| Mutagen Loading (-S9) | 0.46 | -0.26 | -0.64 | -0.17 | -0.48 | 0.19 | -0.11 | -0.15 |
| Mutagen Loading (+S9) | 0.41 | -0.02 | -0.49 | 0.02 | -0.31 | 0.37 | 0.10 | 0.06 |
| Claremont (HMC) | | | | | | | | |
| Nitrogen Oxide | | -0.10 | -0.49 | **-0.79** | **-0.82** | -0.51 | | |
| Nitrogen Dioxide | | | 0.17 | 0.19 | -0.13 | -0.05 | | |
| Ozone | | | | 0.51 | 0.50 | -0.33 | | |
| $b_{scat}$ | | | | | **0.91** | 0.56 | | |
| PAN | | | | | | | | |
| Carbon Monoxide | | | | | | | | |
| Extract Mass | **-0.76** | 0.28 | 0.48 | **0.99** | **0.89** | 0.57 | | |
| Specific Activity (-S9) | **0.80** | -0.13 | **-0.85** | -0.55 | -0.61 | 0.09 | | |
| Specific Activity (+S9) | 0.67 | -0.08 | **-0.89** | -0.41 | -0.47 | 0.24 | | |
| Total Activity (-S9) | -0.27 | 0.28 | -0.32 | 0.59 | 0.44 | **0.83** | | |
| Total Activity (+S9) | -0.35 | 0.24 | -0.26 | 0.65 | 0.54 | **0.82** | | |
| Mutagen Density (-S9) | -0.30 | 0.28 | -0.32 | 0.60 | 0.45 | **0.84** | | |
| Mutagen Density (+S9) | -0.37 | 0.24 | -0.26 | 0.66 | 0.54 | **0.83** | | |
| Mutagen Loading (-S9) | 0.45 | -0.22 | **-0.82** | -0.16 | -0.19 | 0.53 | | |
| Mutagen Loading (+S9) | 0.23 | -0.18 | **-0.75** | 0.06 | 0.04 | 0.67 | | |

Table 35 (continued) - 2

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| <u>Riverside (UCR)</u> | | | | | | |
| Nitrogen Oxide | | 0.69 | -0.41 | 0.16 | -0.27 | 0.56 |
| Nitrogen Dioxide | | | -0.24 | 0.58 | 0.31 | **0.72** |
| Ozone | | | | 0.00 | 0.34 | -0.57 |
| $b_{scat}$ | | | | | **0.86** | **0.78** |
| PAN | | | | | | |
| Carbon Monoxide | | | | | | |
| Extract Mass | -0.08 | 0.05 | 0.51 | 0.46 | 0.43 | 0.02 |
| Specific Activity (-S9) | 0.38 | -0.02 | **-0.76** | -0.59 | **-0.79** | 0.03 |
| Specific Activity (+S9) | 0.46 | 0.08 | **-0.74** | 0.58 | **-0.81** | 0.04 |
| Total Activity (-S9) | **0.78** | **0.82** | -0.62 | 0.51 | 0.11 | **0.85** |
| Total Activity (+S9) | **0.85** | **0.84** | -0.47 | 0.43 | 0.04 | **0.73** |
| Mutagen Density (-S9) | **0.80** | **0.83** | -0.60 | 0.50 | 0.10 | **0.84** |
| Mutagen Density (+S9) | **0.86** | **0.84** | -0.47 | 0.43 | 0.03 | **0.74** |
| Mutagen Loading (-S9) | 0.54 | 0.20 | **-0.91** | -0.17 | -0.47 | 0.46 |
| Mutagen Loading (+S9) | 0.70 | 0.32 | **-0.85** | -0.19 | -0.54 | 0.44 |

*Values above a 95% confidence level are shown in boldface type.

Both lead and bromine levels for CSULA on September 17, 1980 gave significant correlations with other parameters measured (Table 35). They correlated in a manner similar to $b_{scat}$, that is, correlations were best with air quality data and mutagen density.

Finally, the correlations were redone with all locations and days combined and data broken down into day and night periods (Tables 36 and 37), and with day and night data combined (Table 38). These correlations reveal no new information over those performed on the grouped data sets.

D. March 11 and 12, 1981

This was a 24-hour period typical of late fall or early spring air pollution episodes. Although the $PAN/O_3$ ratios were not unusually high (at Riverside, the only location where PAN data was available), there was a significant amount of ozone at the Riverside site and degradation of visibility coupled with the moderate temperatures normal for this time of year. Calculated correlation coefficients between the mutagen and air quality data for this episode are shown in Table 39. The low number of data points precluded dividing the data into day and night sets. Carbon monoxide and nitrogen oxide data were obtained for Los Angeles (CSULA) and Claremont (HMC) at the SCAQMD monitoring stations at downtown Los Angeles and Pomona, respectively and thus may not be completely applicable to the sampled air mass.

Although this is only a single monitoring day and firm conclusions cannot be drawn, the results are qualitatively similar to the high oxidant summer episodes in September 1980. For example, each site shows a high degree of correlation between mutagenicity and carbon monoxide. The negative correlation of mutagenicity data with ozone is also still apparent despite the much lower values of ozone at this time of year. At Riverside, $NO_x$ correlates quite strongly with the mutagen parameters with only a weakly positive correlation with NO at the other two sites. Unlike the September data, visibility degradation as measured by light scattering aerosols correlated negatively with mutagenicity parameters. This may be due to a change in the nature of the particulate matter, possibly due to higher water content of the aerosol at the moderate temperatures recorded during this collection.

As before, the correlations were repeated with the data from all locations combined (Table 40). The results are consistent with the correlations obtained with the data grouped by sampling site; in this case the negative correlations between ozone and mutagenic parameters are even more pronounced.

Table 36. Correlation Coefficients* Between Gas Phase Data and Mutagen Assay Data, September 12, 1980, All Mutagen Data Pooled

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Extract Mass | 0.00 | -0.19 | 0.23 | **0.65** | 0.22 | 0.32 |
| Specific Activity (-S9) | 0.20 | 0.19 | **-0.50** | **-0.56** | -0.37 | -0.10 |
| Specific Activity (+S9) | 0.39 | **0.42** | 0.12 | **-0.49** | **0.41** | **0.51** |
| Mutagen Density (-S9) | **0.42** | 0.21 | **-0.51** | -0.14 | -0.23 | **0.40** |
| Mutagen Density (+S9) | **0.41** | 0.17 | **-0.45** | 0.15 | -0.21 | **0.45** |
| Mutagen Loading (-S9) | 0.39 | -0.07 | **-0.72** | -0.22 | **-0.56** | -0.22 |
| Mutagen Loading (+S9) | 0.17 | 0.29 | **-0.71** | -0.23 | **-0.51** | -0.02 |

*Values above a 95% confidence level are shown in boldface type.

Table 37. Correlation Coefficients* Between Gas Phase Data and Mutagen Assay Data, September 17, 1980, All Mutagen Data Pooled

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Extract Mass | -0.24 | **0.43** | 0.38 | **0.76** | **0.67** | **0.44** |
| Specific Activity (-S9) | **0.61** | 0.03 | **-0.72** | **-0.46** | **-0.65** | 0.08 |
| Specific Activity (+S9) | **0.64** | 0.24 | **-0.69** | -0.29 | **-0.52** | 0.19 |
| Mutagen Density (-S9) | **0.46** | **0.57** | -0.39 | **0.42** | 0.17 | **0.72** |
| Mutagen Density (+S9) | **0.45** | **0.73** | -0.33 | **0.51** | 0.26 | **0.76** |
| Mutagen Loading (-S9) | **0.64** | 0.19 | **-0.68** | -0.13 | -0.36 | 0.33 |
| Mutagen Loading (+S9) | **0.63** | 0.37 | **-0.60** | 0.01 | -0.24 | **0.42** |

*Values above a 95% confidence level are shown in boldface type.

Table 38. Correlation Coefficients* Between Gas Phase Data and Mutagen Assay Data, All September 12 and 17, 1980 Mutagen Data Pooled

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | PAN | CO |
|---|---|---|---|---|---|---|
| Extract Mass | -0.23 | 0.24 | **0.31** | **0.58** | **0.43** | **0.28** |
| Specific Activity (-S9) | **0.67** | 0.14 | **-0.54** | **-0.54** | **-0.47** | 0.26 |
| Specific Activity (+S9) | **0.72** | **0.30** | **-0.51** | **-0.47** | **-0.39** | **0.36** |
| Mutagen Density (-S9) | **0.53** | **0.55** | **-0.36** | -0.07 | -0.02 | **0.71** |
| Mutagen Density (+S9) | **0.70** | 0.24 | **-0.53** | **-0.40** | **-0.35** | **0.44** |
| Mutagen Loading (-S9) | **0.70** | 0.24 | **-0.53** | **-0.40** | **-0.35** | **0.44** |
| Mutagen Loading (+S9) | **0.71** | **0.39** | **-0.47** | **-0.32** | -0.26 | **0.52** |

*Values above a 95% confidence level are shown in boldface type.

Table 39. Correlation Coefficients* Between Gas Phase Data and Mutagen Assays, March 11-12, 1981, Individual Sites

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | CO |
|---|---|---|---|---|---|
| Los Angeles (CSULA) | | | | | |
| Nitrogen Oxide | | -0.03 | 0.08 | -0.30 | 0.13 |
| Nitrogen Dioxide | | | **0.83** | **0.81** | 0.68 |
| Ozone | | | | 0.69 | 0.60 |
| $b_{scat}$ | | | | | |
| Carbon Monoxide | | | | | |
| Extract Mass | -0.26 | **0.95** | **0.77** | **0.87** | 0.66 |
| Specific Activity (-S9) | 0.66 | -0.36 | -0.47 | 0.63 | 0.12 |
| Specific Activity (+S9) | 0.67 | -0.26 | -0.37 | -0.64 | 0.27 |
| Mutagen Density (-S9) | 0.61 | -0.03 | -.027 | -0.39 | 0.43 |
| Mutagen Density (+S9) | 0.38 | 0.51 | 0.24 | 0.03 | **0.86** |
| Mutagen Loading (S-9) | 0.62 | -0.44 | -0.55 | -0.67 | 0.05 |
| Mutagen Loading (+S9) | 0.61 | -0.39 | -0.50 | -0.73 | 0.16 |
| Claremont (HMC) | | | | | |
| Nitrogen Oxide | | 0.70 | 0.32 | -0.22 | **0.84** |
| Nitrogen Dioxide | | | -0.01 | 0.23 | 0.54 |
| Ozone | | | | -0.12 | -0.01 |
| $b_{scat}$ | | | | | -0.29 |
| Carbon Monoxide | | | | | |
| Extract Mass | -0.30 | 0.00 | 0.27 | **0.71** | -0.26 |
| Specific Activity (-S9) | 0.50 | 0.20 | -0.26 | **-0.78** | **0.73** |
| Specific Activity (+S9) | 0.68 | 0.51 | -0.05 | -.53 | **0.81** |
| Mutagen Density (-S9) | 0.59 | 0.27 | -0.35 | 0.65 | **0.82** |
| Mutagen Density (+S9) | 0.68 | 0.53 | -0.15 | 0.37 | **0.82** |
| Mutagen Loading (-S9) | 0.33 | -0.01 | -0.17 | **-0.90** | 0.57 |
| Mutagen Loading (+S9) | 0.55 | 0.33 | -0.07 | -0.68 | **-0.71** |

Table 39 (continued) - 2

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | CO |
|---|---|---|---|---|---|
| Riverside (UCR) | | | | | |
| Nitrogen Oxide | | **0.80** | -0.44 | -0.55 | 0.65 |
| Nitrogen Dioxide | | | 0.39 | -0.52 | **0.93** |
| Ozone | | | | -0.05 | **0.96** |
| $b_{scat}$ | | | | | -0.11 |
| Carbon Monoxide | | | | | |
| Extract Mass | 0.13 | 0.49 | **0.82** | 0.22 | 0.40 |
| Specific Activity (-S9) | 0.69 | 0.63 | -0.37 | -0.43 | 0.65 |
| Specific Activity (+S9) | **0.71** | 0.69 | -0.26 | -0.43 | 0.77 |
| Mutagen Density (-S9) | **0.76** | **0.81** | 0.05 | -0.39 | **0.81** |
| Mutagen Density (+S9) | **0.76** | **0.81** | 0.06 | -0.40 | **0.87** |
| Mutagen Loading (-S9) | **0.71** | 0.57 | -0.48 | -0.40 | 0.56 |
| Mutagen Loading (+S9) | **0.76** | 0.65 | -0.35 | -0.38 | 0.71 |

*Values above a 95% confidence level are shown in boldface type.

Table 40. Correlation Coefficients* Between Gas Phase Data and Mutagen Assays, March 11-12, 1980, Day and Night Data Separated

| | NO | $NO_2$ | $O_3$ | $b_{scat}$ | CO |
|---|---|---|---|---|---|
| Days | | | | | |
| Nitrogen Oxide | -0.08 | 0.30 | 0.49 | **-0.61** | |
| Nitrogen Dioxide | | | 0.47 | 0.31 | -0.19 |
| Ozone | | | | 0.21 | -0.15 |
| $b_{scat}$ | | | | | **-0.80** |
| Carbon Monoxide | | | | | |
| Extract Mass | -0.01 | **0.66** | **0.58** | 0.32 | 0.10 |
| Specific Activity (-S9) | -0.24 | 0.03 | -0.52 | -0.41 | 0.20 |
| Specific Activity (+S9) | -0.36 | 0.08 | -0.54 | -0.49 | 0.29 |
| Mutagen Density (-S9) | -0.41 | 0.23 | -0.45 | -0.46 | 0.39 |
| Mutagen Density (+S9) | **-0.59** | 0.41 | -0.39 | -0.46 | -0.53 |
| Mutagen Loading (-S9) | -0.23 | 0.00 | -0.55 | -0.43 | 0.21 |
| Mutagen Loading (+S9) | -0.34 | 0.03 | **-0.59** | -0.51 | 0.30 |
| Nights | | | | | |
| Nitrogen Oxide | | 0.45 | 0.08 | 0.46 | -0.23 |
| Nitrogen Dioxide | | | **-0.74** | 0.39 | -0.33 |
| Ozone | | | | -0.42 | 0.38 |
| $b_{scat}$ | | | | | **-0.88** |
| Carbon Monoxide | | | | | |
| Extract Mass | -0.27 | -0.11 | 0.10 | -0.02 | -0.04 |
| Specific Activity (-S9) | -0.29 | 0.51 | **-0.64** | -0.33 | -0.32 |
| Specific Activity (+S9) | 0.01 | **0.76** | **-0.64** | -0.23 | 0.24 |
| Mutagen Density (-S9) | -0.37 | 0.47 | **-0.62** | -0.37 | 0.36 |
| Mutagen Density (+S9) | -0.08 | 0.72 | **-0.64** | -0.26 | 0.26 |
| Mutagen Loading (-S9) | -0.36 | 0.40 | **-0.60** | -0.39 | 0.49 |
| Mutagen Loading (+S9) | -0.07 | 0.68 | **-0.64** | -0.29 | 0.31 |

*Values above a 95% confidence level are shown in boldface type.

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