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A HEAVY-DUTY VEHICLE EMISSION INVENTORY SYSTEM

By
Kenneth W. Arledge
Ronald L. Tan

TRW Environmental Engineering Division
One Space Park
Redondo Beach, California 90278

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1709 11th Street
Sacramento, California 95814

TRW
ENVIRONMENTAL ENGINEERING DIVISION

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"THE INVENTORY PRESENTED HEREIN WAS DEVELOPED TO EVALUATE IMPROVED METHODS OF OBTAINING MOBILE SOURCE EMISSIONS DATA, AND AS SUCH IT DOES NOT REPRESENT OFFICIAL AIR RESOURCES BOARD POLICY."

ABSTRACT

A computerized mobile source emissions model for light-, medium-, and heavy-duty vehicles was developed. The emissions model, which is based on a detailed traffic model, was applied to medium- and heavy-duty vehicles in California's South Coast Air Basin (the Los Angeles Area). Two (2) 1975 inventories were generated, one using emission factors developed by the California Air Resources Board and the other using the emission factors recommended by the United States Environmental Protection Agency for California vehicles. In both cases the predicted emissions exceeded the values developed by the California Air Resources Board for all pollutants. The major reason for the difference is the lower estimate of vehicle miles traveled used by the Air Resources Board.

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CONTENTS

LIST OF ABBREVIATIONS AND SYMBOLS

AADT	-	Annual average daily traffic (annual traffic divided by 365)
ARB	-	California Air Resources Board
CalTrans	-	California State Department of Transportation
EPA	-	United States Environmental Protection Agency
DMV	-	California State Department of Motor Vehicles
GVW	-	Gross vehicle weight (in pounds)
HDV	-	Heavy-duty vehicle ARB definition 8500+ pounds GVW EPA definition 8500+ pounds GVW
LARTS	-	Los Angeles Regional Transportation Study
LDV	-	Light-duty vehicle ARB definition 0-6000 pounds GVW EPA definition 0-8500 pounds GVW
MDV	-	Medium-duty vehicle: ARB definition 6001-8500 pounds GVW EPA definition - none
SCAB	-	South Coast Air Basin
UTM	-	Universal Transverse Mercator
VMT	-	Vehicle miles traveled

SECTION 1

INTRODUCTION

As emissions from light-duty vehicles (LDVs) come under more stringent control, heavy-duty vehicles (HDVs) will account for an increasing fraction of mobile source emissions. It has been estimated, for example, that by 1980 thirty percent of all mobile source emissions in the South Coast Air Basin will come from heavy-duty vehicles, an increase of one hundred percent over 1970 [1]. Likewise, it is expected that they will account for thirty-five percent of the carbon monoxide emissions, an increase of 192 percent, and twenty-five percent of the nitrogen oxide emissions, an increase of sixty-seven percent.

While light-duty vehicle emissions have been the subject of numerous studies conducted by the California Air Resources Board (ARB) and other air pollution control agencies, little attention has been directed toward characterizing heavy-duty vehicle emissions [2], [3], [4]. The increasing importance of heavy-duty vehicles as a mobile emissions source, however, indicates the need to better understand their role in the air pollution problem.

The purpose of this study was to characterize, in detail, the emissions from heavy-duty vehicles. The program consisted of three major aspects:

- Development of inventory methodologies;
- Development of a computerized mobile source emissions inventory model;
- Compilation of a heavy-duty vehicle emissions inventory.

The procedures used to compile a heavy-duty mobile source inventory are less straightforward than those for stationary sources or for light duty vehicles. It is for this reason that considerable effort was expended developing and investigating methods of acquiring the data necessary to generate the inventory.

Because of the complexities involved, computer based methods are the only reasonable way of constructing a disaggregated inventory. Therefore, the second aspect of the program involved the modification of the computerized emissions inventory model that was developed in a previous light-duty vehicle inventory program [2]. The model was improved and modified to calculate emissions from both light- and heavy-duty vehicles.

The model was used to calculate emissions inventories for calendar year 1975. Two (2) were generated using different sets of emission factors. The primary inventory used factors provided by the ARB; the other used the factors listed in the Environmental Protection Agency document, AP-42, Supplement 5 [5].

The term heavy-duty vehicle can cause some confusion. EPA defines light-duty trucks as those with gross vehicle weights (GVW) of 0 to 8500 pounds and heavy-duty vehicles as those with GVWs greater than 8500 pounds. The ARB defines light-duty vehicles as those with GVWs of 0 to 6000 pounds, medium duty vehicles 6001 to 8500 pounds GVW, and heavy-duty vehicles as greater than 8500 pounds GVW. For convenience in this report, heavy-duty vehicle (HDV) means vehicles with GVWs of more than 6000 pounds unless otherwise specified.

SECTION 2

SUMMARY

This study shows that it is feasible to develop a heavy-duty vehicle mobile source inventory disaggregated in terms of body type, geographical location, time-of-day, day-of-week, and season. The emission inventory model that was used was shown to be a workable tool for generating highly disaggregated mobile source inventories. Both of the 1975 South Coast Air Basin inventories that were generated show higher emissions values than does the corresponding Air Resources Board inventory. The primary reason for this is the higher estimate of vehicle miles traveled used in this study. A summary of the 1975 inventories follows:

	ARB Emission Factors (Average Tons/Day)	EPA Emission Factors (Average Tons/Day)
Hydrocarbons (total):	119.2*	147.1
Exhaust:	94.6	102.5
Evaporative:	21.9	41.2
Crankcase:	2.6	3.4
Carbon Monoxide:	876.7	938.7
Nitrogen Oxides:	302.9	293.1
Sulfur Dioxide:	22.6	21.6
Particulates:	24.2	24.2

*Rounding error

SECTION 3

SURVEY OF HEAVY-DUTY VEHICLE DRIVING PATTERNS

A survey of heavy-duty vehicle driving patterns was conducted for TRW by Olson Laboratories of Anaheim, California. The purpose of the survey was three-fold:

- To determine the fundamental differences between the driving patterns of light- and heavy-duty vehicles;
- To determine representative driving cycles for use with the EPA's Modal Emissions Model [6];
- To develop a dynamometer driving sequence for obtaining modal emissions data.

This section describes the procedures that were used.

The Air Resources Board's (ARB) instrumented chase car accumulated HDV driving pattern data by following and duplicating the driving characteristics of a sample of heavy-duty vehicles. To assure that the correct types of vehicles were being followed, carefully selected individual HDVs were followed for an entire day. This is a departure from the previous procedure of following randomly selected vehicles [7]. The vehicles were selected from among those volunteered by fleet operators. It was explained to the operators that:

- No vehicle modifications were required;
- No changes in daily operations were required - normal operations were requested;
- The identity of the vehicle - but not the type of vehicle - would be removed as the data were processed so that confidentiality would be maintained.

A questionnaire (Figure 1) was developed to gather detailed data on each vehicle, its maintenance schedule, annual useage and other operational data. This information is presented in Appendix C.

The chase car's on-board computer recorded vehicle speed, road type (freeway, non-freeway), traffic density (peak, off-peak), and time-of-day on a second-by-second basis. Additional information such as road conditions (wet, dry, under construction), weather conditions (clear, rainy, fog), day-of-week, etc. was also recorded.

The data were processed by the procedures outlined in Figure 2. Data tapes from the on-board mini-computer were edited and reformatted. The editing process corrected errors such as erroneous entries and missing data points. Reformatting was required before the data tape could be read

HEAVY DUTY VEHICLE DRIVING SURVEY DATA

1 NAME AND ADDRESS OF REGISTERED OWNER

2 VEHICLE DESCRIPTION

A. MANUFACTURER . . . . ______________

B. MODEL YEAR . . . . ______________

C. BODY TYPE (PANEL, DUMP, ETC.) . . . . ______________

D. NUMBER OF AXLES AND . . . . ______________

AXLE ARRANGEMENT[1] . . . . ______________

E. GROSS WEIGHT[2] . . . . ______________

F. EMPTY WEIGHT[2] . . . . ______________

G. STATE IN WHICH VEHICLE IS REGISTERED (I.E. HOME STATE) . . . . ______________

H. ADD-ON STREAMLINING DEVICES . . . . . . ______________

I. TIRE SIZE[3] . . . . ______________

J. NUMBER OF TIRES . . . . ______________

K. BRAKE TYPE (AIR OR HYDRAULIC) . . . . . . ______________

L. NUMBER OF EXHAUST PIPES . . . . ______________

M. APPROXIMATE HEIGHT OF EXHAUST PIPE OPENING(S) ABOVE GROUND . . . . ______________

N. BASE OF OPERATION (CITY, COUNTY) . . . . ______________

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[1] INDICATE TRUCK-TRACTOR AND TRAILER SEPARATELY IF APPROPRIATE

[2] IF TRUCK-TRACTOR COMBINATION, INCLUDE TRAILER

[3] IF DIFFERENT SIZES USED, SPECIFY LOCATION

FORM 060191/76/1

Figure 1. Heavy Duty Vehicle Survey Data

HEAVY DUTY VEHICLE DRIVING SURVEY DATA (CONTINUED)

3 POWER UNIT DESCRIPTION

A. MANUFACTURER . . . . ____________

B. MODEL OF ENGINE . . . . ____________

C. SERIAL NUMBER . . . . ____________

D. FUEL TYPE . . . . ____________

E. RATED HORSEPOWER AND RPM . . . . ____________

F. NUMBER OF CYLINDERS . . . . ____________

G. ACCUMULATED ENGINE HOURS/MILEAGE . . . ____________

H. EMISSION CONTROL DEVICES . . . . ____________

I. TURBOCHARGED, SUPERCHARGED OR NATURAL ASPIRATION . . . . ____________

4 HISTORICAL INFORMATION

A. MAJOR USE (CATEGORIES) . . . . ____________

B. PRINCIPAL PRODUCTS CARRIED . . . . ____________

C. AREA OF OPERATION . . . . ____________

D. AVERAGE MILEAGE PER YEAR . . . . ____________

E. TOTAL ACCUMULATED MILEAGE . . . . ____________

F. RANGE WITHOUT REFUELING . . . . ____________

G. FUEL CONSUMPTION (ANNUAL, MONTHLY, DAILY) . . . . ____________

H. MILEAGE DISTRIBUTION(%)
   LOCAL . . . . ____________
   LONG-HAUL . . . . ____________

I. FREQUENCY OF NORMAL TIRE REPLACEMENT . ____________

J. FOR GASOLINE POWERED
   FREQUENCY OF TUNEUP . . . . ____________
   MILEAGE SINCE LAST TUNEUP . . . . ____________

K. FOR DIESEL POWERED
   FREQUENCY OF MINOR MAINTENANCE . . . ____________
   MILEAGE SINCE LAST MINOR MAINTENANCE

L. IS A MAINTENANCE LOG AVAILABLE? . . . . ____________

M. WHO PERFORMS MAINTENANCE? (DEALER, INDEPENDENT GARAGE) . . . . ____________

FORM 060191/76/2

Figure 1. Heavy Duty Vehicle Survey Data (Cont'd)

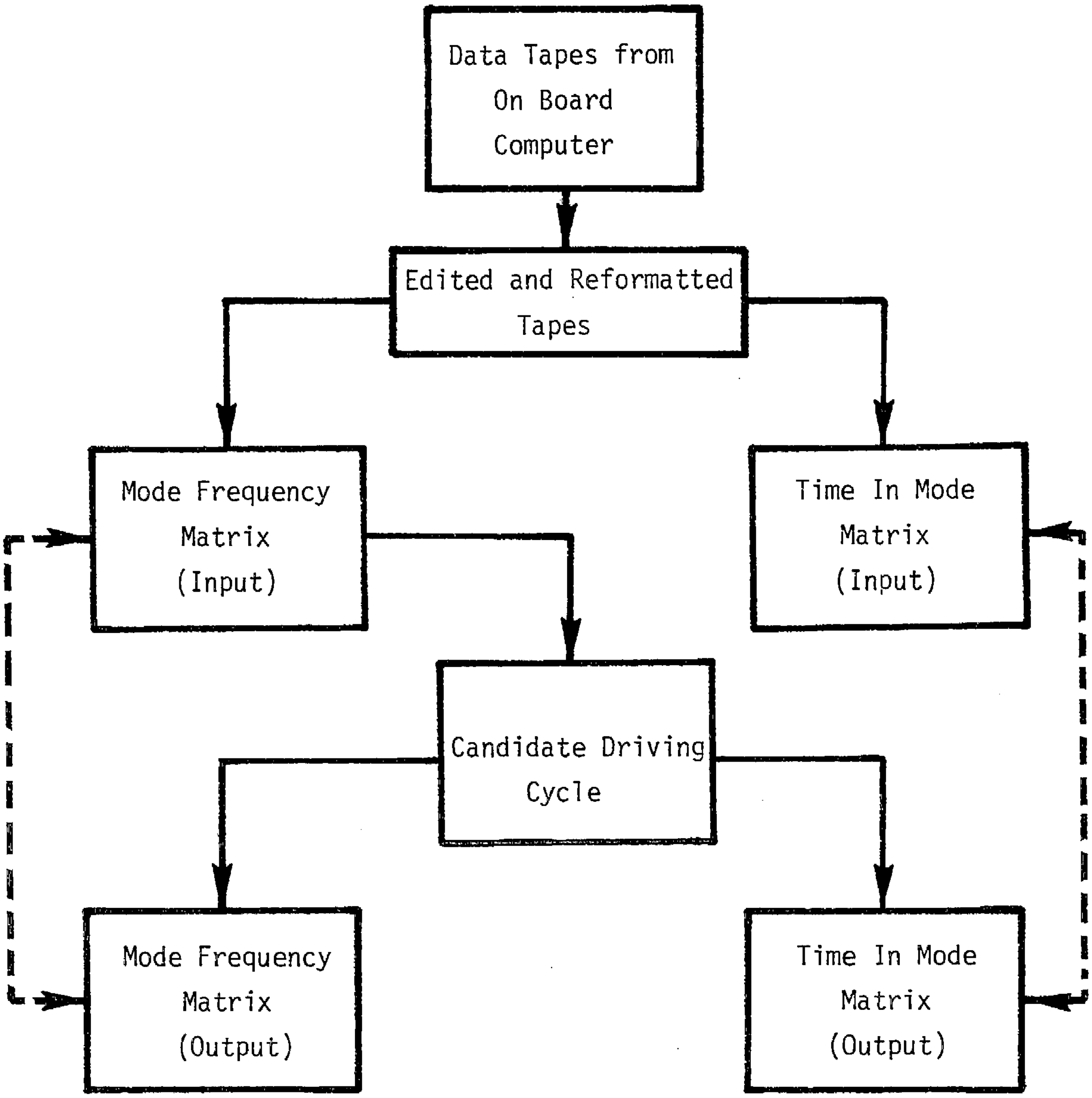

Figure 2. Driving Data Reduction Procedures

by the computer used to process the data. The second-by-second data were converted to a separate Normalized Mode Frequency Matrix-Input for each body type (Figure 3). The matrix shows the frequency (in terms of percent) with which constant speed modes and accelerations or decelerations between two (2) speeds occurred in the vehicle being followed. A Normalized Time in Mode Matrix-Input was also generated (Figure 4). This matrix shows the fraction of time spent in each accelerating, decelerating or constant speed mode. The transition speeds are listed in 5 mph increments for both matrices. Separate matrices were generated for each body type for freeway and non-freeway operation.

Driving cycles were generated by randomly sampling the Mode Frequency Matrix-Input. The cycles so generated, called random cycles, were reprocessed in the same manner as the original data tapes. The resulting matrices, the Mode Frequency Matrix and the Time in Mode Matrix were compared with the original matrices (see Figure 2). Those cycles whose matrices were similar enough to the originals were designated representative driving cycles. Figures 5 through 8 present an example of a random driving cycle, Mode Frequency Matrix, Time in Mode Matrix, and the Matrix Comparisons, respectively.

The procedures used by Olson are described in detail in a previous report [7].

The matrices and driving cycles for each body type were compared to those representing the other body types. These comparisons indicated that the differences were small and random. That is, the driving patterns did not vary consistently with body type. Furthermore, driving data were calculated in two seasons (winter and spring); there was no substantial difference between the driving patterns for the two seasons.

The HDV driving data were then compared to the LDV data gathered in a previous study [2]. Again the differences were small and random. It was concluded, therefore, that traffic conditions (in an urban area) determine driving patterns to a larger degree than vehicle type. Apparently this is so because in moderate to heavy traffic conditions, which exist most of the time in the Basin, no vehicle can drive very much differently than other traffic. In such conditions a fast LDV is frequently forced to follow a slower HDV. The result is both vehicles exhibit similar driving characteristics. In some areas, such as steep hills, there are obviously differences; however, there are few such areas in the Basin.

Some additional traffic data are available from other studies [8], [9]. These data were examined and they tend to support the same conclusion.

On multi-lane highways with low traffic density, vehicle performance and driver characteristics may predominate. However, such areas tend to be open highway where most driving is steady state or nearly so. Only a small fraction of the VMT in the Basin occur under such conditions.

NORMALIZED MODE FREQUENCY (PERCENT) --- INPUT
PICK UP - SPRING NON-FREEWAY

	0	5	10	15	20	25	30	35	40	45	50	55	60
0	8.37	3.22	1.67	1.34	0.65	0.83	0.91	0.40	0.14	0.0	0.0	0.0	0.0
5	2.68	6.41	0.80	1.23	0.65	0.91	0.76	0.43	0.11	0.04	0.0	0.0	0.0
10	1.05	1.20	4.82	0.51	0.94	0.98	0.29	0.11	0.04	0.0	0.0	0.0	0.0
15	0.91	0.80	0.76	4.89	1.01	0.98	0.69	0.33	0.11	0.0	0.04	0.0	0.0
20	0.80	0.91	0.54	0.94	4.31	1.20	0.25	0.07	0.07	0.04	0.0	0.0	0.0
25	1.16	0.80	0.51	0.58	1.01	5.58	1.56	0.36	0.14	0.0	0.0	0.0	0.0
30	0.98	0.58	0.33	0.18	0.40	1.01	5.80	1.63	0.22	0.04	0.0	0.0	0.0
35	0.54	0.25	0.25	0.40	0.04	0.22	0.87	4.49	1.45	0.25	0.0	0.0	0.0
40	0.40	0.18	0.11	0.29	0.04	0.07	0.18	0.54	2.64	0.36	0.04	0.0	0.0
45	0.25	0.11	0.07	0.14	0.07	0.04	0.07	0.14	0.25	1.09	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.11	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 3. Sample Mode Frequency Matrix-Input

NORMALIZED TIME IN MODE (PERCENT) --- INPUT
PICK UP - SPRING NON-FREEWAY

	0	5	10	15	20	25	30	35	40	45	50	55	60
0	17.02	1.55	1.23	1.26	0.78	1.40	1.76	0.97	0.39	0.0	0.0	0.0	0.0
5	1.29	3.63	0.46	0.92	0.67	1.14	1.17	0.74	0.25	0.14	0.0	0.0	0.0
10	0.89	0.66	4.41	0.27	0.75	0.97	0.40	0.16	0.09	0.0	0.0	0.0	0.0
15	0.91	0.63	0.41	2.52	0.61	0.87	0.75	0.44	0.23	0.0	0.08	0.0	0.0
20	0.93	0.86	0.40	0.49	3.90	0.73	0.20	0.10	0.12	0.07	0.0	0.0	0.0
25	1.51	0.94	0.47	0.47	0.52	4.29	0.66	0.31	0.21	0.0	0.0	0.0	0.0
30	1.57	0.79	0.38	0.19	0.33	0.41	6.79	1.00	0.24	0.08	0.0	0.0	0.0
35	0.88	0.36	0.33	0.51	0.04	0.19	0.46	4.67	0.95	0.32	0.0	0.0	0.0
40	0.84	0.33	0.15	0.42	0.03	0.07	0.17	0.31	3.39	0.25	0.07	0.0	0.0
45	0.69	0.22	0.14	0.24	0.12	0.04	0.10	0.12	0.17	1.38	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.07	0.18	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 4. Sample Time In Mode Matrix - Input

MODE	INITIAL SPEED	FINAL SPEED	MODE TIME	MODE DISTANCE	TOTAL TIME	TOTAL DISTANCE	AVG. RATE (MPH/SEC)	CURVE TYPE
1	0	0	13.58	0.0	13.58	0.0	0.0	0
2	0	15	7.40	0.018	20.98	0.018	2.03	1
3	15	15	4.30	0.018	25.28	0.036	0.0	0
4	15	5	4.15	0.012	29.43	0.048	-2.41	4
5	5	5	2.83	0.004	32.26	0.052	0.0	0
6	5	40	17.08	0.109	49.34	0.161	2.05	2
7	40	40	10.70	0.119	60.04	0.280	0.0	0
8	40	45	6.39	0.076	66.43	0.355	0.78	2
9	45	45	16.29	0.204	82.73	0.559	0.0	0
10	45	0	16.15	0.116	98.87	0.675	-2.79	4
11	0	0	13.58	0.0	112.46	0.675	0.0	0
12	0	15	7.40	0.018	119.86	0.693	2.03	1
13	15	15	3.15	0.013	123.01	0.706	0.0	0
14	15	35	12.39	0.087	135.40	0.793	1.61	2
15	35	35	7.52	0.073	142.92	0.866	0.0	0
16	35	0	13.18	0.074	156.10	0.940	-2.66	4
17	0	0	11.00	0.0	167.10	0.940	0.0	0
18	0	30	10.63	0.052	177.73	0.992	2.82	1
19	30	30	8.47	0.071	186.20	1.062	0.0	0
20	30	5	6.07	0.033	192.27	1.095	-4.12	4
21	5	5	4.09	0.006	196.37	1.101	0.0	0
22	5	0	1.44	0.001	197.81	1.102	-3.47	4
23	0	0	11.00	0.0	208.81	1.102	0.0	0
24	0	30	21.25	0.103	230.07	1.205	1.41	1
25	30	30	9.78	0.082	239.85	1.287	0.0	0
26	30	20	3.65	0.026	243.50	1.313	-2.74	4
27	20	20	9.56	0.053	253.07	1.366	0.0	0
28	20	15	4.22	0.021	257.29	1.387	-1.18	4
29	15	15	3.72	0.016	261.01	1.403	0.0	0
30	15	25	5.39	0.030	266.40	1.433	1.85	2
31	25	25	2.99	0.021	269.39	1.453	0.0	0
32	25	30	3.57	0.027	272.97	1.481	1.40	2
33	30	30	4.56	0.038	277.53	1.519	0.0	0
34	30	5	8.07	0.043	285.60	1.562	-3.10	4
35	5	5	3.47	0.005	289.06	1.567	0.0	0
36	5	25	9.16	0.039	298.22	1.606	2.18	2
37	25	25	8.12	0.056	306.34	1.662	0.0	0
38	25	0	10.60	0.042	316.94	1.705	-2.36	4
39	0	0	16.17	0.0	333.10	1.705	0.0	0
40	0	5	4.07	0.003	337.17	1.708	1.23	1

Figure 5. Sample Random Driving Cycle

MODE	INITIAL SPEED	FINAL SPEED	MODE TIME	MODE DISTANCE	TOTAL TIME	TOTAL DISTANCE	AVG. RATE (MPH/SEC)	CURVE TYPE
41	5	5	4.72	0.007	341.89	1.714	0.0	0
42	5	20	6.83	0.024	348.73	1.738	2.20	2
43	20	20	7.55	0.042	356.28	1.780	0.0	0
44	20	15	4.22	0.021	360.50	1.801	-1.18	4
45	15	15	1.43	0.006	361.93	1.807	0.0	0
46	15	10	5.57	0.020	367.51	1.827	-0.90	4
47	10	10	6.61	0.018	374.12	1.846	0.0	0
48	10	5	3.70	0.008	377.81	1.854	-1.35	4
49	5	5	0.94	0.001	378.76	1.855	0.0	0
50	5	25	7.64	0.032	386.40	1.887	2.62	2
51	25	25	4.70	0.033	391.11	1.920	0.0	0
52	25	0	10.60	0.042	401.70	1.962	-2.36	4
53	0	0	13.58	0.0	415.29	1.962	0.0	0
54	0	5	2.91	0.002	418.20	1.965	1.72	1
55	5	5	4.09	0.006	422.30	1.970	0.0	0
56	5	30	10.29	0.051	432.58	2.021	2.43	2
57	30	30	8.47	0.071	441.06	2.092	0.0	0
58	30	5	13.05	0.070	454.11	2.162	-1.92	4
59	5	5	1.58	0.002	455.68	2.164	0.0	0
60	5	40	15.67	0.100	471.35	2.264	2.23	2
61	40	40	7.85	0.067	479.20	2.351	0.0	0
62	40	45	5.55	0.066	484.75	2.417	0.90	2
63	45	45	9.21	0.115	493.95	2.532	0.0	0
64	45	30	4.05	0.043	498.00	2.575	-3.70	4
65	30	30	8.47	0.071	506.47	2.646	0.0	0
66	30	10	12.13	0.072	518.61	2.718	-1.65	4
67	10	10	7.63	0.021	526.24	2.740	0.0	0
68	10	20	5.35	0.022	531.59	2.762	1.87	2
69	20	20	5.54	0.031	537.13	2.793	0.0	0
70	20	25	4.09	0.026	541.22	2.819	1.22	2
71	25	25	2.99	0.021	544.21	2.839	0.0	0
72	25	30	2.81	0.022	547.02	2.861	1.78	2
73	30	30	7.18	0.060	554.20	2.921	0.0	0
74	30	15	7.77	0.051	561.97	2.972	-1.93	4
75	15	15	2.58	0.011	564.54	2.982	0.0	0
76	15	25	4.86	0.027	569.40	3.010	2.06	2
77	25	25	7.27	0.050	576.67	3.060	0.0	0
78	25	0	12.51	0.050	589.18	3.110	-2.00	4
79	0	0	13.58	0.0	602.77	3.110	0.0	0
80	0	5	2.63	0.002	605.39	3.112	1.90	1

Figure 5. Sample Random Driving Cycle (Continued)

MODE	INITIAL SPEED	FINAL SPEED	MODE TIME	MODE DISTANCE	TOTAL TIME	TOTAL DISTANCE	AVG. RATE (MPH/SEC)	CURVE TYPE
81	5	5	4.09	0.006	609.48	3.118	0.0	0
82	5	30	14.91	0.074	624.40	3.192	1.68	2
83	30	30	11.09	0.092	635.49	3.284	0.0	0
84	30	35	5.22	0.047	640.71	3.331	0.96	2
85	35	35	7.52	0.073	648.23	3.404	0.0	0
86	35	30	3.50	0.032	651.73	3.436	-1.43	4
87	30	30	4.56	0.038	656.29	3.474	0.0	0
88	30	10	9.49	0.057	665.78	3.531	-2.11	4
89	10	10	9.66	0.027	675.44	3.558	0.0	0
90	10	20	6.79	0.029	682.23	3.586	1.47	2
91	20	20	3.52	0.020	685.75	3.606	0.0	0
92	20	0	7.82	0.025	693.57	3.631	-2.56	4
93	0	0	16.17	0.0	709.74	3.631	0.0	0
94	0	5	3.78	0.003	713.52	3.634	1.32	1
95	5	5	5.98	0.008	719.50	3.642	0.0	0
96	5	0	3.20	0.003	722.70	3.645	-1.56	4
97	0	0	16.17	0.0	738.87	3.645	0.0	0
98	0	10	5.36	0.009	744.22	3.653	1.87	1
99	10	10	7.63	0.021	751.85	3.675	0.0	0
100	10	20	4.38	0.018	756.24	3.693	2.28	2
101	20	20	2.52	0.014	758.76	3.707	0.0	0
102	20	0	6.96	0.022	765.71	3.729	-2.87	4
103	0	0	16.17	0.0	781.88	3.729	0.0	0
104	0	5	3.78	0.003	785.66	3.732	1.32	1
105	5	5	2.20	0.003	787.86	3.735	0.0	0
106	5	20	8.06	0.028	795.93	3.764	1.86	2
107	20	20	5.54	0.031	801.47	3.795	0.0	0
108	20	15	3.46	0.017	804.93	3.812	-1.44	4
109	15	15	2.58	0.011	807.50	3.823	0.0	0
110	15	5	5.90	0.018	813.41	3.840	-1.69	4
111	5	5	4.09	0.006	817.50	3.846	0.0	0
112	5	10	3.47	0.007	820.98	3.853	1.44	2
113	10	10	6.61	0.018	827.59	3.872	0.0	0
114	10	5	3.29	0.007	830.88	3.879	-1.52	4
115	5	5	7.25	0.010	838.12	3.889	0.0	0
116	5	25	9.16	0.039	847.28	3.928	2.18	2
117	25	25	4.70	0.033	851.98	3.960	0.0	0
118	25	15	6.04	0.035	858.02	3.995	-1.66	4
119	15	15	4.87	0.020	862.89	4.015	0.0	0
120	15	5	4.15	0.012	867.04	4.028	-2.41	4

Figure 5. Sample Random Driving Cycle (Continued)

MODE	INITIAL SPEED	FINAL SPEED	MODE TIME	MODE DISTANCE	TOTAL TIME	TOTAL DISTANCE	AVG. RATE (MPH/SEC)	CURVE TYPE
121	5	5	4.09	0.006	871.13	4.033	0.0	0
122	5	0	2.85	0.002	873.98	4.036	-1.75	4
123	0	0	13.58	0.0	887.56	4.036	0.0	0
124	0	5	3.20	0.003	890.77	4.038	1.56	1
125	5	5	2.83	0.004	893.60	4.042	0.0	0
126	5	0	3.55	0.003	897.16	4.045	-1.41	4
127	0	0	18.61	0.0	915.77	4.045	0.0	0
128	0	15	5.14	0.013	920.91	4.057	2.92	1
129	15	15	2.58	0.011	923.49	4.068	0.0	0
130	15	0	7.46	0.018	930.94	4.086	-2.01	4
131	0	0	13.58	0.0	944.53	4.086	0.0	0
132	0	5	4.36	0.004	948.88	4.090	1.15	1
133	5	5	2.83	0.004	951.72	4.094	0.0	0
134	5	20	6.83	0.024	958.55	4.118	2.20	2
135	20	20	6.54	0.036	965.10	4.154	0.0	0
136	20	5	4.96	0.019	970.06	4.173	-3.02	4
137	5	5	2.83	0.004	972.89	4.177	0.0	0
138	5	30	10.29	0.051	983.18	4.228	2.43	2
139	30	30	12.39	0.103	995.56	4.331	0.0	0
140	30	25	3.01	0.023	998.58	4.354	-1.66	4
141	25	25	3.85	0.027	1002.42	4.381	0.0	0
142	25	30	3.32	0.025	1005.74	4.406	1.51	2
143	30	30	12.39	0.103	1018.13	4.509	0.0	0
144	30	35	5.59	0.051	1023.72	4.560	0.89	2
145	35	35	7.52	0.073	1031.24	4.633	0.0	0
146	35	40	4.77	0.050	1036.01	4.683	1.05	2
147	40	40	10.70	0.119	1046.71	4.802	0.0	0
148	40	15	8.57	0.070	1055.28	4.872	-2.92	4
149	15	15	3.72	0.016	1059.00	4.887	0.0	0
150	15	25	5.93	0.033	1064.93	4.920	1.69	2
151	25	25	5.56	0.039	1070.48	4.959	0.0	0
152	25	30	3.32	0.025	1073.80	4.984	1.51	2
153	30	30	1.96	0.016	1075.76	5.001	0.0	0
154	30	35	3.74	0.034	1079.50	5.034	1.34	2
155	35	35	8.68	0.084	1088.18	5.119	0.0	0
156	35	40	4.77	0.050	1092.95	5.169	1.05	2
157	40	40	9.27	0.103	1102.22	5.272	0.0	0
158	40	35	3.44	0.036	1105.66	5.308	-1.45	4
159	35	35	9.84	0.096	1115.50	5.403	0.0	0
160	35	30	3.50	0.032	1119.00	5.435	-1.43	4

Figure 5. Sample Random Driving Cycle (Continued)

MODE	INITIAL SPEED	FINAL SPEED	MODE TIME	MODE DISTANCE	TOTAL TIME	TOTAL DISTANCE	AVG. RATE (MPH/SEC)	CURVE TYPE
161	30	30	13.69	0.114	1132.69	5.550	0.0	0
162	30	35	3.37	0.030	1136.06	5.580	1.48	2
163	35	35	8.68	0.084	1144.74	5.664	0.0	0
164	35	15	13.33	0.098	1158.07	5.763	-1.50	4
165	15	15	6.01	0.025	1164.09	5.788	0.0	0
166	15	5	4.73	0.014	1168.82	5.802	-2.11	4
167	5	5	3.47	0.005	1172.29	5.807	0.0	0
168	5	0	2.50	0.002	1174.78	5.809	-2.00	4
169	0	0	18.61	0.0	1193.40	5.809	0.0	0
170	0	20	8.72	0.028	1202.12	5.837	2.29	1
171	20	20	6.04	0.034	1208.16	5.870	0.0	0
172	20	0	7.82	0.025	1215.98	5.895	-2.56	4
173	0	0	13.58	0.0	1229.56	5.895	0.0	0

Figure 5. Sample Random Driving Cycle (Continued)

NORMALIZED MODE FREQUENCY (PERCENT) --- CYCLE 2111656277

	0	5	10	15	20	25	30	35	40	45	50	55	60
0	8.67	4.05	0.58	1.73	0.58	0.0	1.16	0.0	0.0	0.0	0.0	0.0	0.0
5	2.89	9.83	0.58	0.0	1.73	1.73	1.73	0.0	1.16	0.0	0.0	0.0	0.0
10	0.0	1.16	2.89	0.0	1.73	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.58	2.31	0.58	5.78	0.0	1.73	0.0	0.58	0.0	0.0	0.0	0.0	0.0
20	1.73	0.58	0.0	1.73	4.62	0.58	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	1.73	0.0	0.0	0.58	0.0	4.62	2.31	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	1.73	1.16	0.58	0.58	0.58	6.94	2.31	0.0	0.0	0.0	0.0	0.0
35	0.58	0.0	0.0	0.58	0.0	0.0	1.16	3.47	1.16	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.58	0.0	0.0	0.0	0.58	2.31	1.16	0.0	0.0	0.0
45	0.58	0.0	0.0	0.0	0.0	0.0	0.58	0.0	0.0	1.16	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 6. Sample Mode Frequency Matrix - Output

NORMALIZED TIME IN MODE (PERCENT) --- CYCLE 2111656277

	0	5	10	15	20	25	30	35	40	45	50	55	60
0	17.81	2.01	0.44	1.62	0.71	0.0	2.59	0.0	0.0	0.0	0.0	0.0	0.0
5	1.10	4.99	0.28	0.0	1.77	2.11	2.89	0.0	2.66	0.0	0.0	0.0	0.0
10	0.0	0.57	3.10	0.0	1.34	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
15	0.61	1.54	0.45	2.84	0.0	1.32	0.0	1.01	0.0	0.0	0.0	0.0	0.0
20	1.84	0.40	0.0	0.97	3.81	0.33	0.0	0.0	0.0	0.0	0.0	0.0	0.0
25	2.74	0.0	0.0	0.49	0.0	3.27	1.06	0.0	0.0	0.0	0.0	0.0	0.0
30	0.0	2.21	1.76	0.63	0.30	0.25	8.38	1.46	0.0	0.0	0.0	0.0	0.0
35	1.07	0.0	0.0	1.08	0.0	0.0	0.57	4.05	0.78	0.0	0.0	0.0	0.0
40	0.0	0.0	0.0	0.70	0.0	0.0	0.0	0.28	3.13	0.97	0.0	0.0	0.0
45	1.31	0.0	0.0	0.0	0.0	0.0	0.33	0.0	0.0	2.07	0.0	0.0	0.0
50	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
60	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Figure 7. Sample Time In Mode Matrix - Output

THE STATISTICS FOR CYCLE 2111656277 ARE AS FOLLOWS:

-----KOLMOGOROV-SMIRNOV DIFFERENCES-----

MODE FREQUENCY MATRIX:

	DIFFERENCE	SL
MATRIX:	0.0538	0.200
CRUISE:	0.0631	0.200
ACCEL:	0.0564	0.200
DECEL:	0.0683	0.200

TIME IN MODE MATRIX:

	DIFFERENCE	SL
MATRIX:	0.0262	0.200
CRUISE:	0.0308	0.200
ACCEL:	0.0632	0.150
DECEL:	0.0733	0.100

-----SUMMARY PERCENTAGE MEASURES-----

MODE FREQUENCY MATRIX:

	INPUT	CYCLE
IDLE:	8.37	8.67
CRUISE:	40.13 *	41.62 *
ACCEL:	27.78	26.59
DECEL:	23.72	23.12

TIME IN MODE MATRIX:

	INPUT	CYCLE
IDLE:	17.02	17.81
CRUISE:	35.16 *	35.65 *
ACCEL:	25.76	25.34
DECEL:	22.06	21.20

AVERAGE SPEED FOR INPUT MATRIX:	17.24 MPH
AVERAGE SPEED FOR CYCLE:	17.26 MPH
CYCLE DISTANCE:	5.90 MILES
NUMBER OF STOPS PER MILE:	2.37
FIGURE OF MERIT:	1.31

* THE IDLE PERCENTAGE IS HERE NOT INCLUDED IN THE CRUISE PERCENTAGE.

Figure 8. Sample Driving Cycle Comparison Statistics

The data collected during this phase of the program were used to specify a dynamometer test sequence to be used for collecting modal HDV emissions data. This sequence, shown in Table 1, contains those driving modes that were observed. (The sequence was modified by the ARB to improve dynamometer driveability [10]. The modified sequence is shown in Table 2.) The sequence is not a representative driving cycle. A representative cycle, similar to the Federal Test Procedure, attempts to simulate the emissions of in-use vehicles by assuming that the total emissions during the cycle (on a grams-per-mile basis) are representative of the emissions of such vehicles. This sequence is for obtaining modal emissions data only.

Table 1. HDV Modal Emissions Driving Sequence

Mode No.*	Speed Range (mph)	Time in Mode (sec)	Distance in Mode (miles)
1	0-30	18	0.0592
2	30-0	16	0.0741
3	0-0	15	0
4	0-15	8	0.0201
5	15-30	11	0.0705
6	30-45	13	0.1360
7	45-45	20	0.2500
8	45-30	12	0.1268
9	30-60	25	0.3134
10	60-45	12	0.1716
11	45-60	14	0.2043
12	60-60	12	0.2000
13	60-15	30	0.3367
14	15-60	26	0.3136
15	60-0	35	0.3293
16	0-0	9	0
17	0-60	38	0.4009
18	60-30	23	0.2994
19	30-30	30	0.2500
20	30-15	9	0.0579
21	15-0	8	0.0173
22	0-45	22	0.1759
23	45-15	16	0.1392
24	15-45	18	0.1528
25	45-0	19	0.1304

*The ARB modified this sequence to include several steady state modes to make the sequence easier to drive on a dynamometer (see Table 2).

Table 2. Modified Driving Sequence

Mode No.	Speed Range (mph)	Time in Mode (Sec)
1	0-30	18
1A	30-30	20
2	30-0	16
3	0-0	15
4	0-15	8
5	15-30	11
6	30-45	13
7	45-45	20
8	45-30	12
8A	30-30	20
9	30-60	15
9A	60-60	20
10	60-45	12
10A	45-45	20
11	45-60	14
12	60-60	12
13	60-15	30
13A	15-15	20
14	15-60	26
14A	60-60	20
15	60-0	35
16	0-0	9
17	0-60	38
17A	60-60	20
18	60-30	23
19	30-30	30
20	30-15	9
21	15-0	8
21A	0-0	20
22	0-45	22
22A	45-45	20
23	45-15	16
23A	15-15	20
24	15-45	18
24A	45-45	20
25	45-0	19

SECTION 4

CHARACTERIZATION OF VEHICLE POPULATION

Heavy-duty vehicles (HDVs) were characterized on the basis of model year, body type, weight class, fuel type and emission standards. Since the data to adequately characterize the HDV population in terms of these categories do not exist, estimating procedures were developed. This section describes those procedures and discusses their advantages and weaknesses.

Heavy-duty vehicles represent a more diverse group of emission sources than do light-duty vehicles. For example, 80,000 pound GVW tractor trailer combinations and 3/4 ton recreational vans have both been categorized as heavy-duty vehicles (using the 6000 pound GVW criteria). The emissions characteristics of these two types of vehicles are substantially different. Recognizing this, such vehicles are now classified by the Air Resources Board (ARB) as either medium-duty vehicles (6001 pounds to 8500 pounds GVW) or heavy-duty vehicles (8501 pounds GVW and greater).

For these reasons, twenty (20) categories of vehicles, which account for almost all HDVs in the South Coast Air Basin (SCAB), were defined (see Table 3). Since individual emission factors for these vehicle categories do not now exist, they were defined in anticipation of such data becoming available.

Although several data sources contain information relating to heavy-duty vehicle population, none contained sufficiently detailed information to adequately characterize the HDV population. Therefore, the registration records of the Department of Motor Vehicles (DMV) were examined. A special report from the Department of Motor Vehicles' "regular commercial" registration files was assembled for TRW by a division of the Reuben Donnelley Corporation [11]. The computer generated report, a sample of which is shown in Figure 9, contained registration data by body type, model year, fuel, weight class and county of registration.

The data are presented in the following manner:

- Eight (8) body types: pick-up, tractor, bus, dump, flat bed, tank, sedan delivery (panel truck), and van*;
- Three (3) weight classes: 0 to 6000 pounds GVW, 6001 to 10,000 pounds GVW, and greater than 10,000 pounds GVW;
- Model years: pre-1970 and 1970 through 1976 by model year;

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*The DMV "Gross Report" indicates that these eight (8) body types constitute more than 97% of all registered commercial vehicles in the state [12].

Table 3. Heavy-Duty Vehicle Body Types, Weight Categories, and Fuel Type

Body Type	Fuel Type	Weight Category	GVW Range, lbs
Pickup	Gasoline	Medium-Duty Gas	6001 - 8500
Pickup	Gasoline	Heavy-Duty Gas	8501 -10,000
Tractor	Gasoline	Heavy-Duty Gas	10,000+
Tractor	Diesel	Heavy-Duty Diesel	10,000+
Bus	Gasoline	Heavy-Duty Gasoline	10,000+
Bus	Diesel	Heavy-Duty Diesel	10,000+
Dump	Gasoline	Heavy-Duty Gas	10,000+
Dump	Diesel	Heavy-Duty Diesel	10,000+
Flatbed	Gasoline	Medium-Duty Gas	6001 - 8500
Flatbed	Gasoline	Heavy-Duty Gas	8501 -10,000
Flatbed	Gasoline	Heavy-Duty Gas	10,000+
Flatbed	Diesel	Heavy-Duty Diesel	10,000+
Tanker	Gasoline	Heavy-Duty Gas	10,000+
Tanker	Diesel	Heavy-Duty Diesel	10,000+
Van	Gasoline	Medium-Duty Gas	6001 - 8500
Van	Gasoline	Heavy-Duty Gas	8501 -10,000
Van	Gasoline	Heavy-Duty Gas	10,000+
Van	Diesel	Heavy-Duty Diesel	10,000+
Tractor (non-Calif.)	Gasoline	Heavy-Duty Gas	10,000+
Tractor (non-Calif.)	Diesel	Heavy-Duty Diesel	10,000+

TRW TRUCK REGISTRATION
DATE 07/01/77

LOS ANGELES COUNTY

BODY TYPE	FUEL	YEAR	GVW 0-6000	GVW 6001-10,000	GVW OVER 10,000
PICKUP	GAS	PRE 1970	27889	28744	43
		1970	7482	10555	13
		1971	5728	10008	8
		1972	7228	13583	2
		1973	7795	15289	1
		1974	7251	6571	
		1975	4894	8055	
		1976	1480	3096	
	DIESEL	PRE 1970	6	4	
		1970	4	4	
		1971	4	1	
		1972	1	5	
		1973	2	2	
		1974	3	3	
		1975		4	
		1976		1	
TRACTOR	GAS	PRE 1970		17	1237
		1970		9	469
		1971			295
		1972		3	454
		1973		6	428
		1974		7	277
		1975		11	195
		1976		10	26
	DIESEL	PRE 1970		1	3824
		1970			1104
		1971			1225
		1972			1372
		1973			1668
		1974			1882
		1975			1124
		1976			221
	UKNOWN	PRE 1970			9
		1970			2
		1971			4
		1972			48
		1973			20
		1974			17
		1975			34
BUS	GAS	PRE 1970		6	291
		1970		2	109
		1971		13	67
		1972		2	102
		1973		3	26
		1974			21
		1975			77
		1976			3
	DIESEL	PRE 1970			15

Figure 9. Sample of the Donnelley Registration Data Report

- Fuels: gasoline (gas), diesel, and unknown (predominantly propane and liquified natural gas);

- Counties: Los Angeles, Orange, Riverside and San Bernardino (entire county, not just SCAB portion).

The weight classes are gross vehicle weight (GVW), not unladen weight as in the Gross Report. The Donnelley report represents vehicle registrations as of February 1, 1976.

The registration file from which the report was compiled consists of "regular commercial" vehicles only. There are two other categories of vehicles that were not counted: Board of Equalization (B.E.) commercials and exempt vehicles. B.E. commercials are essentially those vehicles that are rented or leased. Exempt vehicles are those operated by various governmental agencies and are identified by a diamond shaped insignia surrounding an upper case "E".

The number of B.E. commercials was determined by establishing the state-wide ratio of B.E. commercials for a given body type to the regular commercial registrations for that body type. This ratio was multiplied by the number of regular commercial registrations for that body type in each county as shown in the Donnelley Report.

Exempt commercials were estimated in a similar manner. The ratio of exempt vehicles for a given county to regular commercials of all body types for that county was established and multiplied by the registered regular commercials for each body type and weight class.

An additional registration category exists for buses. Buses are sometimes registered as automobiles in spite of the fact that they are over 6000 pounds GVW. The Gross Report was used to determine the statewide ratio between buses registered as automobiles and buses registered as commercial vehicles. This ratio was applied to buses registered as commercials in each county.

The sum of these four (4) categories, regular commercial, Board of Equalization, commercial exempt, and buses as automobiles was multiplied by the fraction of vehicles in each county that are also in SCAB as estimated in the ARB [13]. This procedure yields the number of registered commercials in each county. For purposes of this study only vehicles with GVWs of greater than 6000 pounds were considered.

The following is the mathematical statement of the procedure (for buses an additional term is required):

$$\left[CD_{b,w,c} + \left(\frac{BE_b}{CG_b} \times CD_{b,w,c} \right) + \left(\frac{EC_c}{CDT_c} \times CD_{b,w,c} \right) \right] \times CF_w = RC_{b,w,c}$$

Where:

$CD_{b,w,c}$ = Registered regular commercials (Donnelley Report)
- by body type, b
- by weight class, w
- by county, c

BE_b = Board of Equalization commercials - statewide (DMV Gross Report)
- by body type, b

CG_b = Registered regular commercials - statewide (DMV Gross Report)
- by body type, b

EC_c = Exempt (DMV)
- by county, c

CDT_c = Total regular commercial commercials, all body types (Donnelley Report)
- by county, c

CF_w = Fraction of vehicles in county, c, which are also in the South Coast Air Basin (ARB data)
- by weight class, w

$RC_{b,w,c}$ = Registered commercials
- by body type, b
- by weight class, w
- by county, c

For buses the term $\frac{BA}{CG_b} + CD_{b,w,c}$, where BA is buses registered as autos, was added.

Donnelley was not able to provide 6001 to 8500 GVW and 8501 to 10,000 GVW weight category breakdowns because the necessary data are not encoded in the DMV records. These records show the following weight categories: 0-6000 pounds, 6001 to 10,000 pounds, and several categories greater than 10,000. It was therefore necessary to develop a procedure for estimating the required weight breakdowns.

R. L. Polk and Company has described methods of using DMV records to determine weight class distributions using serial (vehicle identification) numbers and ignition key identification numbers from a random sample of vehicles [14]. The procedures were not used for this study because of the expense and because they are untried.

Methods of estimating GVW from unladen weight have been proposed. Since the unladen weight of each commercial vehicle is contained in the DMV records, it should be possible to establish a maximum load for each body type and unladen weight combination. Such values have been proposed (see Table 4) [15]. Table 4 also shows additional data obtained from the small sample of vehicles used by Olsen. Note that the difference between the estimated and actual loads is large and variable. It was determined that estimating GVW from unladen weight was not feasible.

The necessary breakdown was obtained by combining information from the Donnelley report and data from the ARB [13]. The Donnelley Report has 10,000+ GVW vehicles listed separately. It was used to determine registrations for this category. That is, the fraction of all vehicles 6001 pounds GVW and greater that are 10,000+ GVW was determined to be 31.1%. Similarly, the ARB data shown 6001 to 8500 GVW vehicles as a separate category. These data show that 33.2% of all HDVs are in this weight range. The remainder, 35.7%, were assumed to be 8501 to 10,000 pound GVW vehicles. This procedure is shown schematically in Figure 10.

The vehicles were also distributed by model year. For model years 1970 and later, the Donnelley Report listed registrations by model year. Model years prior to 1970 were lumped together. Data provided by the ARB were used to estimate the distribution of model years 1969 and earlier [13]. Model year distributions for vehicles in the weight classes 6001 to 8500 GVW and 8501 to 10,000 GVW were assumed to be the same because the Donnelley Report showed only combined registration data for these two weight classes.

Estimates of the change in model year distribution with season were made. The distributions were calculated by using the Donnelley registration data and assuming an annual growth rate of 4.43% for 1975 [13].

It was necessary to develop a method for estimating the vehicle miles traveled (VMT) by out-of-state vehicles. It was assumed that all out-of-state vehicles were gasoline and diesel powered tractors and that each VMT by an out-of-state vehicle replaced a VMT by a California registered vehicle. Implicit in this simplifying assumption is the assumption that the buses and other types of vehicles contribute a small fraction of the total VMT. These assumptions introduce small errors. Data from five (5) locations [16] showing the number of heavy-duty vehicles that are registered in other states (see Table 5). An average of the values was used to arrive at the estimate of 11.1% of VMT by tractors as being contributed by out-of-state vehicles.

To allocate emissions from these vehicles, the simplification of showing these vehicles as being registered in SCAB was employed. 11.1% of the California registered tractors were shown as being replaced by an equal number of out-of-state tractors. Average annual mileage and model year distributions were assumed to be the same as California vehicles.

The vehicle population was characterized by:

Table 4. Comparison of Estimated and Actual Loads by Body Type

Body Type		Unladen Weight (lbs)	Load (lbs)	GVW (lbs)	Comments
Pickup	Estimated, [15]	4,500	1,500	6,000	-
		4,800		8,500	-
	Actual	5,800	1,800	7,600	1 vehicle
Tractor	Estimated	2,000*	4,000	6,000	-
		4,000*	4,500	8,500	-
	Actual - gas	23,000	31,000	8,000	1 vehicle
	Actual - diesel	23,000	57,000	80,000	2 vehicles
		23,300	56,700	80,000	1 vehicle
		28,540	51,460	80,000	1 vehicle
		29,810	32,990	62,800	1 vehicle
		30,000	60,000	30,000	1 vehicle
Bus	Estimated	5,000*	1,000	6,000	-
		6,000*	2,500	8,500	-
	Actual - diesel	20,000	15,000	35,000	2 vehicles
Flatbed	Estimated	4,500	1,500	6,000	
		4,700	3,800	8,500	
	Actual - gas	8,900	11,100	20,000	1 vehicle
		12,000	23,000	35,000	1 vehicle
Van	Estimated	4,500	1,500	6,000	-
		4,800	3,700	8,500	-
	Actual - gas	8,900	5,100	14,000	1 vehicle
		11,000	11,000	22,000	1 vehicle

*It is unclear why such low unladen weights were used for these vehicle types.

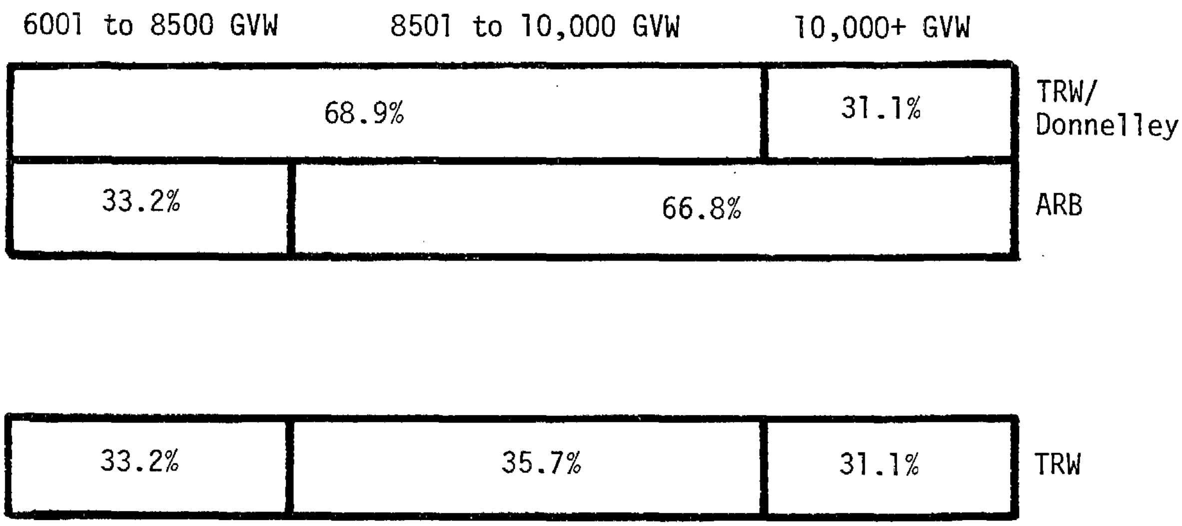


Figure 10. Schematic Representation of the Procedure Used to Estimate Weight Class Breakdowns

Table 5. Out-of-State Heavy-Duty Vehicles, [16]

Location*	% Non-California HDV**
Cajon Pass IS*** 15	19.4
San Gorgonio Pass IS 10	25.7
South Coast IS 15	3.6
Los Angeles Area IS 405	6.4
Los Angeles Industrial Area	9.2
Long Beach Port Area	2.5
Average	11.1%

* State operated truck weight station
**Defined as vehicles whose primary registration is in a state other than California.
***Inter-state Highway

- Body type (20 categories);
- Fuel type (2 types);
- County of primary registration (4 counties) ;
- GVW class (3 categories);
- Fraction of out-of-state vehicles.

As the previous discussion indicates, these distributions are estimates only. They were determined by reasonable methods but may contain substantial inaccuracies. It is difficult to determine accuracy limits on these categorizations. However, the list shown above is in approximately descending order of reliability.

SECTION 5

DISTRIBUTION OF TOTAL VEHICLE MILES TRAVELED

The temporal and geographical distribution of emissions is directly related to the distribution of vehicle miles traveled (VMT). Data were developed to allocate VMT in the following manner:

- County
- Grid square
- Hour of day
- Weekday / weekend
- Season
- Freeway/non-freeway

This section describes the data that are available and how they were used to develop temporally and geographically resolved VMT estimates.

The basis for the VMT distribution is the LARTS (Los Angeles Regional Transportation Study) traffic model. The computerized LARTS model consists of four (4) major components :

- A computerized road network system for the Los Angeles area showing location, lengths, and road type (freeway/non-freeway) for approximately 9600 major roadway links;

- Annual average 24-hour week day traffic volume estimates;

- Average 24-hour weekday VMT estimates for each link - this is determined by multiplying the volume on each link by its length;

- Average link speed for peak and non-peak traffic conditions - actually a so-called "policy speed."

The link traffic volumes which are for total traffic light- and heavy-duty vehicles, are based on 1974 data. 1975 traffic volume estimates were obtained by increasing the volume on each link by 5.5%, the value recommended by CalTrans[12]. Traffic which in reality flows on roads not included in the road network, is assigned to those roadways which are included by the LARTS model.

Each link or portion thereof was assigned to the appropriate 10 km by 10 km UTM grid square <u>and</u> to the appropriate county by TRW. The TRW model allows grid sizes down to 1 km by 1 km to be selected; calculation of emissions to this scale requires enormous amounts of computer time with a very slight corresponding real increase in resolution. That is, the inaccuracies inherent in the model are such that the increased resolution obtained in using a smaller grid size is more apparent than real.

Comparisons were made between LARTS estimated daily traffic and traffic count data [2]. These comparisons showed that on any given link the error in LARTS traffic volume estimate could be very large, as much as 70%. The errors for a group of links close together, however, are random, not systematic, and tend to cancel each other. The overall error in each 10 km grid square tends to be small. The volume inaccuracies set the primary limitation on geographical resolution. These considerations plus those of computer time requirements make 10 km a workable grid size.

To obtain the required degree of temporal resolution it was necessary to disaggregate the 24-hour average weekday VMT obtained from LARTS. Hourly vehicle count data from freeway and surface street locations throughout the basin were obtained for weekdays and weekends for four (4) seasons[2].

The annual average weekday 24-hour traffic volume was determined from these counts (as opposed to using the LARTS volumes). The ratio of each season's volume to the newly calculated annual average was determined. The value so obtained is an estimate of seasonal distribution of total annual VMT for each link. This was done for each traffic count location and the results averaged within each grid square. The average of those grid squares that define a grid square type (which will be described later) were used to determine the final seasonal variation.

For each location and season the ratio of weekend (2-day average) to weekday (5 day average) traffic volumes was calculated. This ratio was used to determine weekend volumes from the seasonally adjusted average weekday volume.

The average weekday and average weekend volumes for each grid square were converted to separate hourly percentages of 24-hour total values and plotted for each grid square for which there was data (see Figures 11 and 12). That is, the fraction of the 24-hour volume that occurred during each hour was plotted versus hour of the day. Separate plots were made for freeways and surface streets.

These hourly volume curves are different from the hourly curves used by LARTS [18]. The LARTS curves represent the hourly distribution of total daily trips-in-motion, whereas the TRW curves represent fraction of total daily volume. The major difference is since a trip-in-motion can last more than one hour, the peak hour portions of the LARTS curve (when traffic moves slower and trips take longer) are higher.

Using the weekday curve as the primary determinant, the plots for each grid square were compared to all others. Those that were similar were grouped together and the average for each hour determined. The normalized hourly averages from the combined curves were considered to be representative of the traffic characteristics in all grid squares comprising the combined average. Each such curve is called a <u>traffic pattern type</u>.

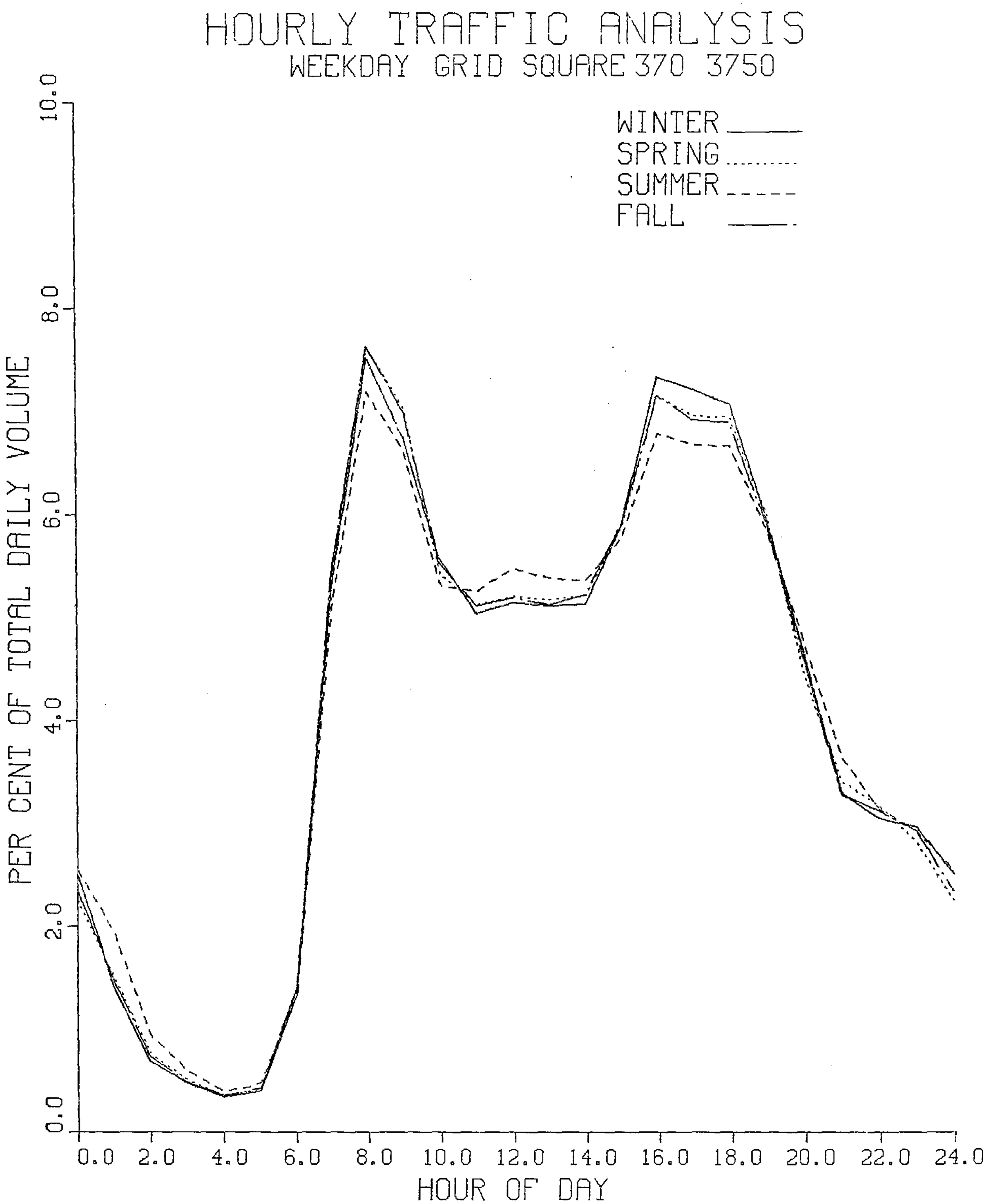


Figure 11. Example of Weekday Freeway Diurnal Traffic Distribution

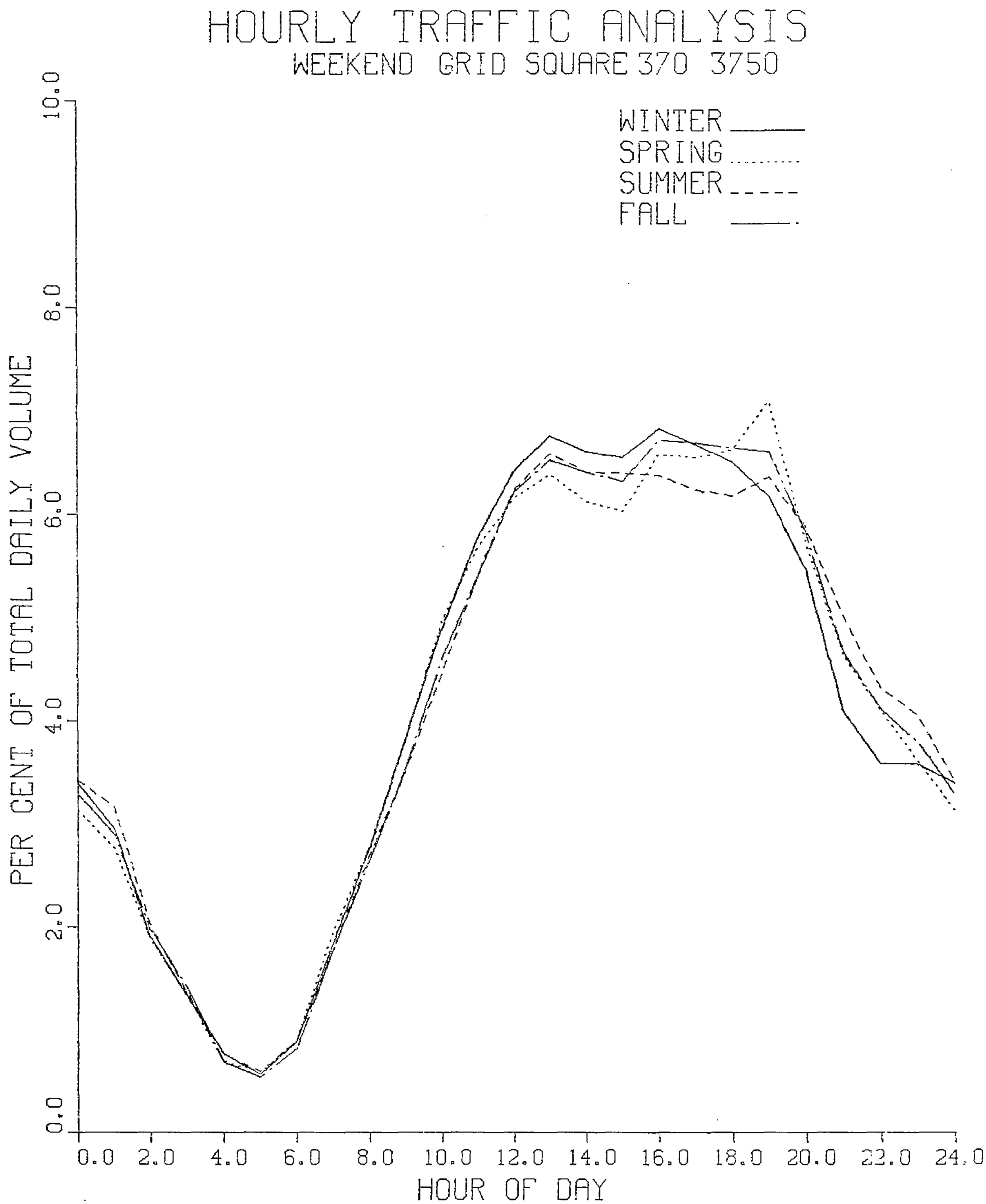


Figure 12. Example of Weekend Freeway Diurnal Traffic Distribution

Five (5) freeway traffic pattern types and two (2) surface street traffic pattern types were determined. It is significant to note that the number of different traffic pattern types was determined solely by the characteristics of the traffic flow. That is, no predetermined number of traffic pattern types was selected. These data naturally fall quite distinctly into five (5) and two (2) patterns, respectively. Also, note the traffic patterns were not obtained from the LARTS model, they are based on actual measurements of traffic flow. Figures 13 through 19 show the hourly distributions and season variations for the seven (7) traffic pattern types. Table 6 shows the characteristics of each traffic pattern type and Figures 20 and 21 are maps of the basin showing the traffic pattern type for each grid square.

The combination of a freeway traffic pattern type and a surface street traffic pattern type forms a grid square type. Figure 22 is a map showing the grid square type for each grid square. This constitutes the final level of temporal resolution. The factors necessary to disaggregate the volume associated with each link were predetermined for each grid square by specifying the grid square type. The TRW emissions model currently calculates 192 hourly traffic estimates which reflect seasonal, day-of-week, and hourly variations in traffic volume (4 seasons, 2 day types, 24 hours).

The temporal disaggregation procedure is described mathematically by the following equation:

$$V_{rsdhg} = (AADT)\ (SF_{rsg})\ (WF_{rdg})\ (HF_{rhg})$$

where

V_{rsdhg} = the traffic volume for
- road type (freeway, non-freeway), r
- season (winter, spring, summer, fall), s
- day (weekend, weekday), d
- hour-of-day (1-24), h
- grid square type (1-5), g

AADT = annual average daily weekday traffic from LARTS model

SF_{rsg} = seasonal factor
- road type, r
- season, s
- grid square type, g

WF_{rdg} = weekday/weekend factor
- road type, r
- day, d
- grid square type, g

HF_{rhg} = hourly factor
- road type, r
- hour-of-day, h
- grid square type, g

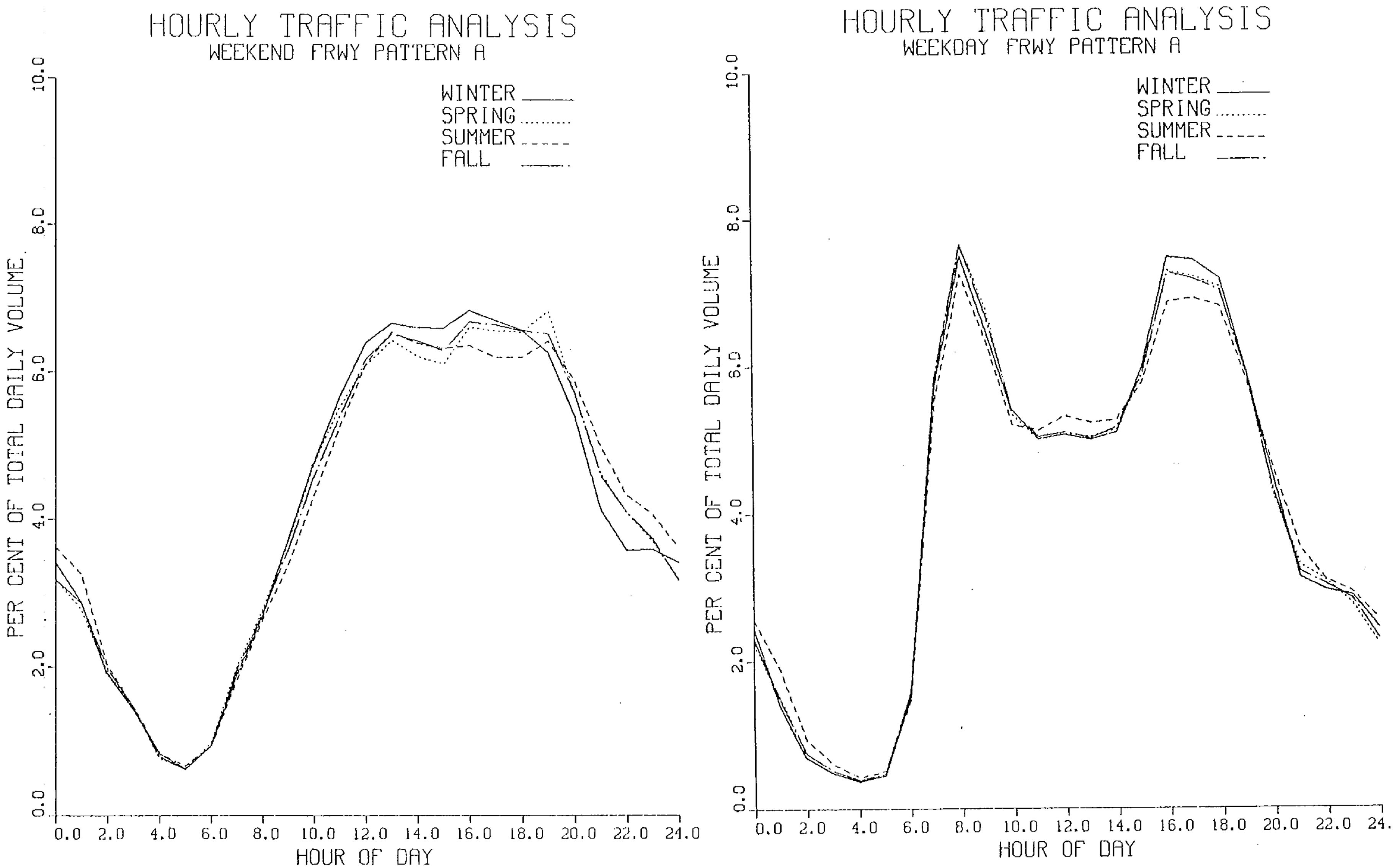


Figure 13. Freeway Traffic Pattern Type A

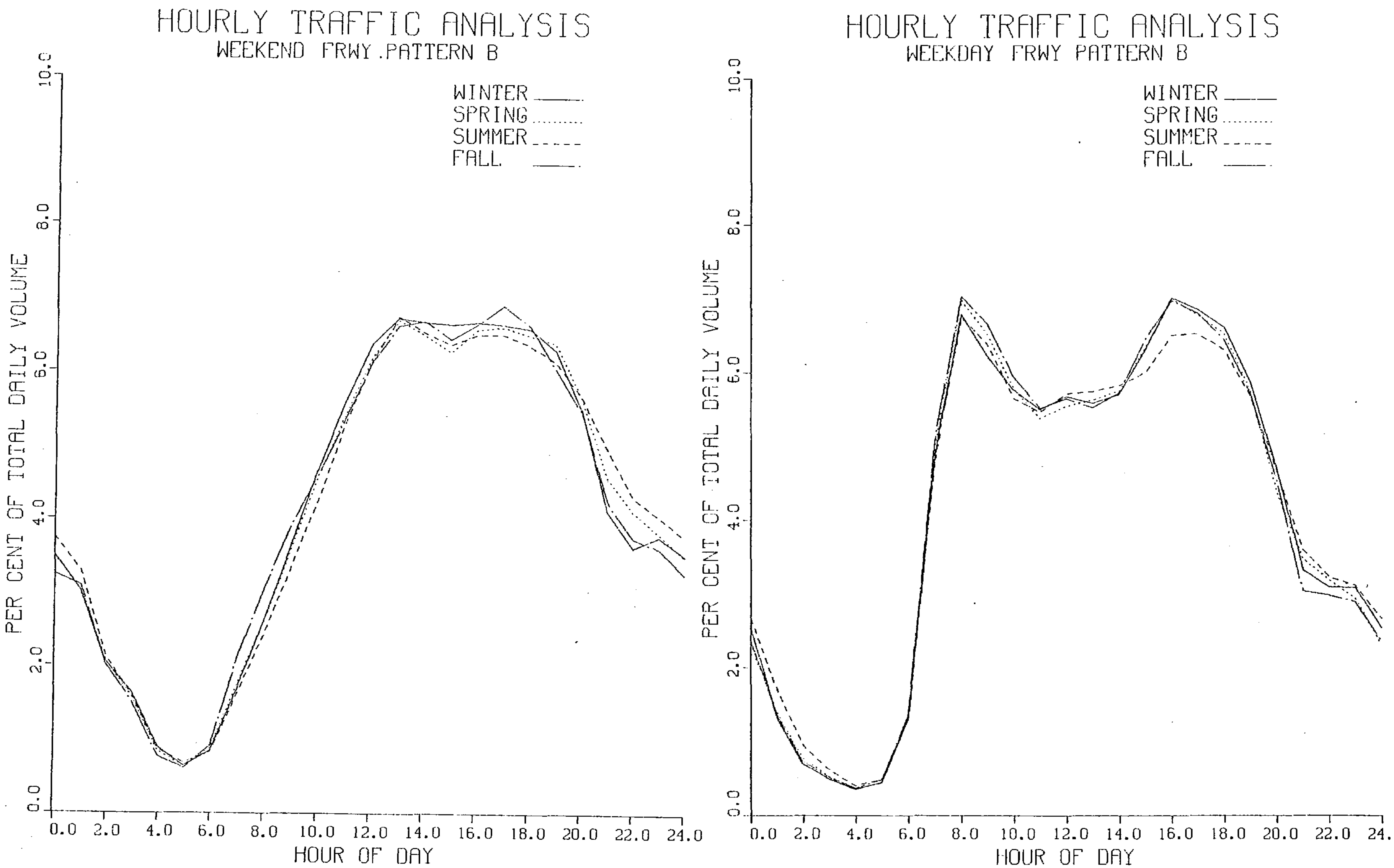
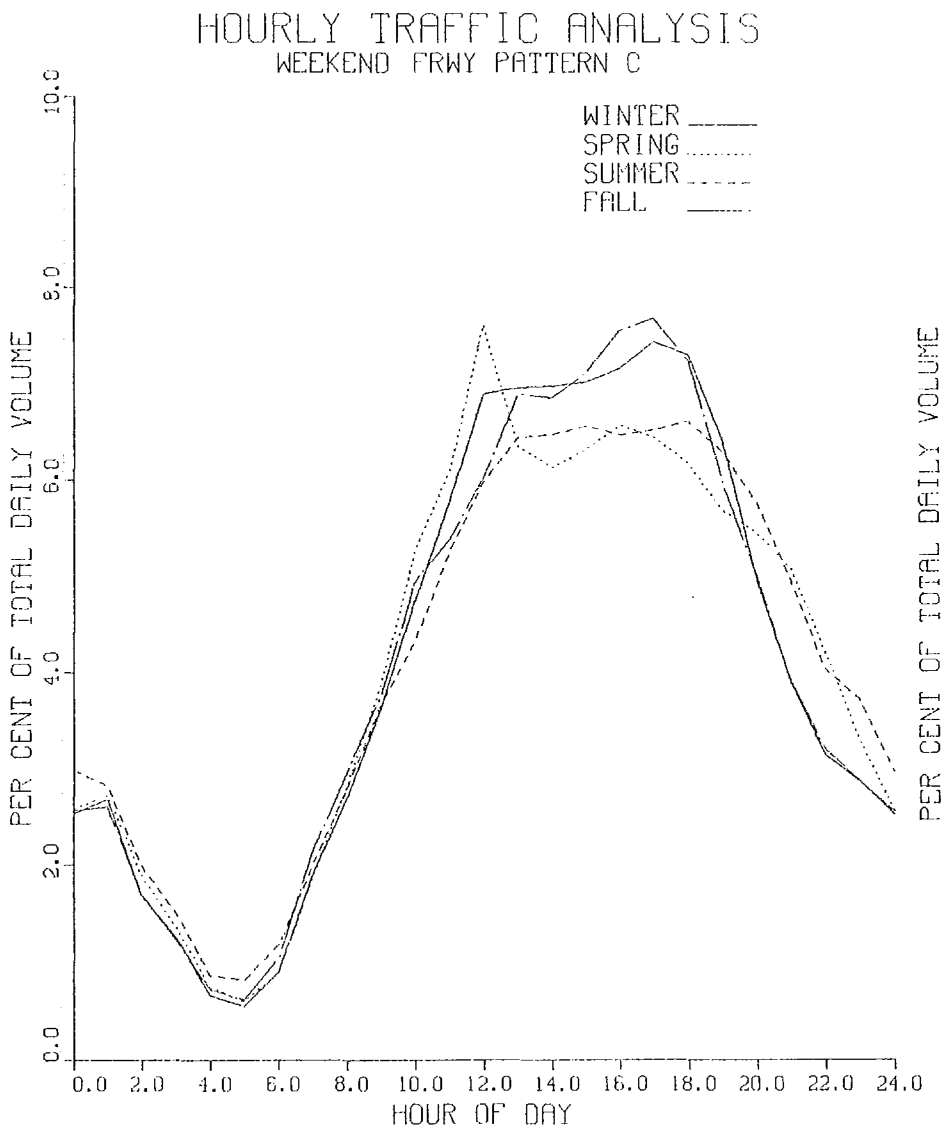


Figure 14. Freeway Traffic Pattern Type B



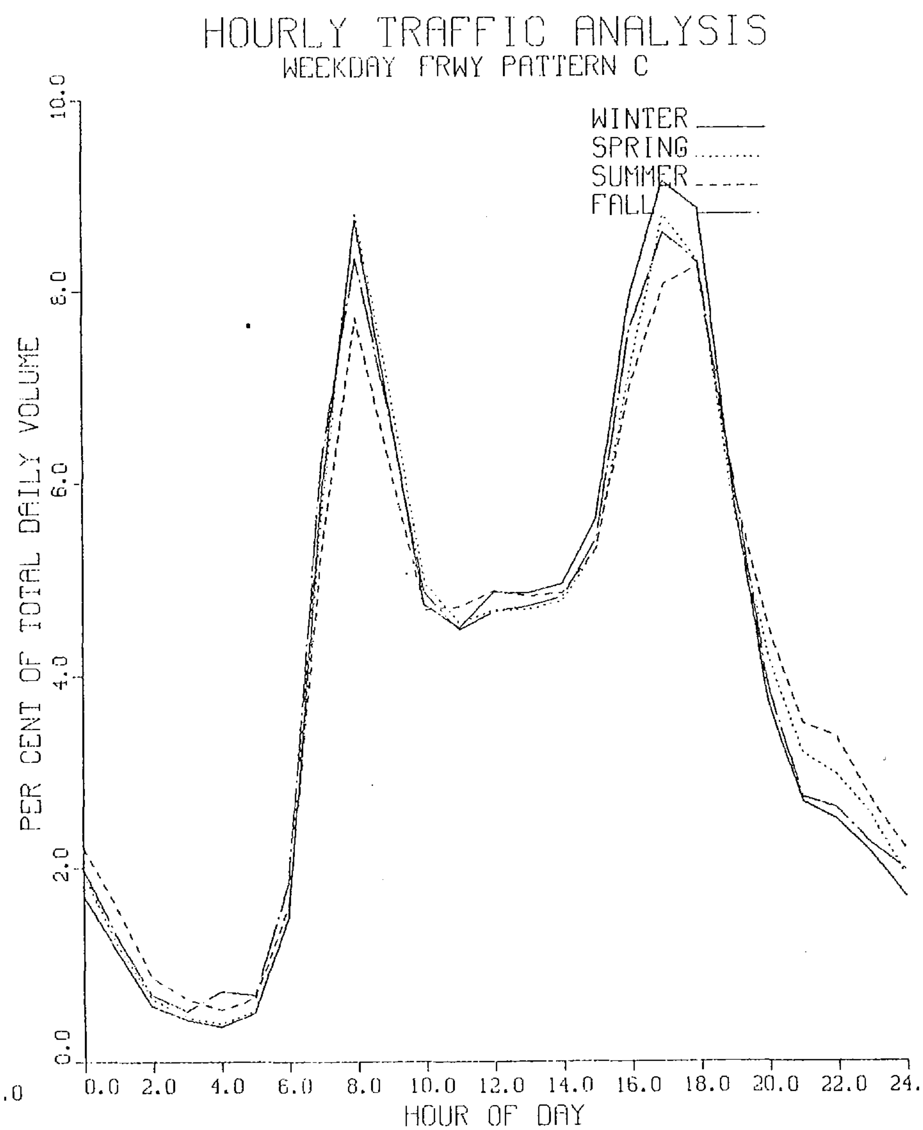


Figure 15. Freeway Traffic Pattern Type C

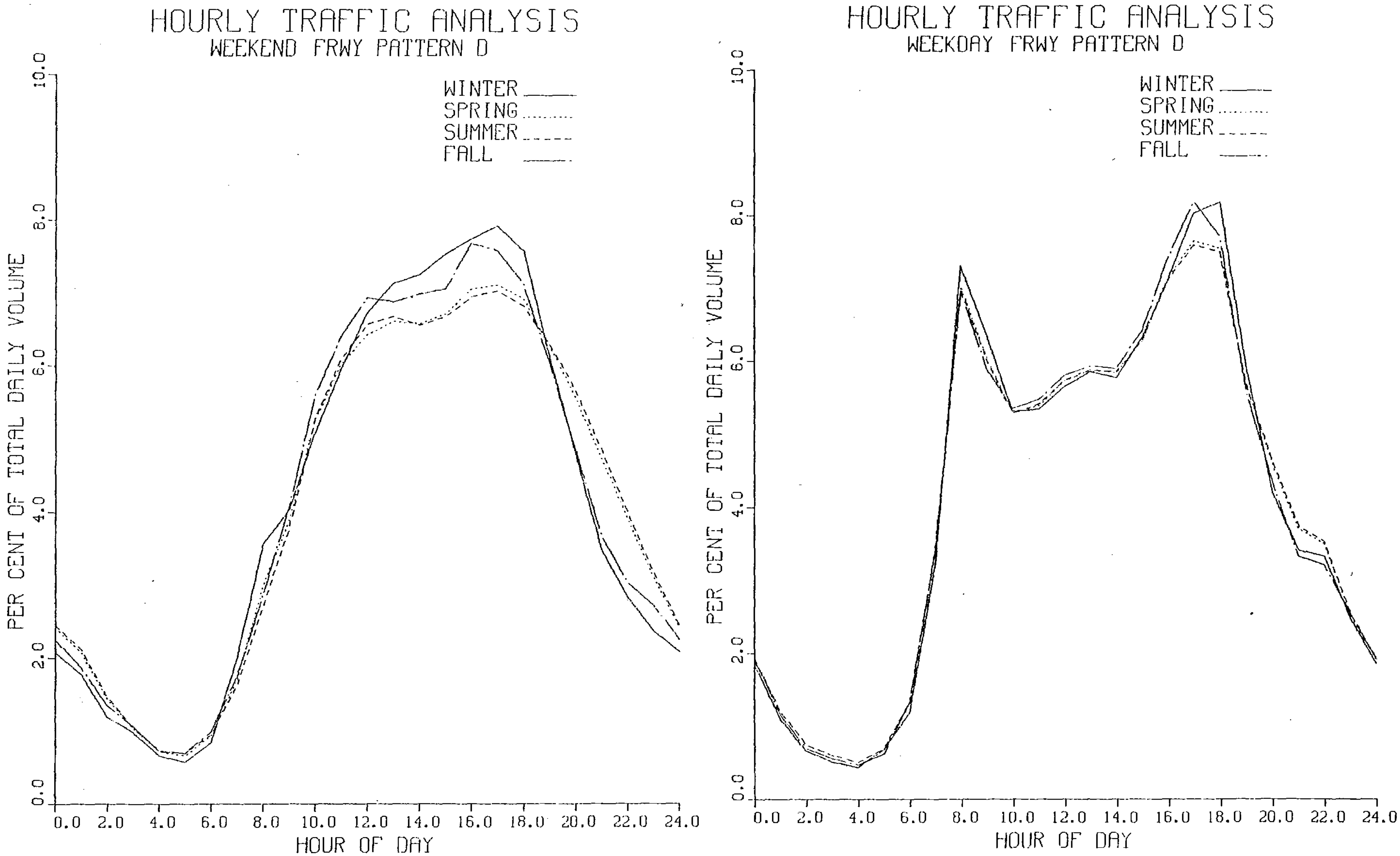


Figure 16. Freeway Traffic Pattern Type D

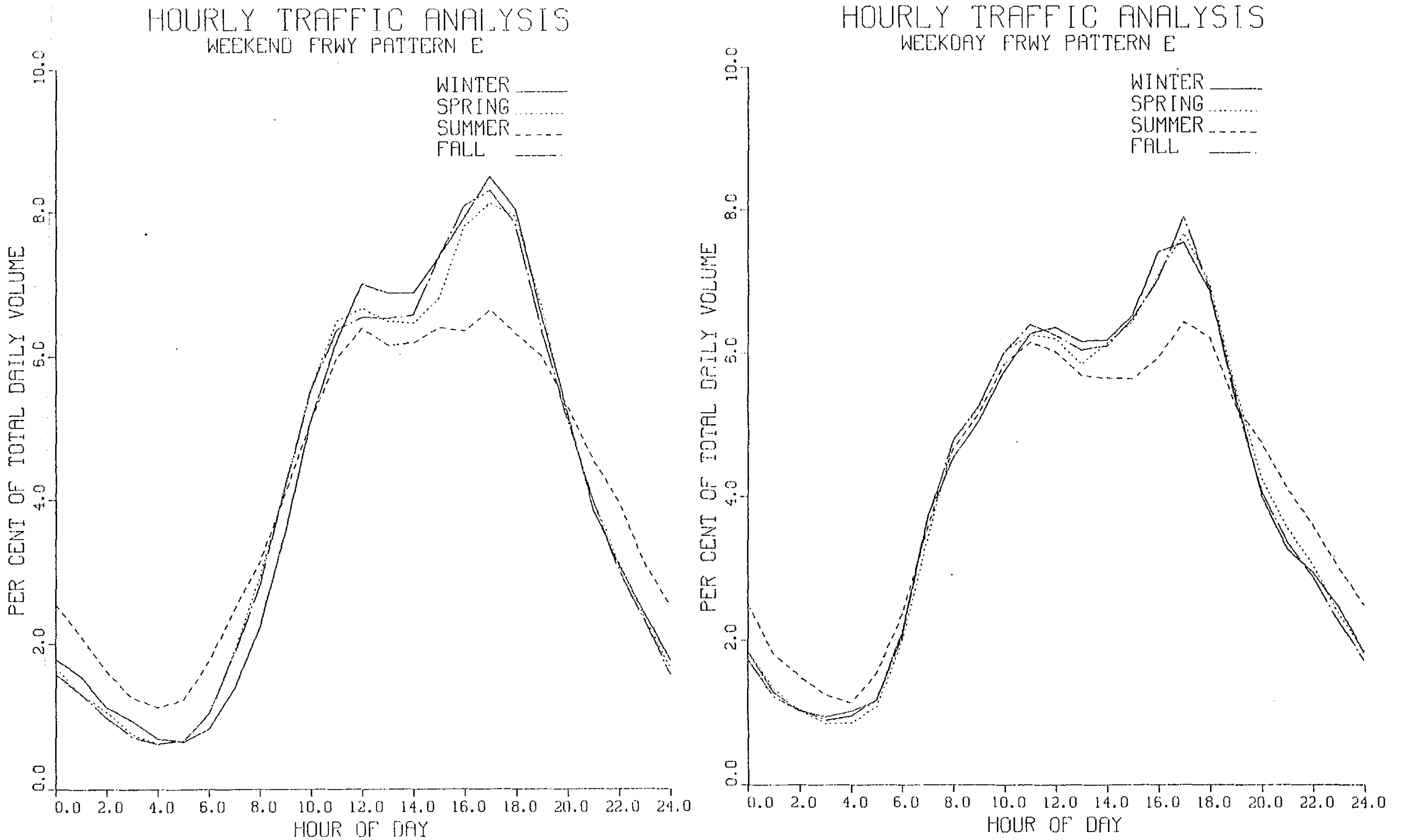
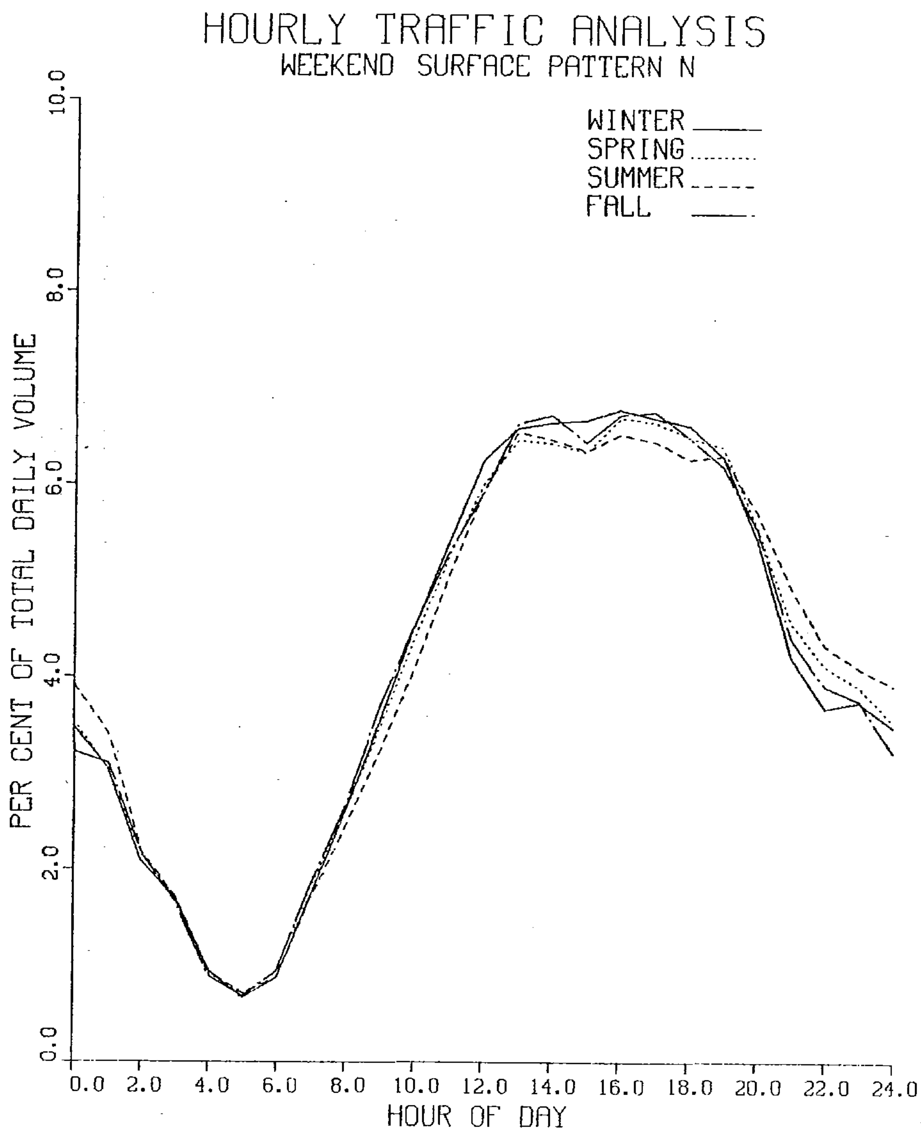


Figure 17. Freeway Traffic Pattern Type E



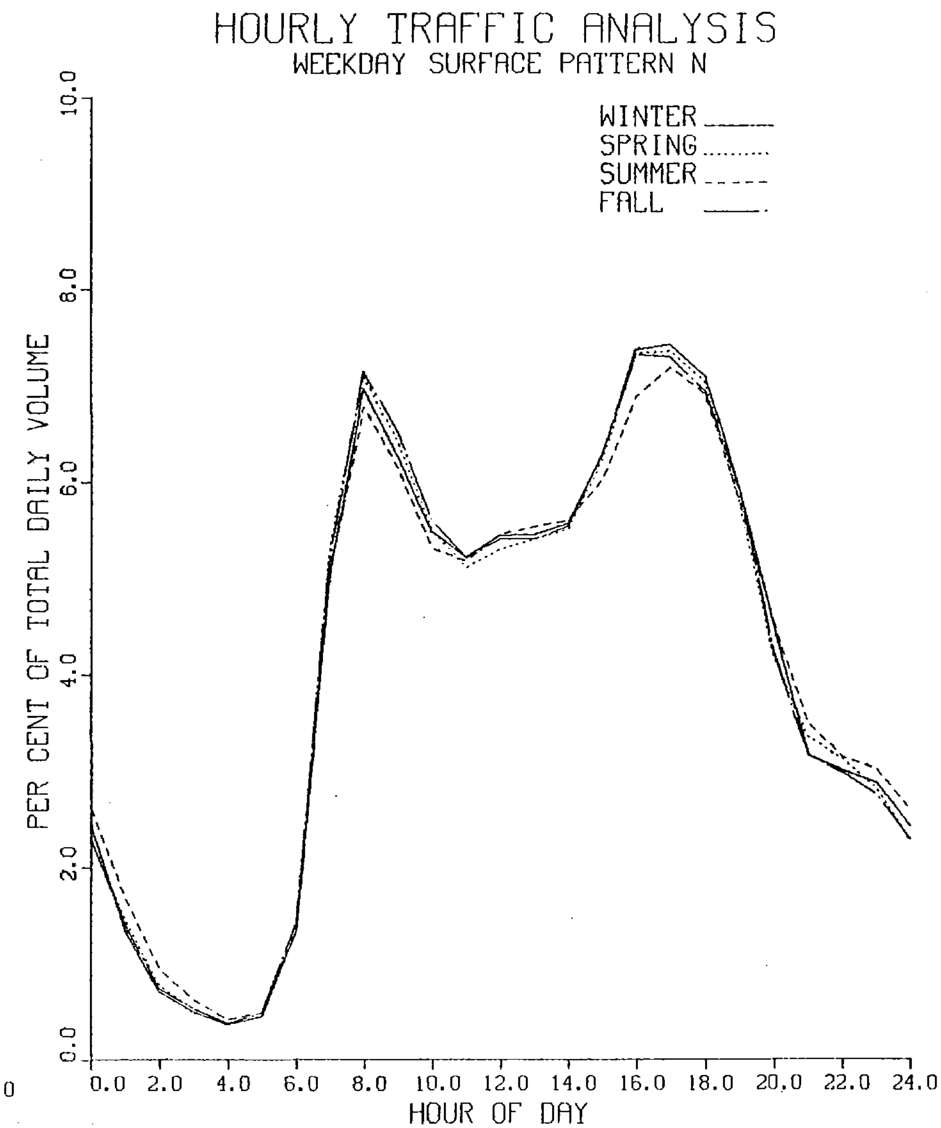


Figure 18. Surface Street Traffic Pattern Type N

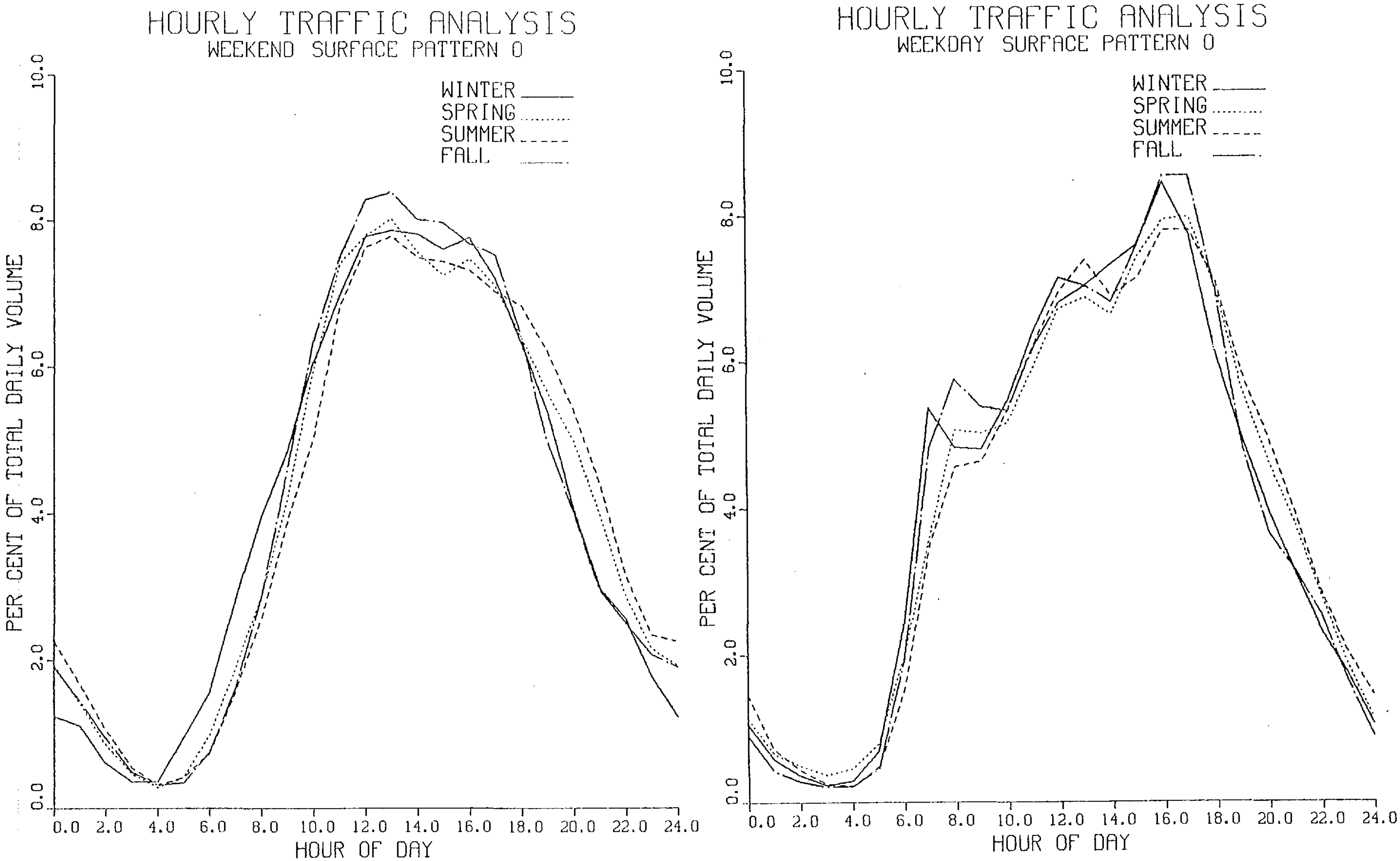


Figure 19. Surface Street Traffic Pattern Type 0

Table 6. Traffic Pattern Type Characteristics (All Vehicle Types)

Traffic Pattern Type	Characteristics
Freeway	
Type A	A strong north-south freeway traffic flow
Type B	A strong east-west freeway traffic flow
Type C	No strong north-south or east-west traffic flow
Type D	Isolated rural
Type E	Freeway traffic flow in rural areas
Surface Street	
Type N	Urban surface street traffic flow
Type O	Rural surface street traffic flow

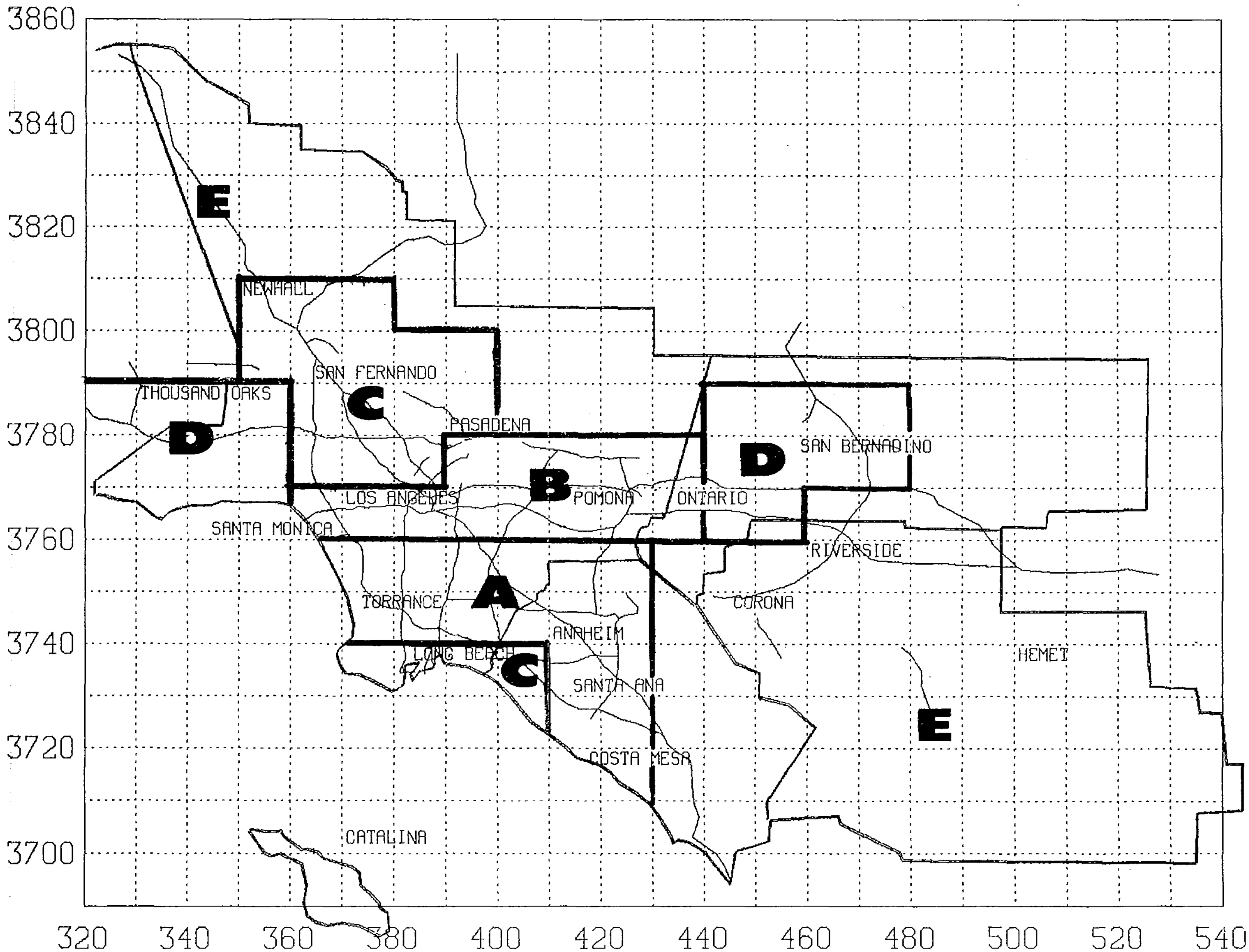


Figure 20. Freeway Traffic Pattern Type Zones

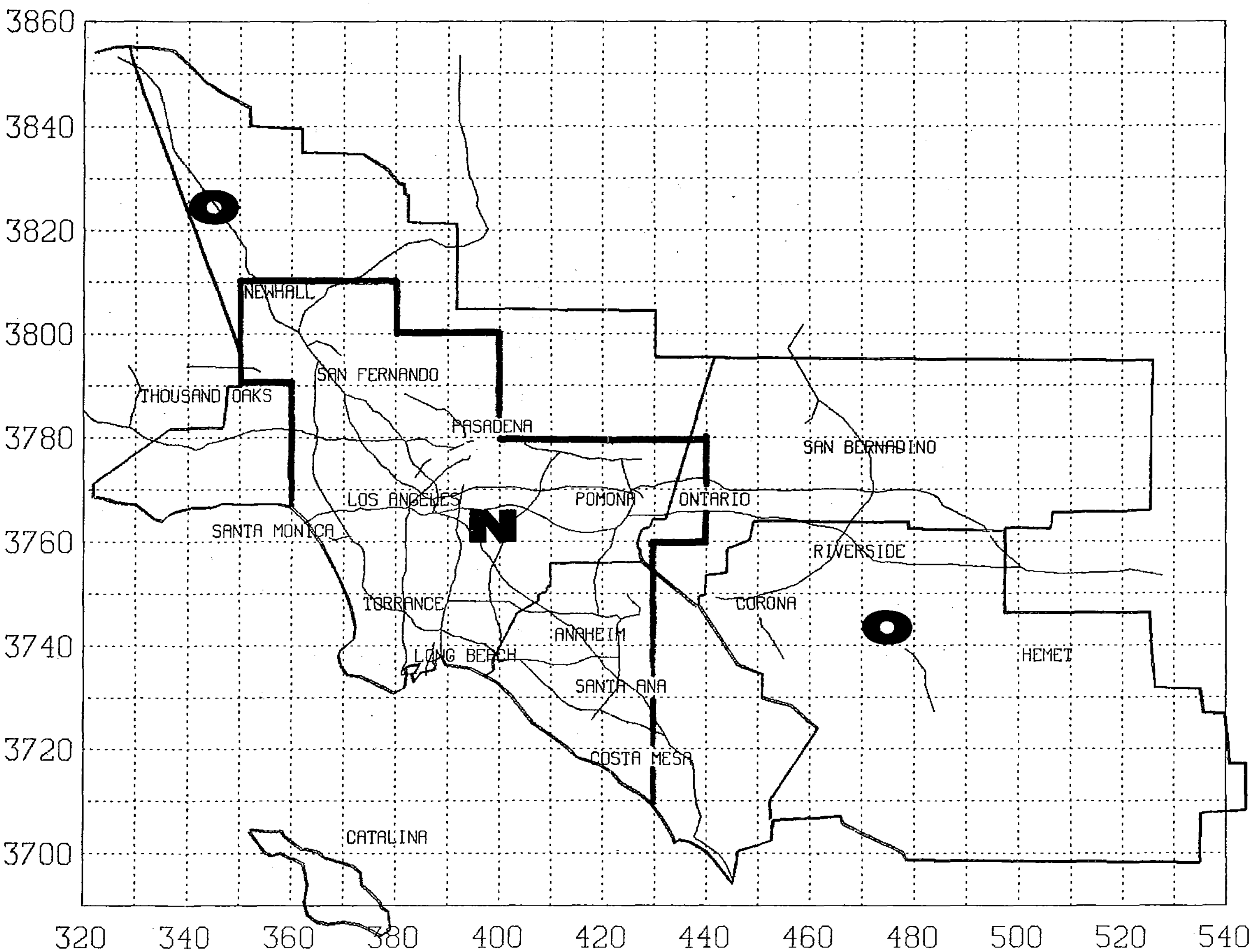


Figure 21. Surface Street Traffic Pattern Type Zones

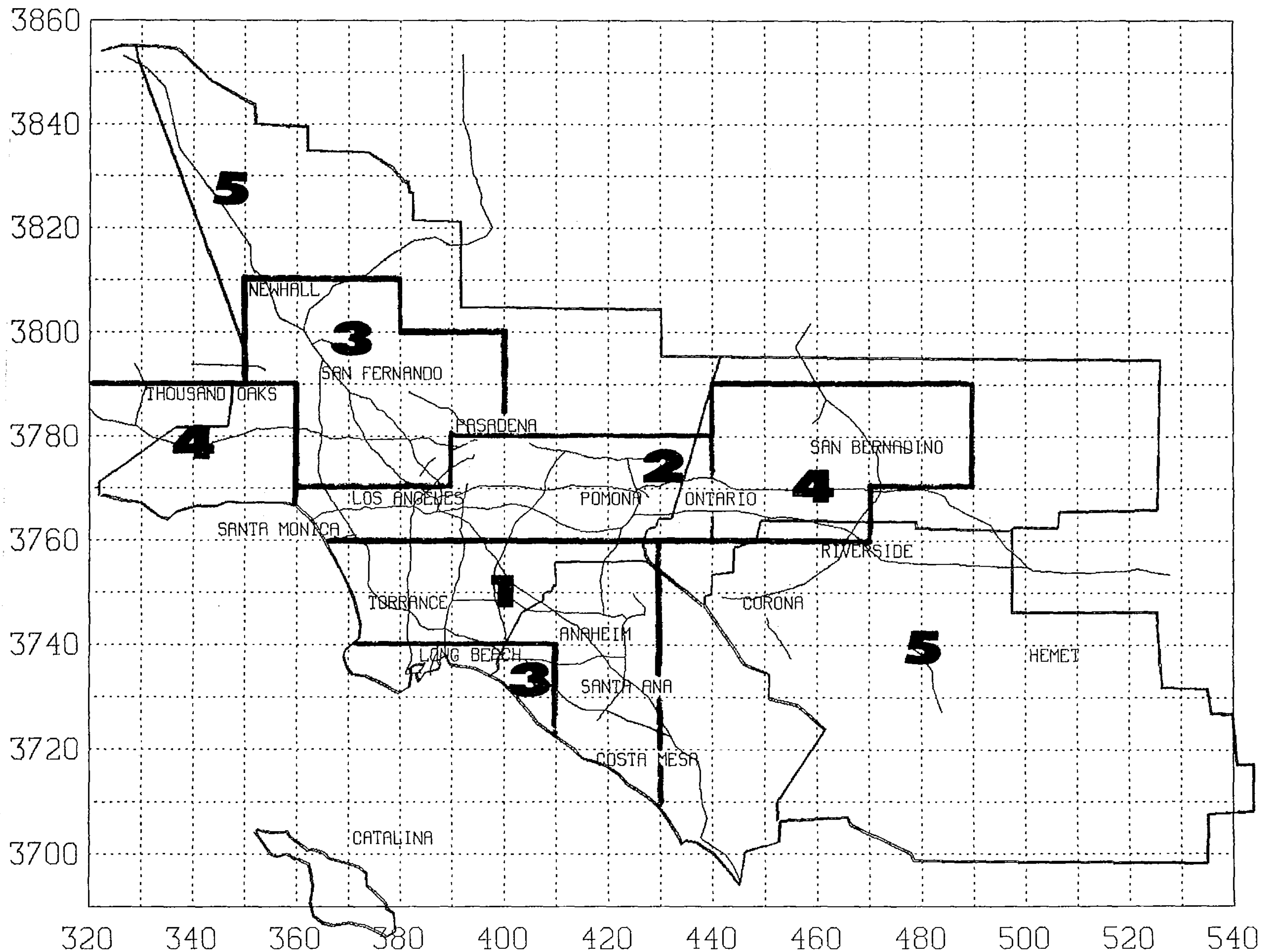


Figure 22. Grid Square Type Zones

The average speed at which each link is traversed is a necessary component for calculating vehicular emissions. LARTS contains average link speeds for peak and off-peak traffic conditions. Rather than being determined by the model, they are arbitrarily selected speeds based on road type, location and other parameters. These so-called "policy speeds" represent the average speed over the link including time spent stopped. That is, it represents the length of the link divided by the time required to traverse it. It does <u>not</u> represent the average velocity of the population of vehicles traversing the link. The distinction is important.

The LARTS model is described more completely in a series of CalTrans publications [18], [19], [20]. The procedures for developing a temporally and geographically disaggregated VMT data base are described in greater detail in the previous report of this series [2]. It should be noted that these procedures are used to allocate total VMT for all vehicle types. Procedures specific to vehicles with GVW of more than 6000 pounds are discussed in the next section.

SECTION 6

DISTRIBUTION OF HEAVY DUTY VEHICLE MILES TRAVELED

In addition to being disaggregated temporally and geographically, the emissions were disaggregated in terms of body type, weight class and fuel type. The data required to disaggregate the emissions in this manner are:

- Registration data by body type, weight class, fuel, and model year;
- Total vehicle miles traveled by all body types;
- Average annual mileage for each body type.

This section describes the data that are available and how they were used to allocate VMT.

Department of Motor Vehicle (DMV) registration data obtained from a special report generated by a division of the Reuben Donnelley Corporation, in conjunction with other data, were used to determine the number of vehicles of each body type, weight class, fuel type and model year that are registered in each county in the Basin [11]. The procedures used are described in detail in Section 4.

Total VMT by all vehicle types was determined for LARTS data (see Section 5). The LARTS model calculates VMT for all vehicles, light- and heavy-duty, and assumes that 5.0% were attributable to HDVs (on an annual average weekday basis). A more disaggregated estimate of HDV VMT was obtained by using traffic count data as explained in the following paragraphs.

Heavy duty vehicle counts were obtained for several locations in the Basin. The purpose was to determine the fraction of total vehicles passing a point that were heavy duty vehicles. It had been hoped that these data would be available on an hourly basis and that they would be classified counts. (That is, classified by body type). Such county data are limited, however. A few hourly counts for 24-hours (consecutive) were available from CalTrans for freeway locations [21]. Most of the available data were 6-hour counts during daylight hours [22].

Several different vehicle classification schemes were used by the various traffic agencies. Some agencies classified counts by body type, some by number of axles, and some on the basis of unspecified criteria. Because of the inconsistency and because for this study vehicles were classified by body type, only the total HDV counts were used (HDV being 6001 pounds GVW or greater). That is, only the total number of non-LDVs was considered without regard to any further subclassification.

To supplement the available data, TRW made arrangements with De Mers Airviews of Santa Ana, California to take a series of aerial photographs at selected locations [23]. The purpose of the photographs was to provide additional classified traffic count data.

Approximately 170 oblique aerial photographs were taken at 16 freeway and non-freeway locations. At each location photographs were taken at 15 minute intervals during three (3) time periods:

- Morning peak - 7 AM to 9 AM;
- Midday - 10 AM to 12 PM and 1 PM to 3 PM;
- Evening peak - 4 PM to 7 PM.

Figure 23 is a sample photograph.

The purpose of the aerial photographs was two-fold:

- To supplement the available classified vehicle counts;
- To characterize the total HDV counts by body type.

As a supplement to count data the aerial photographs worked well, and additional total HDV count data were obtained efficiently. However, the photographs were not as useful for classifying vehicles by body type. There were three (3) main unanticipated problems:

- Not enough vehicles were seen in any single photograph or any hourly set of four (4) photographs to be meaningful;
- It was difficult to determine the correct body type from the oblique angle used;
- Classification errors were common in those cases where the body type could be determined.

For these reasons the aerial photographs were used only to determine fraction of HDVs as a function of total vehicles. Although improvements are needed, the aerial photograph method is a potentially valuable technique for obtaining HDV traffic data. The method is reasonably inexpensive and provides a permanent record. Three (3) major improvements are required:

- Higher resolution photographic films and equipment must be used;
- More photographs per hour are required;
- Trained photo interpreters must be used.

For each count or photograph location a plot of % HDVs (as a function of total traffic) versus total traffic for each hour of the day was made. A sample is shown in Figure 24. In each case these curves represent normal weekday traffic conditions. These curves look similar to those

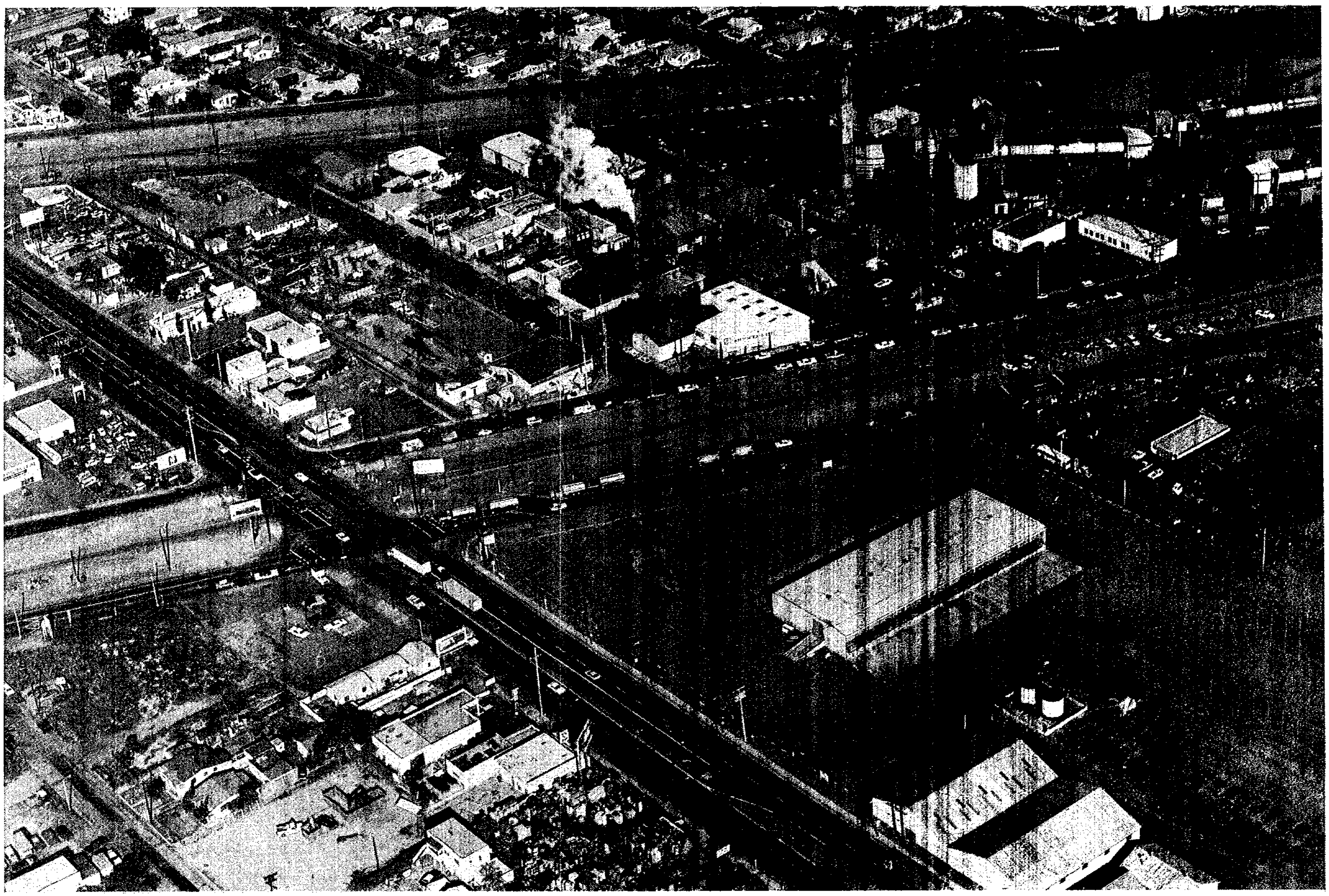


Figure 23. Sample Aerial Photograph

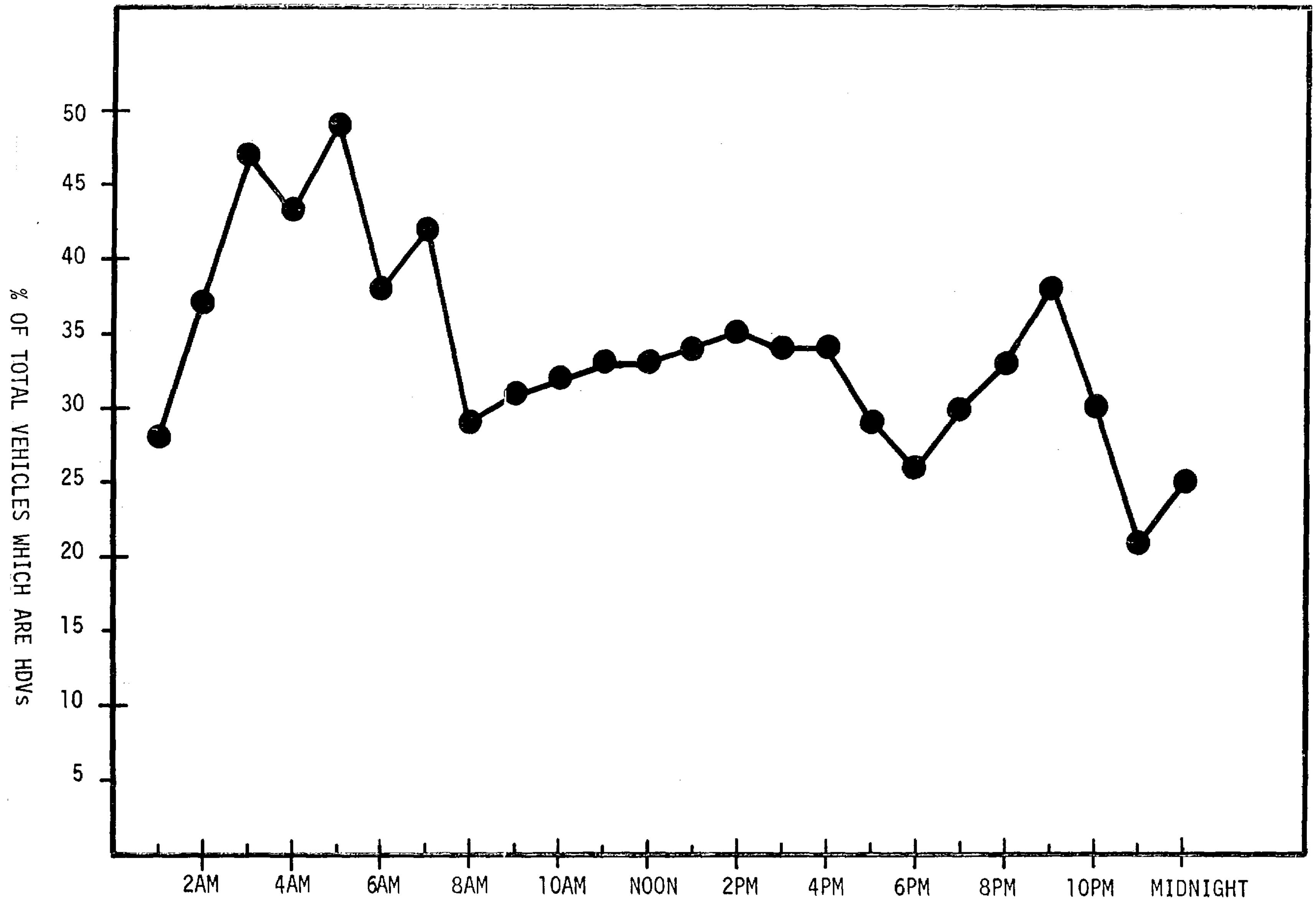


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Figure 24. Sample Diurnal HDV Distribution

discussed earlier that represent fraction of total daily traffic occurring in each hour, but represent something different.

The hourly distributions were compared and those with similar shapes grouped together. One (1) non-freeway and three (3) freeway patterns were determined. In a manner similar to that used to develop grid square types, all grid squares were classified as one of three (3) HDV grid square types and Figure 25 shows how each grid square was classified. Table 7 describes the grid square characteristics. Figures 26 through 29 show the composite curves.

Only data for weekday conditions were available. It was assumed, therefore, that the same hourly fraction of total vehicles that are heavy duty vehicles was valid for weekends. This assumption does not eliminate the weekday/weekend resolution since total traffic is shown as variable during these time periods.

These curves were further disaggregated by considering the type (body type) of HDV that is likely to be on the road during each of three (3) time periods:

- 6 AM to 6 PM (day);
- 6 PM to 10 PM (evening);
- 10 PM to 6 AM (night).

Table 8 shows what fraction of HDV traffic is attributable to each body type. These estimates are based on a series of reasonable assumptions about the use patterns of the various types of heavy-duty vehicles. The basic assumptions are:

- Pickups and light vans are operated primarily during the day and evening hours on both weekdays and weekend days. Only 5% as many are in operation during the night as during the other time periods. This reflects the fact that many of these vehicles are used for personal transportation.

- Tractors and heavy tankers are operated on an around-the-clock basis on weekdays and weekend days.

- A random sample of bus schedules from throughout the Basin was used to determine the ratio of scheduled bus runs during each time period to each other time period. Therefore, these ratios are based on actual data.

- All other vehicle types operate only on weekdays during the day.

These assumptions are summarized in Table 9. Note that this table does not show the ratio of, say, bus traffic to total traffic. That is shown in the previous table. Instead it shows the ratio of bus traffic in each time period to the bus traffic in each of the other two time periods.

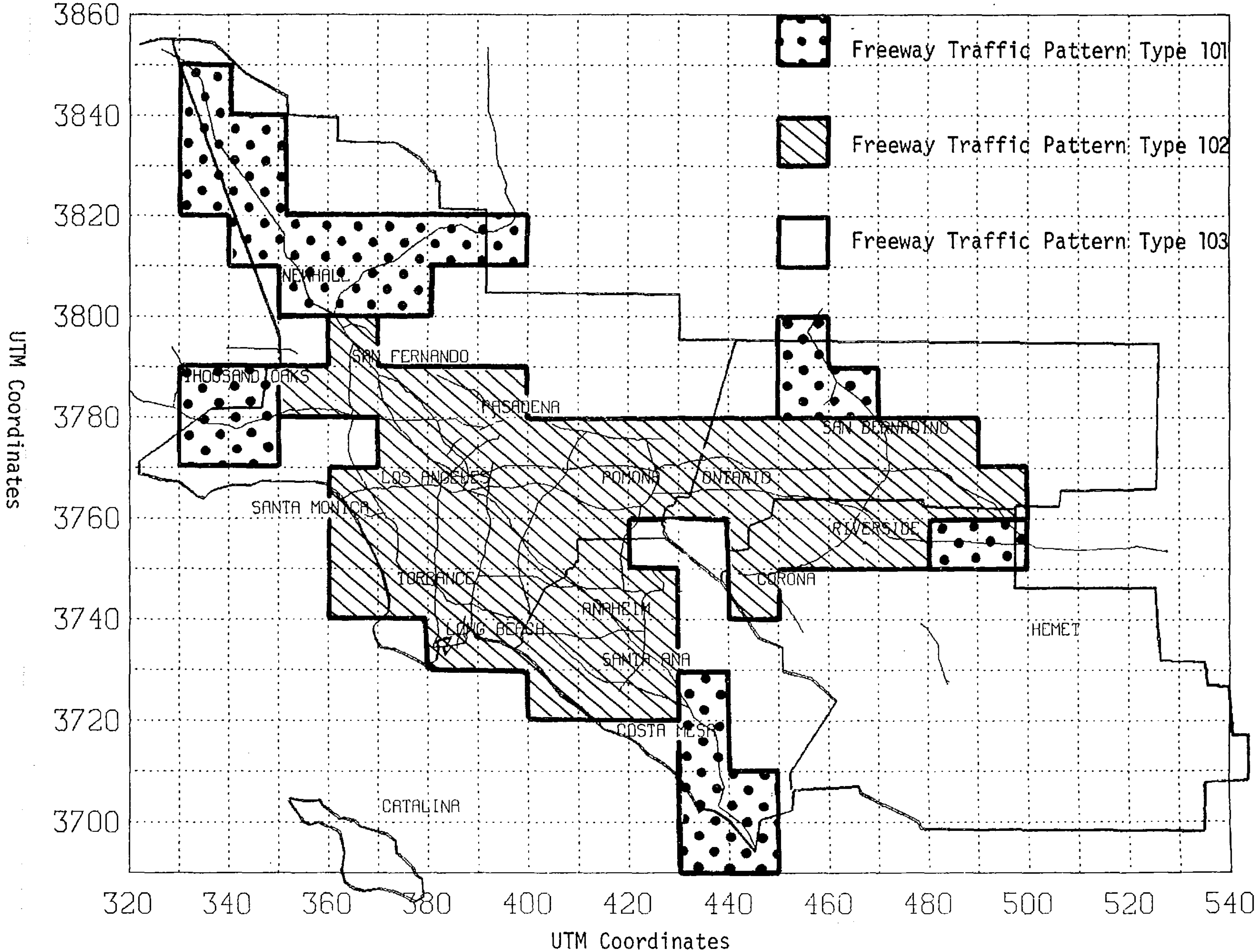

Figure 25. HDV Grid Square Classifications for the South Coast Air Basin

Table 7. HDV Traffic Pattern Type Characteristics

HDV Traffic Pattern Type	Characteristics
Freeway	
Type 101	Basin entrance
Type 102	Heavily commercial/industrial
Type 103	Residential/rural
Surface Street	
Type 104	All surface streets

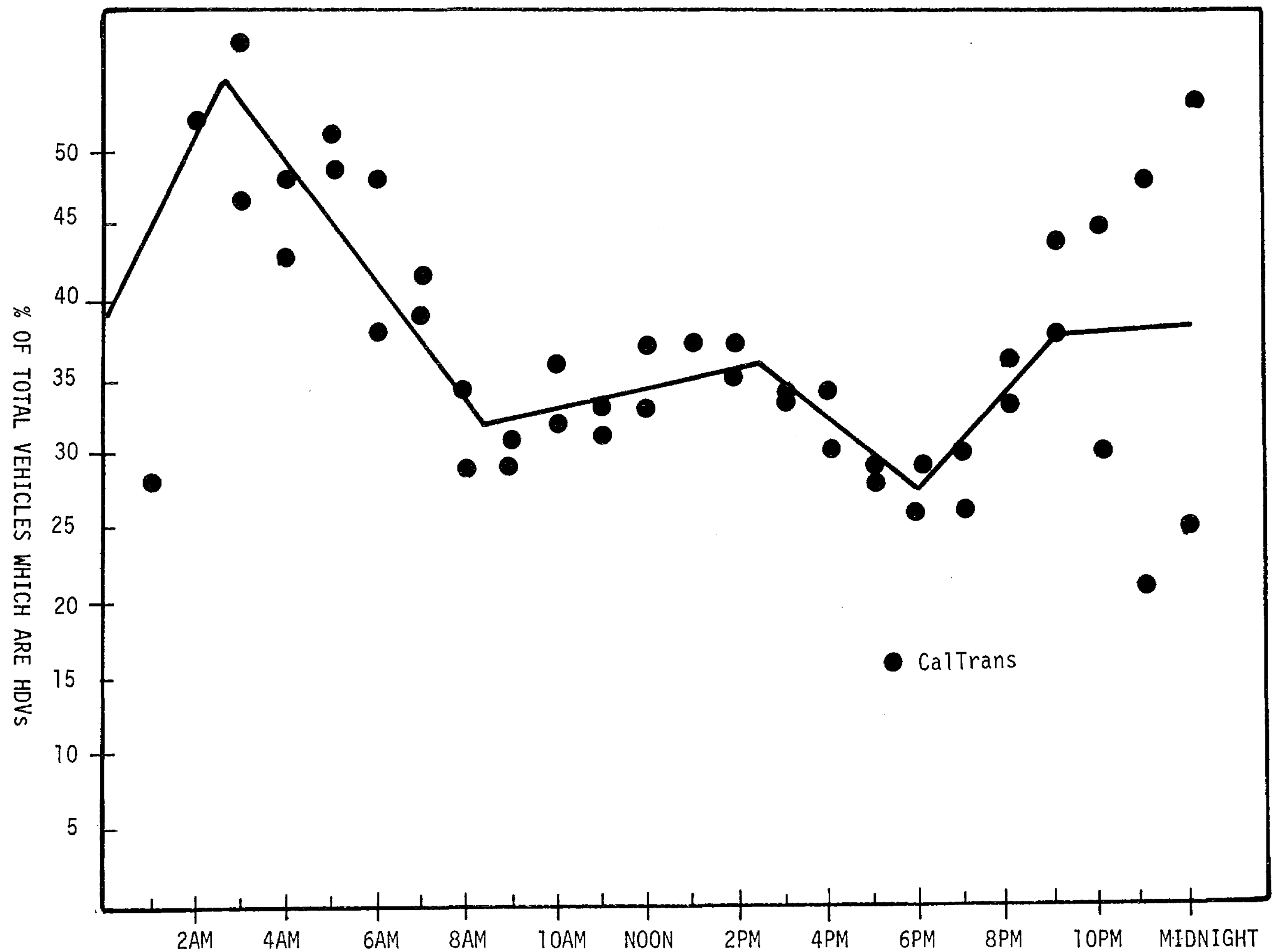

Figure 26. Freeway Diurnal HDV Distribution In Basin Entrance Areas (Type 101)

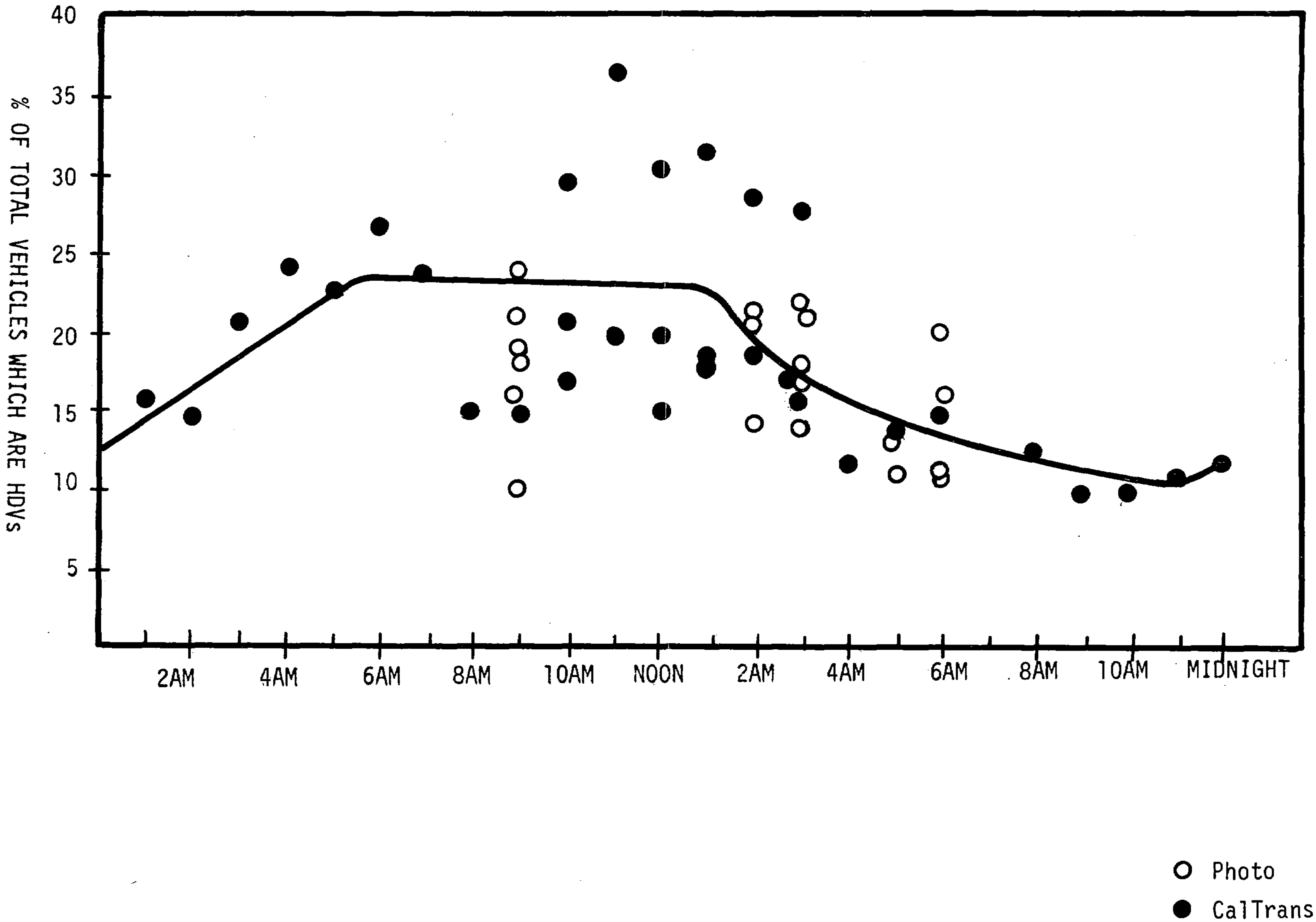

Figure 27. Freeway Diurnal HDV Distribution In Heavily Commercial/Industrial Areas (Type 102)

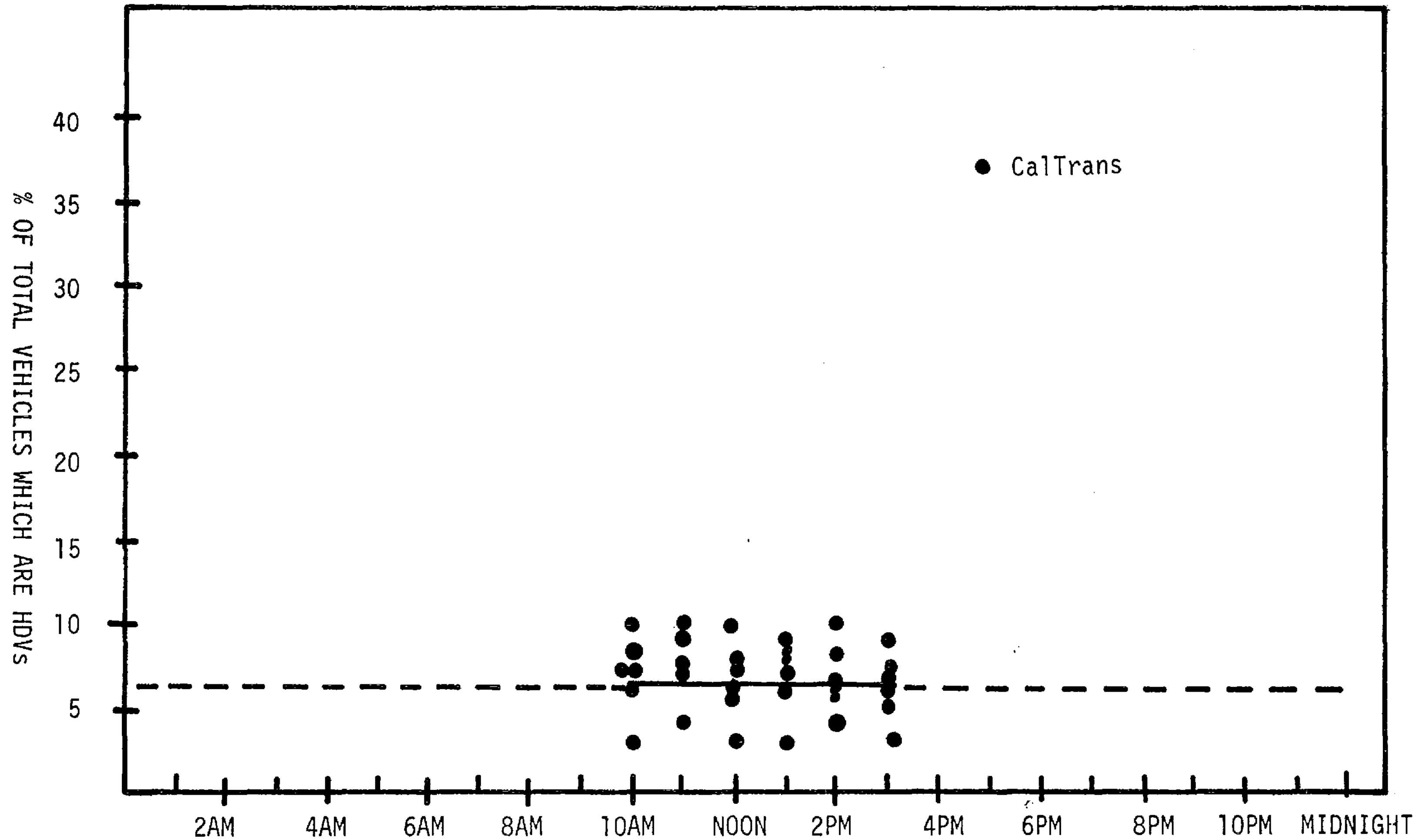

Figure 28. Freeway Diurnal HDV Distribution In Residential/Rural Areas (Type 103)

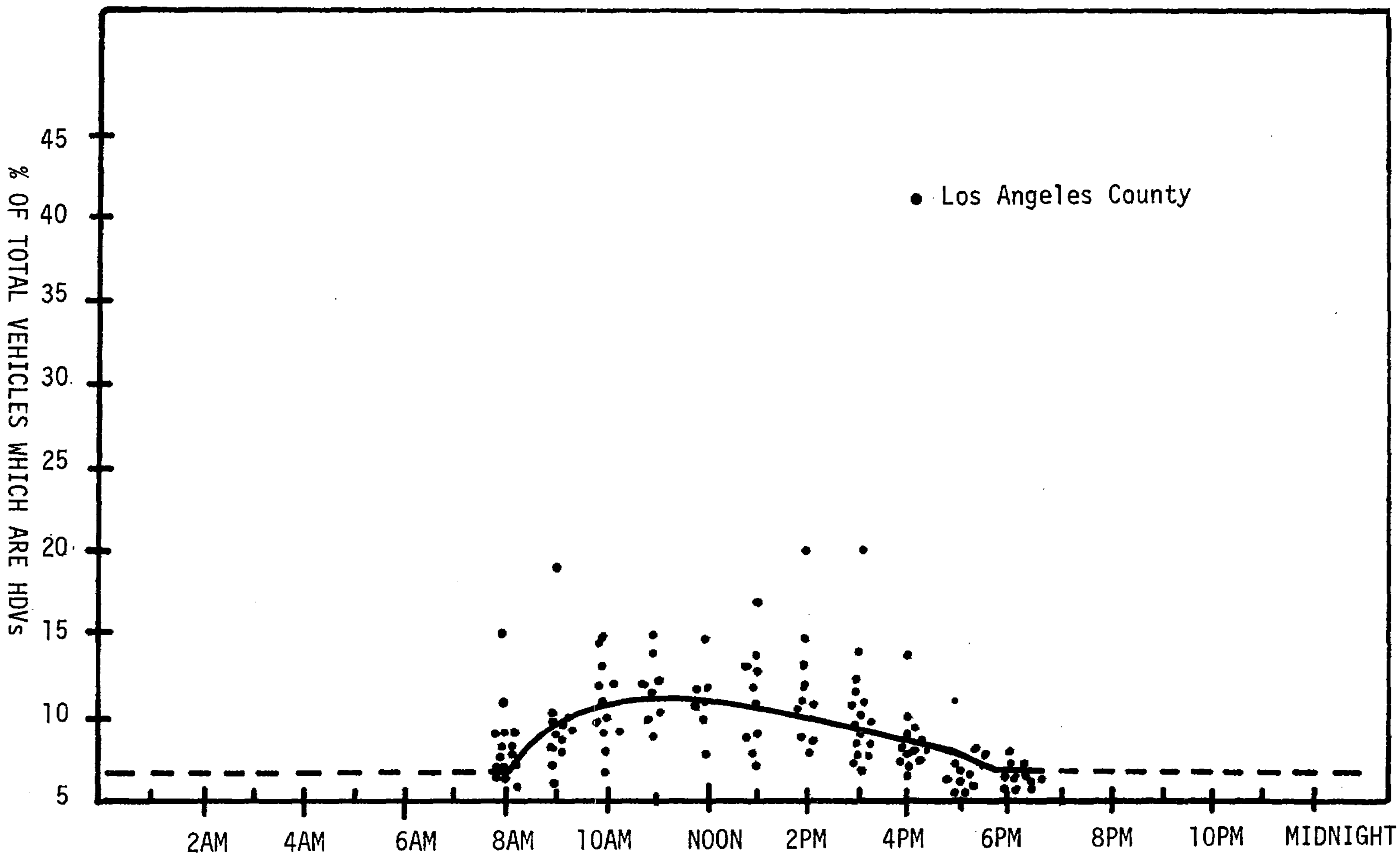

Figure 29. Surface Street Diurnal HDV Distribution In All Areas (Type 104)

Table 8. Diurnal HDV Distribution By Body Type

Body Type	GVW Range, lbs	Fuel Type	Weekday, % of HDVs Day	Weekday, % of HDVs Evening	Weekday, % of HDVs Night	Weekend Day, % of HDVs Day	Weekend Day, % of HDVs Evening	Weekend Day, % of HDVs Night
Pickup	6001 - 8500	Gasoline	.2415	.3068	.0426	.3041	.3058	.0424
Pickup	8501 -10000	Gasoline	.2576	.3272	.0454	.3244	.3262	.0453
Tractor	10000+	Gasoline	.0128	.0163	.0451	.0161	.0162	.0449
Tractor	10000+	Diesel	.2005	.2546	.7063	.2525	.2539	.7038
Bus	10000+	Gasoline	.0084	.0065	.0039	.0106	.0079	.0056
Bus	10000+	Diesel	.0083	.0063	.0039	.0105	.0077	.0056
Dump	10000+	Gasoline	.0090	.0000	.0000	.0000	.0000	.0000
Dump	10000+	Diesel	.0293	.0000	.0000	.0000	.0000	.0000
Flatbed	6001 - 8500	Gasoline	.0212	.0000	.0000	.0000	.0000	.0000
Flatbed	8501 -10000	Gasoline	.0224	.0000	.0000	.0000	.0000	.0000
Flatbed	10000+	Gasoline	.0456	.0000	.0000	.0000	.0000	.0000
Flatbed	10000+	Diesel	.0120	.0000	.0000	.0000	.0000	.0000
Tank	10000+	Gas	.0029	.0037	.0102	.0037	.0037	.0102
Tank	10000+	Diesel	.0127	.0161	.0447	.0160	.0161	.0446
Van	6001 - 8500	Gasoline	.0111	.0141	.0021	.0140	.0141	.0021
Van	8501 -10000	Gasoline	.0116	.0147	.0021	.0146	.0147	.0021
Van	10000+	Gasoline	.0545	.0000	.0000	.0000	.0000	.0000
Van	10000+	Diesel	.0120	.0000	.0000	.0000	.0000	.0000
Tractor (Non-Cal)	10000+	Gasoline	.0016	.0020	.0056	.0020	.0020	.0056
Tractor (Non-Cal)	10000+	Diesel	.0250	.0317	.0881	.0315	.0317	.0878
			1.0000	1.0000	1.0000	1.0000	1.0000	1.0000

Table 9. Summary of Assumptions Used to Represent Diurnal HDV Use Patterns

Body Type	GVW Range, lbs	Fuel Type	Weekday Day	Weekday Evening	Weekday Night	Weekend Day Day	Weekend Day Evening	Weekend Day Night
Pickup	6001 - 8500	Gasoline	1.00*	1.00	0.05*	1.00	1.00	0.05
Pickup	8501 -10000	Gasoline	1.00	1.00	0.05	1.00	1.00	0.05
Tractor	10000+	Gasoline	1.00	1.00	1.00	1.00	1.00	1.00
Tractor	10000+	Diesel	1.00	1.00	1.00	1.00	1.00	1.00
Bus	10000+	Gasoline	1.00	0.60	0.13	1.00	0.74	0.19
Bus	10000+	Diesel	1.00	0.60	0.13	1.00	0.74	0.19
Dump	10000+	Gasoline	1.00	0.00*	0.00	0.00	0.00	0.00
Dump	10000+	Diesel	1.00	0.00	0.00	0.00	0.00	0.00
Flatbed	6001 - 8500	Gasoline	1.00	0.00	0.00	0.00	0.00	0.00
Flatbed	8501 -10000	Gasoline	1.00	0.00	0.00	0.00	0.00	0.00
Flatbed	10000+	Gasoline	1.00	0.00	0.00	0.00	0.00	0.00
Flatbed	10000+	Diesel	1.00	0.00	0.00	0.00	0.00	0.00
Tank	10000+	Gasoline	1.00	1.00	1.00	1.00	1.00	1.00
Tank	10000+	Diesel	1.00	1.00	1.00	1.00	1.00	1.00
Van	6001 - 8500	Gasoline	1.00	1.00	0.05	1.00	1.00	0.05
Van	8501 -10000	Gasoline	1.00	1.00	0.05	1.00	1.00	0.05
Van	10000+	Gasoline	1.00	0.00	0.00	0.00	0.00	0.00
Van	10000+	Diesel	1.00	0.00	0.00	0.00	0.00	0.00
Tractor (Non-Cal)	10000+	Gasoline	1.00	1.00	1.00	1.00	1.00	1.00
Tractor (non-Cal)	10000+	Diesel	1.00	1.00	1.00	1.00	1.00	1.00

*1.00 means this class does drive during this time period. Any other number indicates that the class of vehicle is on the road, but in reduced numbers. 0.00 means this class of vehicle is not on the road in substantial numbers during the time period.

It is important to note that HDV grid square types do not replace the grid square types described in Section 5. Instead they overlap the existing grid square characterizations. Grid square types characterize the flow of total traffic; HDV grid square types characterize the portion of the total that is heavy-duty vehicles.

This procedure establishes estimates of HDV traffic (VMT) on the basis of the following:

- Grid square ;
- Hour of day ;
- Weekday/weekend ;
- Body type .

The body type distributions for each hour are determined by three (3) factors:

- The ratios of registrations for each body type;
- The average annual mileage for each body type ;
- The assumed use patterns for each vehicle type as described in Table 9.

It was assumed that the body type distribution was constant throughout the Basin. This assumption was required because no data exists from which localized distributions can be determined. For freeways the assumption is probably a good one. For surface streets, however, some errors are probable. For example, the fraction of HDVs that are tractors in Palos Verdes* would be expected to be lower than in the harbor area.** The model assumes the same fraction for both areas. Note that only the fraction is the same, the absolute number is different because the LARTS model allocates different total traffic to these two (2) areas.

* An upper class residential area in the southwest corner of Los Angeles County - UTM grid square 370-3730.

**Just east of Palos Verdes - UTM grid square 380-3730.

SECTION 7

CHARACTERIZATION OF EMISSIONS

Emissions were calculated using methods similar to those described in the Environmental Protection Agency (EPA) Document AP-42, Supplement 5 [5]. Modifications were made to provide for increased temporal and geographical resolution. Two sets of emission factors were used, those listed in AP-42 Supplement 5 and those provided by the Air Resources Board (ARB) [13]. This section describes the methods used to calculate emissions and the formats used to present the inventory.

The computerized inventory model is capable of utilizing emission factors that are specific for:*

- Fuel type;
- Model year;
- Weight class;
- Body type.

Ideally emission factors based on these criteria would be available. However, the data to determine all of the factors do not exist. What does exist are emission factors based on fuel type (gasoline or diesel only), model year, and weight class (0 to 6000 pounds GVW, 0 to 8500 pounds GVW, and greater than 8500 pounds GVW). No body type factors are available.

That significant errors are introduced by the lack of body type related factors can be demonstrated by considering the following: An 8501 pound GVW diesel powered flat bed and an 80,000 pound GVW diesel powered tractor-trailer combination are represented by the same emission factor. There are several vehicle characteristics that would almost certainly result in very different emission patterns for these two (2) vehicle types:

- The GVWs differ by a factor of more than nine (9). For a given driving cycle the horse-power requirements for the tractor would be much higher than for the flat bed (although probably less than nine (9) times as great). Because there is a relationship between power, fuel consumption and emissions, it would be expected that the tractor exhaust emissions would be substantially higher.
- The tractor and its trailers have higher aerodynamic drag. The higher power requirements that result would cause higher emissions as described above.
- Engine-transmission-differential combinations are different for the two types of vehicles. Tractors would tend to have larger engines, some turbocharged. Tractors typically have

*Additional criteria such as vehicle use (i.e., personal versus commercial) can easily be added by simply redefining the vehicle types.

18 to 48 forward speeds while flat beds have 3 to 10. These characteristics would be expected to affect emissions.

As individual emission factors for each body type become available they can be incorporated into the model.

Two (2) sets of emission factors are available. The first, published in AP-42, Supplement 5, was developed by the Environmental Protection Agency in which a different set of factors is presented for each inventory year. That is, the emission factors for each model year vary with the inventory year. For example, an exhaust emission factor for a 1970 model year vehicle for inventory year 1975 would, in general, be higher than for inventory year 1974. The difference represents the deterioration of the emission control systems. In the second set, developed by the California Air Resources Board, deterioration is calculated by applying a constant to an initial emission factor.

Although a number of HDV emission characterization studies have been conducted, only these complete sets of factors are available. A search of the available literature was conducted in an attempt to find additional emission factor data. The results of a number of studies were examined. In general, the emissions data that are available do not apply to California vehicles, are incomplete or are for a single pollutant. Further, the two (2) sets of factors that were used already incorporate most of the available data. Conversations with the ARB and the EPA confirm that there is little additional emissions factor data currently available.

The ARB emission factors were used as published except for the SO_2 factors for gasoline powered vehicles. These were recalculated assuming the following:

- The average gasoline sulfur content is 0.06 weight%;
- Average gasoline density is 6.0 lbs/gal;
- Average medium-duty vehicle (MDV) mileage is 10.0 mi/gal;
- Average heavy-duty vehicle (HDV) mileage is 6.0 mi/gal.

Both sets of factors are based on extremely limited non-modal test data. Because of the limited test data it is difficult to critically evaluate their respective reliabilities. It appears, however, that the ARB factors were developed from a more detailed analysis of the available data. The EPA factors for California vehicles, particularly medium duty trucks, were extrapolated from data which are questionable.

A revised version of the EPA factors is under development. As of this writing, the new factors, to be published in AP-42, Supplement 8, had not been released.

Exhaust emissions are calculated using the Federal Test Procedure (FTP) as presented in Supplement 5. The FTP mean-emission factor, which is appropriately deteriorated for the inventory year and which is model year dependent, is modified by a series of correction factors. Corrections are made to account for off-nominal average speed (average link speed), ambient temperature, and percent cold operation. Stated mathematically:

$$e_{npstw} = \sum_{i=n-12}^{n} c_{ipn} \, m_{in} \, v_{ips} \, z_{ipt} \, r_{iptw}$$

where:

e_{npstw} = Composite emission factor in g/mi
- calendar year, n
- pollutant, p
- average speed, s
- ambient temperature, t
- percentage cold operation, w

c_{ipn} = The FTP (1975 Federal Test Procedure or ARB mean emission factor)
- model year, i
- pollutant, p
- calendar year, n

m_{in} = The fraction of annual travel
- model year, i
- calendar year, n

v_{ips} = The speed correction factor
- model year, i
- pollutant, p
- average speed, s

z_{ipt} = The temperature correction factor
- model year, i
- pollutant, p
- ambient temperature, t

r_{iptw} = The hot/cold vehicle operation correction factor
- model year, i
- pollutant, p
- ambient temperature, t
- percentage cold operation, w

The selection of emission factors (c_{ipn}) was discussed above. The fraction of annual travel (m_{in}) by each model year and body type is discussed in Section 6. The speed correction factors used were those developed specifically for the South Coast Air Basin for light-duty cars and trucks (6000 pounds or less) as a part of the previous program [2]. As in Supplement 5, it was assumed that the LDV speed correction factors are applicable to medium- and heavy-duty vehicles. It should be noted that the speed correction factors for the SCAB were developed in exactly the same way that the speed correction factors in Supplement 5 were. The difference between them is that the Supplement 5 factors used data from Los Angeles and five other cities* and that freeway and non-freeway data were combined [8]. The averaged results are reasonable nationwide estimates but differ considerably from SCAB only results. The factors used for this inventory were developed from SCAB data and the freeway and non-freeway data were processed separately. The temperature correction factors were used as suggested in Supplement 5 except that four (4) temperatures, one (1) for each season, were used. The Supplement 5 recommended percentage of cold operation was used.

In some cases correction factors of unity were applied. For example, the temperature correction factor for diesel exhaust emission is assumed to be 1.000 for all temperatures.

The VMT based FTP approach to determining mobile source emissions is generally used to calculate aggregated emissions for an area. This model calculates emissions on a link-by-link basis. For each link in the LARTS network (see Section 5) VMT and average speed are known on an hourly basis. Using these and supporting data (temperature, percent cold operation, etc.) emissions for each link are calculated for each hour. The emissions are then summed for each grid square.

The resulting inventory is disaggregated in the following manner:

- Temporally
  - hour of day
  - weekday/weekend
  - season

- Geographically
  - grid square (10 km by 10 km)
  - county
  - SCAB

- Vehicle category
  - fuel
  - body type
  - weight class

- Emissions
  - NO_x
  - SO_x
  - exhaust hydrocarbons
  - evaporative hydrocarbons
  - crank case
  - CO
  - particulates (exhaust and tire wear)

*Houston, Cincinnati, Chicago, New York, and Detroit.

Since this amounts to approximately 5,400,000 discrete emission values, it is obvious that only summary reports can be presented in printed form. This amount of data is useful only when recorded on computer tape. The summary reports are presented in two forms:

- As maps showing summaries of emissions by grid square
- As tabulations showing emissions by county and for the Basin.

The model generates a computer tape that contains the fully disaggregated inventory. It is possible to generate a tape that lists emissions by link. The tape would contain approximately 258,000,000 discrete emission estimates. It is not appropriate to use individual link emission values as estimates of emission from a segment of roadway. As explained in Section 5, the accuracy of the emission estimates are very poor at this level of resolution.

In order to use the model as a predictive tool, it is necessary to be able to derive emission factors in terms of grams per mile (gm/mi) from the emission standards that will apply in future years. Currently there are no wholly satisfactory methodologies for deriving these factors. It appears that this situation will continue until a body of chassis dynamometer data using a standardized and representative driving cycle is developed. With those data it would be possible to derive accurate estimates of future emissions based on proposed standards.

One potentially useful methodology will be presented here. It makes use of data that are currently available, albiet in limited quantities. The method, like the others, is not wholly satisfactory but should enable reasonable predictions of the magnitude of emission factors for future years. Furthermore, as additional test data on existing vehicles become available, the future year predictions can be improved.

Since emission standards for medium- and heavy-duty vehicles are expressed in terms of grams per brake-horsepower hour (gm/BHp-hr) a conversion factor or factors must be determined. Expressed mathematically:

$$\text{gm/mi} = (K)\ (\text{gm/BHp-hr})_s$$

where s indicates an emission standard.

The constant K consists of two components. One, K', relates actual emissions in terms of gm/BHp-hr to the emission standards, the other relates horsepower requirements to VMT. The expanded form of the equation is:

$$\text{gm/mi} = (K'_p)\ \left(\frac{\text{BHp-hr}}{\text{mi}}\right)\ \left(\frac{\text{gm}}{\text{BHp-hr}}\right)_s$$

where p indicates a specific pollutant.

Since the relationship between actual emissions and the standards is probably pollutant specific, a unique K', and therefore K is required for each pollutant.

In principle, K' can be determined from the manufacturers compliance test data. This is analogous to comparing chassis dynamometer, gm/mi emissions for light-duty vehicles to the LDV standards. It is, however, more difficult to determine the brake-horsepower-hours per mile for an average vehicle. Therefore, data that measures K directly are the most useful.

Table 10 shows K values calculated from existing data. They were obtained by rearranging the equation above:

$$K = \left(\frac{gm}{mi} \right) / \left(\frac{gm}{GHp\text{-}hr} \right)_s$$

where gm/mi is the measured emission rate from a modal dynamometer test or road course, and $(gm/BHp\text{-}hr)_S$ is the applicable standard.

The data points labeled "ARB tests," were modal dynamometer tests conducted by the ARB, [24]. It is important to note that although these were modal tests, the combination of modes did not necessarily constitute a representative driving cycle. Instead a series of modes which were representative of observed modes was used.

Because of this, the K values derived from the road tests are probably the most representative.

In Table 11, the K value presented for CO is the average of the CO values and the NO_X and HC values are the average of the NO_X + HC values. Note that the procedure is not applicable to SO_X and particulates.

Another worker has used a similar procedure to calculate a single K value of 3.16 for all pollutants, [15].

Emission factors in terms of gm/mi are calculated by substituting for K in:

$$(gm/mi)_{s,p} = (K) \left(\frac{gm}{BHp\text{-}hr} \right)_{s,p}$$

where: $(gm/mi)_p$ = the emission factor for pollutant p,

K = the conversion factor, and

$\left(\frac{gm}{BHp\text{-}hr} \right)_{s,p}$ = the emission standard.

An alternate method has been proposed by the EPA in an unpublished document [25]. It is based on the assumption that LDV emissions factors can be scaled up on the basis of vehicle weight and fuel consumption. The approach is also reasonable although the data requirements are greater and a larger number of assumptions are required.

Table 10. Summary of K Values Calculated from Currently Available Data

Model Year and Test Conditions	K Value HC	CO	NO_x	$HC+NO_x$	Source
Gasoline					
1973-1974					
Cold start	-	1.53	-	0.74	ARB tests, [24]
Curb weight	-	1.14	-	0.81	ARB tests, [24]
50% load	-	1.39	-	0.86	ARB tests, [24]
1974					
Road course	-	3.1	-	1.51	[25]
1975-1976					
Cold start	-	1.98	-	1.00	ARB tests, [24]
Curb weight	-	1.31	-	1.24	ARB tests, [24]
50% load	-	2.18	-	1.00	ARB tests, [24]
Road course		2.73	-	0.82	[25]
1977					
Cold start	-	1.00	-	1.22	ARB tests, [24]
Curb weight	-	0.63	-	1.10	ARB tests, [24]
50% load	-	0.94	-	1.00	ARB tests, [24]
Road course	-	1.59	-	0.69	[25]
Diesel					
1974					
Road course	-	0.75	-	1.65	[25]
1975-1976					
Road course	-	0.37	-	1.41	[25]

Table 11. K Values for Future Model Years

Pollutant	Gasoline	Diesel
HC	1.01	1.53
CO	2.47	0.56
NO_x	1.01	1.53
SO_x	N.A.	N.A.
Particulate	N.A.	N.A.

N.A. means not applicable.

SECTION 8

THE EMISSIONS INVENTORY MODEL

Because of the large number of calculations and data manipulations required to produce a mobile source inventory, a computer model was required. In order to produce a detailed and useable inventory, the model was designed with the following guidelines in mind:

- The model should produce a highly disaggregated (both temporally and geographically) inventory;
- It should be easy and economical to use in terms of data input and computer time requirements;
- The output data should be useful for air quality and planning studies, providing an annual "benchmark", and be general enough to be used for other types of environmental studies.

Figure 30 shows the major operations of the model. The two (2) major components are VMT and emission factors. Other input data only correct, modify or disaggregate these fundamental inputs.

The model has the following properties:

- It is simple and economical to use.
- It uses readily obtainable data.
- It uses data that are routinely collected for other purposes by various government agencies, data such as traffic counts and and vehicle registration information. The model is designed to make maximum use of these existing data, which are very expensive to collect.
- The model can be updated easily. (Most of the required input data are updated regularly by the collecting agencies.)
- It generates a highly disaggregated inventory. Other computer models provide only Basin-wide, county-by-county or annual daily average emission rates.
- The output in the most disaggregated form is provided on industry standard computer tapes. (The volume of output data is so large that it can only be handled effectively by computer.)
- Detailed summaries of the output data by grid square and county are provided in tabular form.

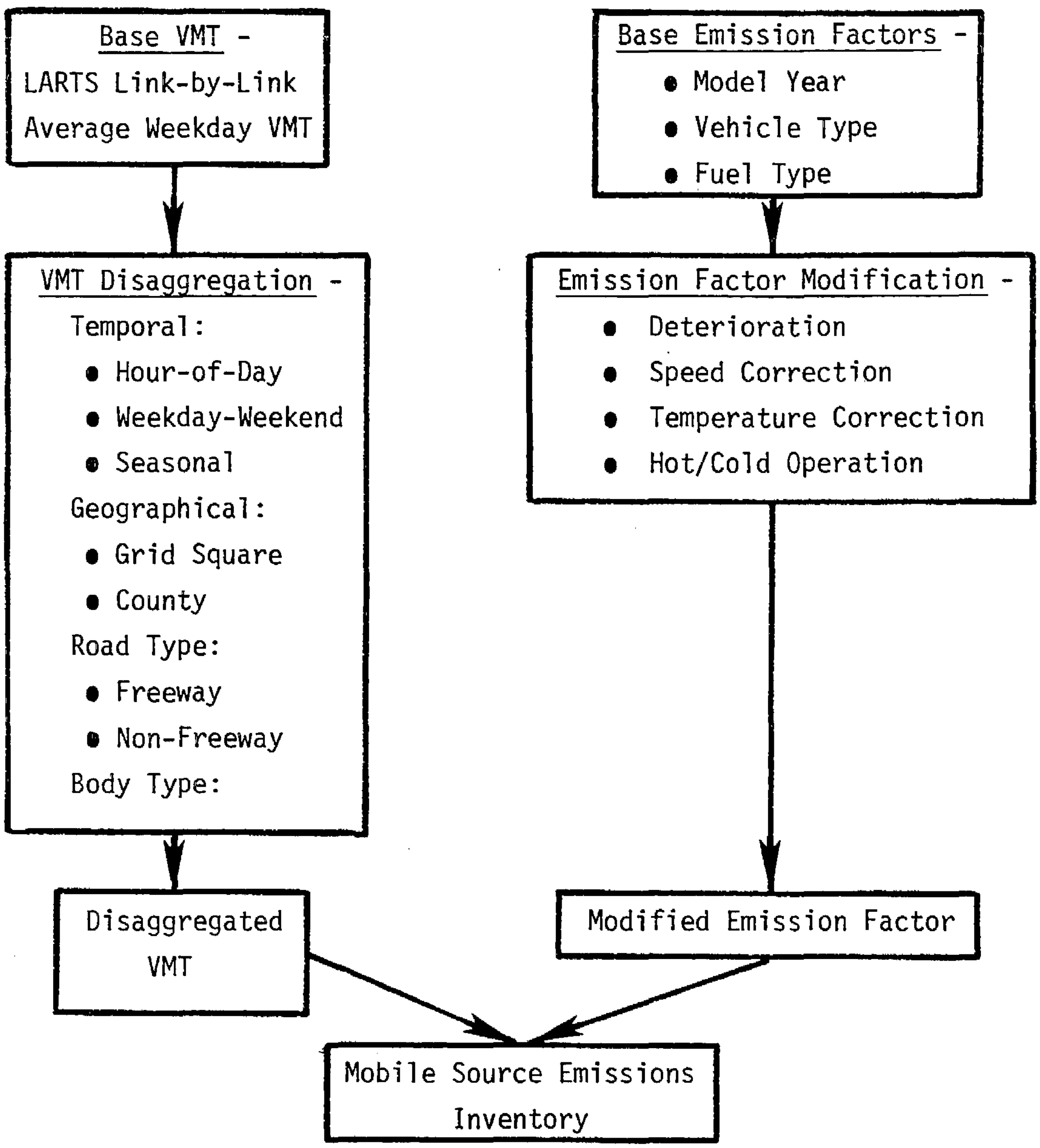

Figure 30. Major Operations Performed by the Model

- Geographical distributions are expressed in standard UTM (Universal Transverse Mecator) coordinates.
- Grid square size is variable (10 km grids were used for this inventory).

Tables 12 and 13 summarize the model inputs and outputs. Many of the inputs can be considered to be constants since they describe fundamental characteristics of the Basin. Others, such as model year distributions and total VMT, change annually. Still others, such as emission factors, can be expected to change as new research is completed. All input parameters are easily modified, making the model a useful research tool.

Table 12. Summary of Input Data

LARTS Data

- LARTS roadway network - freeway/non-freeway (converted to UTM coordinates [2]
- LARTS VMT estimates (link-by-link)
- LARTS off-peak average link speed estimates (link-by-link)
- LARTS peak average link speed estimates (link-by-link)

Vehicle Population Distribution Data

- Vehicle type distribution (body type and fuel)
- Model year distribution
- California/out-of-state distribution
- Average annual mileage

Grid Square Characteristics - All Vehicle Types

- Hourly traffic distribution
- Weekday/weekend traffic distribution
- Seasonal traffic distribution
- Peak/off-peak hours
- Population distribution

Heavy Duty Vehicle Grid Square Characteristics

- Hourly fraction of HDV versus total traffic
- Hourly body type distribution
- Weekday/weekend body type distribution
- Seasonal body type distribution

Emission Factors

- Mean emission factor
- Speed correction curves
- Temperature correction curves
- Average number of trips/day
- Average daily temperature
- Percent hot/cold operation

Table 13. Summary of Output Data

Grid Square (on computer tape only)

- Emissions by body type
- Freeway/non-freeway
- Hourly emissions
- Weekday/weekend emissions
- Seasonal emissions
- Annual total
- Annual daily average

County (hard copy)

- Body type
- Freeway/non-freeway
- Average weekday (each of four (4) seasons)
- Average weekend day (each of four (4) seasons)
- Annual average weekday
- Annual average weekend day
- Annual average day

Basin (hard copy)

- Body type
- Freeway/non-freeway
- Average weekday (each of four (4) seasons)
- Average weekend day (each of four (4) seasons)
- Annual average weekday
- Annual average weekend day
- Annual average day

SECTION 9

1975 Heavy-Duty Vehicle Emissions Inventory

This section summarizes the assumptions used to calculate the inventory and presents the results. The inventory was developed using emission factors provided by the ARB (except for the SO_x factors). For purposes of comparison, another inventory, developed using AP-42, Supplement 5 emission factors, is presented in Section 10. It is believed, however, that the inventory using the ARB factors is the most reliable.

The large number of assumptions that were required can be classified into two (2) major categories. Those that simplified a complicated or insoluble problem or those required because no hard data were available. The following is a list of the major assumptions:

- LARTS traffic volume for calendar year 1975 was 5.5% higher than for 1974. This assumption, recommended by CalTrans, was necessary because the LARTS model was not run for 1975 [17].

- The total annual average daily VMT for heavy-duty vehicles in the South Coast Air Basin (4 county) was 1.63×10^7 VMT; (2.85×10^6 VMT freeway and 1.34×10^7 VMT non-freeway). This value was obtained by applying the necessary weekday/weekend correction factors (LARTS provides average weekday VMT estimates only) and then individually summing the VMT on each link in the Basin [2].*

- The fraction of the total VMT driven by the heavy-duty vehicles is calculated by the model: the fraction varies with location in the Basin. The average fraction is 10.5%. (1.63×10^7 VMT for HDVs; 1.56×10^8 VMT for all vehicles).*

- The average speeds on each link (as distinguished from an instantaneous average speed) were assumed to be the LARTS policy speeds [19].*

- All of the out-of-state vehicles were tractors. This introduces small errors since only a few buses cross the state line and very few HDVs of other body types would be expected to.

- Out-of-state vehicles (all tractors) consist of 3.5% of the total HDV VMT in the Basin. This is based on limited data developed by the University of California at Berkeley [26].*

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*There is additional information on these subjects in the Appendix.

- No seasonal changes in HDV use patterns occur. Although for the SCAB this probably does not introduce any major errors, the assumption was required because no data are available.

- It was assumed that the distribution of HDV body types with location was constant, an assumption which introduces some error. It was necessary because the data required to estimate the variation do not exist.

- Emission factors, except for SO_x, were supplied by the ARB [13].*

- Average gasoline sulfur content was assumed to be 0.06%. This value was used to calculate the SO_x emission factors for gasoline vehicles.

- The speed correction factor coefficients used were those developed by TRW in the previous study [2].*

- The number of trips per day were assumed to be [13]:
  - MDV gasoline: 9.3 trips/day
  - HDV gasoline: 9.5 trips/day
  - HDV diesel: 9.5 trips/day

- Hot/cold operation split was assumed to be [5], [13]:
  - cold start 20%
  - hot start 27%
  - hot cruise 53%

Tables 14 through 23 and Figures 31 through 54 present the 1975 Heavy-duty vehicle emission inventory for the South Coast Air Basin (4-county).

Tabulations:

Table 14	1975 Emissions inventory for	- SCAB
Table 15		- Los Angeles Co. (SCAB portion)
Table 16		- Orange County
Table 17		- Riverside Co. (SCAB portion)
Table 18		- San Bernardino Co. (SCAB por.)
Table 19	1975 Organic emissions summary	- SCAB
Table 20		- Los Angeles Co. (SCAB por.)
Table 21		- Orange County
Table 22		- Riverside Co. (SCAB portion)
Table 23		- San Bernardino Co. (SCAB por.)

*There is additional information on these subjects in the Appendix.

Maps - Grid Square Summaries:

Table 14. 1975 Emissions Inventory for The South Coast Air Basin (Tons/Day)

SOUTH COAST AIR BASIN

	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	35.7	82.7	118.4	230.6	663.0	893.5	47.2	248.1	295.4	3.9	18.2	22.1	4.3	19.5	23.8
WEEK END	28.4	64.5	92.9	155.0	482.2	637.2	38.7	211.0	249.7	3.3	15.3	18.5	3.5	16.0	19.4
SPRING															
WEEK DAY	37.9	95.1	133.0	243.6	748.7	992.2	48.9	275.0	323.9	4.0	20.1	24.1	4.4	21.5	25.9
WEEK END	29.9	76.7	106.6	163.6	570.6	734.2	40.0	244.7	284.8	3.4	17.6	20.9	3.6	18.4	22.0
SUMMER															
WEEK DAY	36.9	95.6	132.5	235.7	761.2	996.9	48.3	286.4	334.7	4.0	21.1	25.1	4.4	22.5	27.0
WEEK END	29.3	76.4	105.7	159.4	574.2	733.6	40.1	252.2	292.3	3.4	18.3	21.7	3.6	19.2	22.8
FALL															
WEEK DAY	36.3	86.7	123.0	233.1	689.6	922.7	48.0	259.5	307.5	4.0	19.1	23.1	4.4	20.4	24.8
WEEK END	28.2	67.8	96.0	150.4	504.7	655.1	37.9	222.1	260.0	3.2	16.1	19.3	3.4	16.9	20.3
ANNUAL AVG.															
WEEK DAY	36.7	90.0	126.7	235.7	715.6	951.3	48.1	267.3	315.4	4.0	19.7	23.6	4.4	21.0	25.4
WEEK END	29.0	71.3	100.3	157.1	532.9	690.0	39.2	232.5	271.7	3.3	16.8	20.1	3.5	17.6	21.1
DAY	34.5	84.7	119.2	213.3	663.4	876.7	45.6	257.3	302.9	3.8	19.8	22.6	4.1	20.0	24.2
PICKUP GAS 6000	7.1	16.8	23.9	37.8	110.2	148.1	5.6	37.5	43.0	.3	1.2	1.4	.4	1.9	2.4
PICKUP GAS 8500	14.8	35.9	50.6	102.6	345.6	448.2	9.8	51.3	61.1	.5	2.1	2.6	.9	4.3	5.2
TRAC. GAS 10000	.8	2.5	3.3	6.3	23.4	29.7	.6	3.3	3.9	.0	.1	.2	.1	.4	.5
TRAC. DSL 10000	2.2	8.3	10.5	9.5	20.8	30.3	17.9	105.6	123.5	2.1	11.0	13.1	1.6	8.7	10.3
BUS GAS 10000	1.2	1.6	2.7	7.7	12.1	19.8	.6	1.6	2.2	.0	.1	.1	.1	.2	.2
BUS DSL 10000	.1	.3	.3	.3	.7	1.0	.6	3.2	3.8	.0	.1	.1	.0	.2	.2
DUMP GAS 10000	.5	1.0	1.5	2.6	7.9	10.4	.2	1.0	1.2	.0	.0	.1	.0	.1	.1
DUMP DSL 10000	.2	.6	.7	.8	1.6	2.4	1.5	6.8	8.3	.2	.7	.9	.1	.5	.6
FLAT. GAS 6000	.5	1.0	1.5	2.4	6.6	9.0	.3	1.9	2.2	.0	.1	.1	.0	.1	.1
FLAT. GAS 8500	1.0	2.2	3.2	6.1	18.5	24.6	.5	2.5	3.1	.0	.1	.1	.1	.3	.3
FLAT. GAS 10000	2.1	4.4	6.5	12.3	38.1	50.4	1.1	5.2	6.2	.1	.2	.3	.1	.6	.7
FLAT. DSL 10000	.1	.2	.3	.3	.6	1.0	.6	2.8	3.3	.1	.3	.4	.0	.2	.2
TANK GAS 10000	.2	.6	.8	1.5	5.4	6.8	.1	.8	.9	.0	.0	.0	.0	.1	.1
TANK DSL 10000	.1	.5	.7	.6	1.3	1.9	1.2	6.7	7.9	.1	.7	.8	.1	.4	.5
VAN GAS 6000	.3	.8	1.1	1.7	5.1	6.8	.3	1.7	2.0	.0	.1	.1	.0	.1	.1
VAN GAS 8500	.6	1.6	2.2	4.4	15.5	19.9	.4	2.3	2.7	.0	.1	.1	.0	.2	.2
VAN GAS 10000	2.2	4.8	7.1	14.1	43.9	58.0	1.3	6.3	7.6	.1	.3	.3	.1	.6	.7
VAN DSL 10000	.1	.2	.3	.3	.6	1.0	.6	2.8	3.4	.1	.3	.4	.0	.2	.2
TRAC GAS NONCAL	.1	.4	.5	.8	3.3	4.1	.1	.4	.5	.0	.0	.0	.0	.1	.1
TRAC DSL NONCAL	.3	1.2	1.5	1.1	2.3	3.4	2.4	13.8	16.1	.3	1.4	1.6	.2	1.1	1.3

Table 15. 1975 Emissions Inventory for Los Angeles County* (Tons/Day)

LOS ANGELES COUNTY	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	24.0	58.1	82.1	159.6	470.5	630.0	31.0	171.6	202.6	2.6	12.6	15.2	2.9	13.5	16.4
WEEK END	18.7	42.6	61.3	103.9	317.7	421.6	24.9	139.0	163.9	2.1	10.1	12.2	2.2	10.5	12.8
SPRING															
WEEK DAY	25.5	66.3	91.8	167.7	527.0	694.7	31.9	188.5	220.3	2.7	13.8	16.5	2.9	14.8	17.7
WEEK END	19.7	50.0	69.7	109.6	370.7	480.2	25.7	159.0	184.7	2.2	11.4	13.6	2.3	12.0	14.3
SUMMER															
WEEK DAY	25.1	65.9	91.1	165.8	529.2	695.0	32.3	193.6	225.9	2.7	14.3	17.0	3.0	15.3	18.3
WEEK END	19.6	49.8	69.4	109.4	372.9	482.3	26.4	163.7	190.2	2.3	11.9	14.2	2.4	12.5	14.9
FALL															
WEEK DAY	24.6	60.2	84.9	162.5	483.7	646.2	31.7	177.3	209.0	2.7	13.1	15.8	2.9	14.0	17.0
WEEK END	18.7	44.0	62.7	102.2	325.9	428.1	24.7	143.4	168.1	2.1	10.4	12.6	2.2	10.9	13.2
ANNUAL AVG.															
WEEK DAY	24.8	62.6	87.5	163.9	502.6	666.5	31.7	182.7	214.4	2.7	13.5	16.1	2.9	14.4	17.3
WEEK END	19.2	46.6	65.8	106.3	346.8	453.1	25.4	151.3	176.7	2.2	11.0	13.1	2.3	11.5	13.8
DAY	23.2	58.1	81.3	147.4	458.1	605.5	29.9	173.7	203.7	2.5	12.8	15.3	2.8	13.6	16.3
PICKUP GAS 6000	4.8	11.5	16.3	25.9	76.3	102.2	3.7	25.2	28.9	.2	.8	1.0	.3	1.3	1.6
PICKUP GAS 8500	9.8	24.4	34.3	70.7	236.9	307.7	6.4	34.7	41.1	.3	1.4	1.7	.6	2.9	3.5
TRAC. GAS 10000	.6	1.7	2.2	4.4	15.9	20.2	.4	2.2	2.6	.0	.1	.1	.1	.3	.3
TRAC. DSL 10000	1.5	5.7	7.1	6.8	14.6	21.4	11.8	71.0	82.7	1.4	7.4	8.8	1.1	5.8	6.9
BUS GAS 10000	.8	1.1	1.9	5.4	8.3	13.7	.4	1.1	1.4	.0	.0	.1	.0	.1	.2
BUS DSL 10000	.1	.2	.2	.2	.5	.7	.4	2.2	2.6	.0	.0	.1	.0	.1	.2
DUMP GAS 10000	.3	.7	1.0	1.8	5.5	7.3	.1	.7	.8	.0	.0	.0	.0	.1	.1
DUMP DSL 10000	.1	.4	.5	.6	1.2	1.7	1.0	4.7	5.7	.1	.5	.6	.1	.3	.4
FLAT. GAS 6000	.3	.7	1.0	1.7	4.7	6.3	.2	1.3	1.5	.0	.0	.1	.0	.1	.1
FLAT. GAS 8500	.7	1.5	2.2	4.2	13.0	17.2	.4	1.7	2.1	.0	.1	.1	.0	.2	.2
FLAT. GAS 10000	1.4	3.1	4.5	8.5	26.8	35.4	.7	3.6	4.3	.0	.2	.2	.1	.4	.5
FLAT. DSL 10000	.1	.2	.2	.2	.5	.7	.4	1.9	2.3	.0	.2	.2	.0	.1	.2
TANK GAS 10000	.1	.4	.5	1.0	3.6	4.6	.1	.5	.6	.0	.0	.0	.0	.1	.1
TANK DSL 10000	.1	.4	.5	.4	.9	1.4	.8	4.5	5.3	.1	.5	.6	.1	.3	.4
VAN GAS 6000	.2	.5	.7	1.2	3.5	4.7	.2	1.2	1.3	.0	.0	.0	.0	.1	.1
VAN GAS 8500	.4	1.1	1.5	3.1	10.6	13.6	.3	1.6	1.8	.0	.1	.1	.0	.1	.2
VAN GAS 10000	1.5	3.4	5.0	9.8	30.9	40.7	.9	4.3	5.2	.0	.2	.2	.1	.4	.5
VAN DSL 10000	.1	.2	.2	.2	.5	.7	.4	1.9	2.3	.0	.2	.2	.0	.1	.1
TRAC GAS NONCAL	.1	.3	.4	.6	2.2	2.8	.0	.3	.3	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.2	.8	1.0	.8	1.6	2.4	1.6	9.2	10.8	.2	.9	1.1	.1	.7	.9

*South Coast Air Basin portion only.

Table 16. 1975 Emissions Inventory for Orange County (Tons/Day)

ORANGE COUNTY

	HYDROCARBONS N-FWY	HYDROCARBONS FWY	HYDROCARBONS TOTAL	CARBON MONOXIDE N-FWY	CARBON MONOXIDE FWY	CARBON MONOXIDE TOTAL	NITROGEN OXIDES N-FWY	NITROGEN OXIDES FWY	NITROGEN OXIDES TOTAL	SULFUR DIOXIDE N-FWY	SULFUR DIOXIDE FWY	SULFUR DIOXIDE TOTAL	PARTICULATES N-FWY	PARTICULATES FWY	PARTICULATES TOTAL
WINTER															
WEEK DAY	6.7	14.6	21.4	42.6	116.9	159.5	9.9	46.0	55.9	.8	3.4	4.2	.9	3.6	4.5
WEEK END	5.3	12.3	17.6	28.3	93.7	122.1	8.0	41.5	49.5	.7	3.0	3.7	.7	3.1	3.8
SPRING															
WEEK DAY	7.1	17.0	24.1	44.8	133.6	178.4	10.2	51.6	61.8	.8	3.8	4.6	.9	4.0	4.9
WEEK END	5.6	15.0	20.6	29.9	113.4	143.3	8.2	49.3	57.5	.7	3.6	4.2	.7	3.7	4.4
SUMMER															
WEEK DAY	7.0	17.5	24.5	44.0	139.4	183.4	10.3	55.2	65.5	.8	4.1	4.9	.9	4.3	5.2
WEEK END	5.6	15.0	20.6	29.6	115.1	144.7	8.4	51.2	59.6	.7	3.7	4.4	.7	3.9	4.6
FALL															
WEEK DAY	6.9	15.8	22.7	43.3	125.7	169.0	10.1	49.7	59.8	.8	3.7	4.5	.9	3.9	4.8
WEEK END	5.3	13.4	18.8	27.7	102.2	130.0	7.9	45.6	53.5	.7	3.3	4.0	.7	3.5	4.2
ANNUAL AVG.															
WEEK DAY	6.9	16.2	23.2	43.7	128.9	172.6	10.1	50.6	60.7	.8	3.7	4.5	.9	3.9	4.8
WEEK END	5.5	13.9	19.4	28.9	106.1	135.0	8.1	46.9	55.0	.7	3.4	4.1	.7	3.6	4.3
DAY	6.5	15.6	22.1	39.4	122.4	161.8	9.5	49.6	59.1	.8	3.6	4.4	.8	3.8	4.7
PICKUP GAS 6000	1.4	3.1	4.5	7.1	20.3	27.3	1.1	7.2	8.3	.1	.2	.3	.1	.4	.5
PICKUP GAS 8500	2.8	6.6	9.4	19.0	64.4	83.4	2.0	9.8	11.8	.1	.4	.5	.2	.8	1.0
TRAC. GAS 10000	.2	.5	.6	1.2	4.5	5.7	.1	.7	.8	.0	.0	.0	.0	.1	.1
TRAC. DSL 10000	.4	1.6	2.0	1.7	3.8	5.5	3.8	20.7	24.5	.4	2.2	2.6	.3	1.7	2.0
BUS GAS 10000	.2	.3	.5	1.4	2.3	3.7	.1	.3	.4	.0	.0	.0	.0	.0	.0
BUS DSL 10000	.0	.0	.1	.1	.1	.2	.1	.6	.7	.0	.0	.0	.0	.0	.0
DUMP GAS 10000	.1	.2	.3	.5	1.4	1.9	.0	.2	.2	.0	.0	.0	.0	.0	.0
DUMP DSL 10000	.0	.1	.1	.1	.3	.4	.3	1.2	1.6	.0	.1	.2	.0	.1	.1
FLAT. GAS 6000	.1	.2	.3	.4	1.1	1.6	.1	.3	.4	.0	.0	.0	.0	.0	.0
FLAT. GAS 8500	.2	.4	.6	1.1	3.3	4.4	.1	.5	.6	.0	.0	.0	.0	.0	.1
FLAT. GAS 10000	.4	.8	1.2	2.3	6.8	9.1	.2	.9	1.2	.0	.0	.1	.0	.1	.1
FLAT. DSL 10000	.0	.0	.1	.1	.1	.2	.1	.5	.6	.0	.1	.1	.0	.0	.0
TANK GAS 10000	.0	.1	.1	.3	1.0	1.3	.0	.1	.2	.0	.0	.0	.0	.0	.0
TANK DSL 10000	.0	.1	.1	.1	.2	.4	.2	1.3	1.6	.0	.1	.2	.0	.1	.1
VAN GAS 6000	.1	.1	.2	.3	.9	1.3	.1	.3	.4	.0	.0	.0	.0	.0	.0
VAN GAS 8500	.1	.3	.4	.8	2.9	3.7	.1	.4	.5	.0	.0	.0	.0	.0	.0
VAN GAS 10000	.4	.8	1.2	2.6	7.8	10.4	.3	1.1	1.4	.0	.0	.1	.0	.1	.1
VAN DSL 10000	.0	.0	.1	.1	.1	.2	.1	.5	.6	.0	.1	.1	.0	.0	.0
TRAC GAS NONCAL	.0	.1	.1	.1	.6	.8	.0	.1	.1	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.1	.2	.3	.2	.4	.6	.5	2.7	3.2	.1	.3	.3	.0	.2	.3

Table 17. 1975 Emissions Inventory for Riverside County* (Tons/Day)

RIVERSIDE COUNTY	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	2.5	3.5	6.0	10.9	22.0	32.8	2.7	9.1	11.8	.2	.7	.9	.2	.7	.9
WEEK END	2.3	3.6	5.9	9.0	23.0	32.0	2.5	9.9	12.4	.2	.7	.9	.2	.7	1.0
SPRING															
WEEK DAY	2.6	4.1	6.8	11.9	26.7	38.6	2.9	10.9	13.7	.2	.8	1.0	.2	.8	1.1
WEEK END	2.4	4.5	6.9	9.5	29.7	39.2	2.6	12.6	15.1	.2	.9	1.1	.2	.9	1.2
SUMMER															
WEEK DAY	2.4	4.4	6.8	9.7	29.7	39.4	2.4	12.4	14.7	.2	.9	1.1	.2	1.0	1.2
WEEK END	2.2	4.5	6.7	7.9	30.0	37.8	2.2	13.0	15.2	.2	.9	1.1	.2	1.0	1.2
FALL															
WEEK DAY	2.5	3.8	6.2	10.4	24.3	34.7	2.6	10.1	12.7	.2	.7	.9	.2	.8	1.0
WEEK END	2.2	4.0	6.3	8.0	26.3	34.3	2.2	11.4	13.7	.2	.8	1.0	.2	.9	1.1
ANNUAL AVG.															
WEEK DAY	2.5	3.9	6.4	10.7	25.7	36.4	2.6	10.6	13.2	.2	.8	1.0	.2	.8	1.0
WEEK END	2.3	4.1	6.4	8.6	27.2	35.8	2.4	11.7	14.1	.2	.8	1.0	.2	.9	1.1
DAY	2.4	4.0	6.4	10.1	26.1	36.2	2.5	10.9	13.5	.2	.8	1.0	.2	.8	1.1
PICKUP GAS 6000	.5	.8	1.2	1.9	4.3	6.2	.3	1.6	1.9	.0	.0	.1	.0	.1	.1
PICKUP GAS 8500	1.2	1.9	3.1	4.9	14.0	19.0	.6	2.2	2.8	.0	.1	.1	.1	.2	.2
TRAC. GAS 10000	.0	.1	.2	.3	1.0	1.3	.0	.1	.2	.0	.0	.0	.0	.0	.0
TRAC. DSL 10000	.1	.3	.4	.4	.8	1.1	1.0	4.6	5.5	.1	.5	.6	.1	.4	.5
BUS GAS 10000	.1	.1	.2	.3	.5	.8	.0	.1	.1	.0	.0	.0	.0	.0	.0
BUS DSL 10000	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0	.0
DUMP GAS 10000	.0	.0	.1	.1	.3	.4	.0	.0	.0	.0	.0	.0	.0	.0	.0
DUMP DSL 10000	.0	.0	.0	.0	.0	.1	.1	.3	.3	.0	.0	.0	.0	.0	.0
FLAT. GAS 6000	.0	.0	.1	.1	.2	.3	.0	.1	.1	.0	.0	.0	.0	.0	.0
FLAT. GAS 8500	.1	.1	.2	.3	.7	.9	.0	.1	.1	.0	.0	.0	.0	.0	.0
FLAT. GAS 10000	.1	.2	.3	.6	1.4	1.9	.1	.2	.3	.0	.0	.0	.0	.0	.0
FLAT. DSL 10000	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
TANK GAS 10000	.0	.0	.0	.1	.2	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
TANK DSL 10000	.0	.0	.0	.0	.0	.1	.1	.3	.4	.0	.0	.0	.0	.0	.0
VAN GAS 6000	.0	.0	.1	.1	.2	.3	.0	.1	.1	.0	.0	.0	.0	.0	.0
VAN GAS 8500	.0	.1	.1	.2	.6	.8	.0	.1	.1	.0	.0	.0	.0	.0	.0
VAN GAS 10000	.1	.2	.3	.7	1.6	2.2	.1	.2	.3	.0	.0	.0	.0	.0	.0
VAN DSL 10000	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.0	.1	.0	.1	.1	.1	.6	.7	.0	.1	.1	.0	.0	.1

*South Coast Air Basin portion only.

Table 18. 1975 Emissions Inventory for San Bernardino County* (Tons/Day)

SAN BERNARDINO COUNTY	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	2.4	6.6	9.0	17.6	53.5	71.1	3.7	21.4	25.1	.3	1.5	1.8	.3	1.7	2.0
WEEK END	2.1	6.0	8.0	13.9	47.7	61.6	3.4	20.5	23.9	.3	1.5	1.7	.3	1.5	1.8
SPRING															
WEEK DAY	2.6	7.7	10.3	19.1	61.4	80.5	3.9	24.1	28.0	.3	1.7	2.0	.4	1.8	2.2
WEEK END	2.2	7.2	9.4	14.6	56.9	71.5	3.5	23.9	27.4	.3	1.7	2.0	.3	1.8	2.1
SUMMER															
WEEK DAY	2.3	7.8	10.1	16.2	62.9	79.0	3.4	25.2	28.7	.3	1.8	2.1	.3	2.0	2.3
WEEK END	1.9	7.1	9.0	12.5	56.4	68.9	3.1	24.3	27.3	.3	1.7	2.0	.3	1.8	2.1
FALL															
WEEK DAY	2.4	6.9	9.3	17.0	55.9	72.9	3.6	22.5	26.1	.3	1.6	1.9	.3	1.7	2.1
WEEK END	1.9	6.3	8.3	12.5	50.2	62.7	3.1	21.7	24.7	.3	1.6	1.8	.3	1.6	1.9
ANNUAL AVG.															
WEEK DAY	2.4	7.2	9.6	17.5	58.4	75.9	3.7	23.3	27.0	.3	1.7	2.0	.3	1.8	2.1
WEEK END	2.0	6.7	8.7	13.4	52.8	66.2	3.3	22.6	25.8	.3	1.6	1.9	.3	1.7	2.0
DAY	2.3	7.1	9.4	16.3	56.8	73.1	3.6	23.1	26.7	.3	1.7	2.0	.3	1.8	2.1
PICKUP GAS 6000	.5	1.4	1.9	2.9	9.4	12.3	.4	3.4	3.9	.0	.1	.1	.0	.2	.2
PICKUP GAS 8500	1.0	3.0	3.9	7.9	30.2	38.2	.8	4.7	5.5	.0	.2	.2	.1	.4	.5
TRAC. GAS 10000	.1	.2	.3	.5	2.0	2.5	.0	.3	.3	.0	.0	.0	.0	.0	.0
TRAC. DSL 10000	.2	.7	.9	.7	1.6	2.3	1.4	9.4	10.7	.2	1.0	1.1	.1	.8	.9
BUS GAS 10000	.1	.1	.2	.6	1.1	1.6	.0	.1	.2	.0	.0	.0	.0	.0	.0
BUS DSL 10000	.0	.0	.0	.0	.1	.1	.1	.3	.3	.0	.0	.0	.0	.0	.0
DUMP GAS 10000	.0	.1	.1	.2	.7	.8	.0	.1	.1	.0	.0	.0	.0	.0	.0
DUMP DSL 10000	.0	.0	.1	.1	.1	.2	.1	.6	.7	.0	.1	.1	.0	.0	.0
FLAT. GAS 6000	.0	.1	.1	.2	.5	.7	.0	.2	.2	.0	.0	.0	.0	.0	.0
FLAT. GAS 8500	.1	.2	.2	.5	1.5	2.0	.0	.2	.3	.0	.0	.0	.0	.0	.0
FLAT. GAS 10000	.1	.3	.5	.9	3.1	4.1	.1	.5	.5	.0	.0	.0	.0	.0	.1
FLAT. DSL 10000	.0	.0	.0	.0	.0	.1	.0	.2	.3	.0	.0	.0	.0	.0	.0
TANK GAS 10000	.0	.0	.1	.1	.5	.6	.0	.1	.1	.0	.0	.0	.0	.0	.0
TANK DSL 10000	.0	.0	.1	.0	.1	.1	.1	.6	.7	.0	.1	.1	.0	.0	.0
VAN GAS 6000	.0	.1	.1	.1	.4	.6	.0	.2	.2	.0	.0	.0	.0	.0	.0
VAN GAS 8500	.0	.1	.2	.3	1.4	1.7	.0	.2	.2	.0	.0	.0	.0	.0	.0
VAN GAS 10000	.1	.4	.5	1.1	3.6	4.7	.1	.6	.7	.0	.0	.0	.0	.0	.1
VAN DSL 10000	.0	.0	.0	.0	.0	.1	.0	.2	.3	.0	.0	.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.1	.3	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.1	.1	.1	.2	.3	.2	1.2	1.4	.0	.1	.1	.0	.1	.1

*South Coast Air Basin portion only.

Table 19. 1975 Organic Emissions Summary for The South Coast Air Basin (Tons/Day)

SOUTH COAST AIR BASIN

	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	22.8	71.0	93.8	12.3	9.6	21.9	.5	2.1	2.7	35.7	82.7	118.4
WEEK END	15.8	53.3	69.1	12.3	9.6	21.9	.3	1.6	1.9	28.4	64.5	92.9
SPRING												
WEEK DAY	25.0	83.1	108.2	12.3	9.6	21.9	.5	2.4	2.9	37.9	95.1	133.0
WEEK END	17.2	65.3	82.6	12.3	9.6	21.9	.4	1.8	2.1	29.9	76.7	106.6
SUMMER												
WEEK DAY	24.0	83.5	107.5	12.3	9.6	21.9	.5	2.5	3.0	36.9	95.6	132.5
WEEK END	16.7	65.0	81.6	12.3	9.6	21.9	.4	1.9	2.2	29.3	76.4	105.7
FALL												
WEEK DAY	23.4	74.9	98.3	12.3	9.6	21.9	.5	2.2	2.8	36.3	86.7	123.0
WEEK END	15.5	56.5	72.1	12.3	9.6	21.9	.3	1.6	2.0	28.2	67.8	96.0
ANNUAL AVG.												
WEEK DAY	23.8	78.1	101.9	12.3	9.6	21.9	.5	2.3	2.8	36.7	90.0	126.7
WEEK END	16.3	60.0	76.3	12.3	9.6	21.9	.3	1.7	2.1	29.0	71.3	100.3
DAY	21.7	73.0	94.6	12.3	9.6	21.9	.5	2.1	2.6	34.5	84.7	119.2
PICKUP GAS 6000	3.9	14.1	18.0	3.1	2.4	5.6	.1	.3	.3	7.1	16.8	23.9
PICKUP GAS 8500	9.1	30.5	39.6	5.4	4.2	9.7	.2	1.1	1.4	14.8	35.9	50.6
TRAC. GAS 10000	.6	2.2	2.8	.2	.2	.4	.0	.1	.1	.8	2.5	3.3
TRAC. DSL 10000	2.2	8.3	10.5	0.0	0.0	0.0	0.0	0.0	0.0	2.2	8.3	10.5
BUS GAS 10000	.8	1.2	1.9	.4	.3	.7	.0	.1	.1	1.2	1.6	2.7
BUS DSL 10000	.1	.3	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.3
DUMP GAS 10000	.3	.8	1.1	.2	.2	.4	.0	.0	.1	.5	1.0	1.5
DUMP DSL 10000	.2	.6	.7	0.0	0.0	0.0	0.0	0.0	0.0	.2	.6	.7
FLAT. GAS 6000	.2	.8	1.0	.3	.2	.5	.0	.0	.0	.5	1.0	1.5
FLAT. GAS 8500	.6	1.7	2.3	.4	.3	.8	.0	.1	.1	1.0	2.2	3.2
FLAT. GAS 10000	1.2	3.6	4.7	.9	.7	1.5	.0	.2	.2	2.1	4.4	6.5
FLAT. DSL 10000	.1	.2	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.3
TANK GAS 10000	.1	.5	.6	.1	.0	.1	.0	.0	.0	.2	.6	.8
TANK DSL 10000	.1	.5	.7	0.0	0.0	0.0	0.0	0.0	0.0	.1	.5	.7
VAN GAS 6000	.2	.6	.8	.1	.1	.2	.0	.0	.0	.3	.8	1.1
VAN GAS 8500	.4	1.4	1.8	.2	.2	.4	.0	.1	.1	.6	1.6	2.2
VAN GAS 10000	1.3	4.0	5.2	.9	.7	1.6	.0	.2	.2	2.2	4.8	7.1
VAN DSL 10000	.1	.2	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.3
TRAC GAS NONCAL	.1	.3	.4	.1	.0	.1	.0	.0	.0	.1	.4	.5
TRAC DSL NONCAL	.3	1.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	.3	1.2	1.5

Table 20. 1975 Organic Emissions Summary for Los Angeles County* (Tons/Day)

LOS ANGELES COUNTY

	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	15.7	50.2	65.9	8.0	6.4	14.4	.4	1.5	1.9	24.0	58.1	82.1
WEEK END	10.5	35.2	45.7	8.0	6.4	14.4	.2	1.0	1.2	18.7	42.6	61.3
SPRING												
WEEK DAY	17.2	58.3	75.4	8.0	6.4	14.4	.4	1.6	2.0	25.5	66.3	91.8
WEEK END	11.5	42.5	54.0	8.0	6.4	14.4	.2	1.2	1.4	19.7	50.0	69.7
SUMMER												
WEEK DAY	16.8	57.8	74.6	8.0	6.4	14.4	.4	1.7	2.1	25.1	65.9	91.1
WEEK END	11.4	42.2	53.6	8.0	6.4	14.4	.2	1.2	1.4	19.6	49.8	69.4
FALL												
WEEK DAY	16.3	52.3	68.5	8.0	6.4	14.4	.4	1.6	1.9	24.6	60.2	84.9
WEEK END	10.5	36.5	47.0	8.0	6.4	14.4	.2	1.1	1.3	18.7	44.0	62.7
ANNUAL AVG.												
WEEK DAY	16.5	54.6	71.1	8.0	6.4	14.4	.4	1.6	2.0	24.8	62.6	87.5
WEEK END	11.0	39.1	50.1	8.0	6.4	14.4	.2	1.1	1.3	19.2	46.6	65.8
DAY	14.9	50.2	65.1	8.0	6.4	14.4	.3	1.5	1.8	23.2	58.1	81.3
PICKUP GAS 6000	2.7	9.7	12.3	2.0	1.7	3.7	.0	.2	.2	4.8	11.5	16.3
PICKUP GAS 8500	6.3	20.9	27.2	3.4	2.7	6.2	.2	.8	.9	9.8	24.4	34.3
TRAC. GAS 10000	.4	1.5	1.9	.1	.1	.3	.0	.1	.1	.6	1.7	2.2
TRAC. DSL 10000	1.5	5.7	7.1	0.0	0.0	0.0	0.0	0.0	0.0	1.5	5.7	7.1
BUS GAS 10000	.5	.8	1.3	.3	.2	.5	.0	.0	.1	.8	1.1	1.9
BUS DSL 10000	.1	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2
DUMP GAS 10000	.2	.6	.7	.1	.1	.2	.0	.0	.0	.3	.7	1.0
DUMP DSL 10000	.1	.4	.5	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.5
FLAT. GAS 6000	.2	.5	.7	.2	.1	.3	.0	.0	.0	.3	.7	1.0
FLAT. GAS 8500	.4	1.2	1.6	.3	.2	.5	.0	.1	.1	.7	1.5	2.2
FLAT. GAS 10000	.8	2.5	3.3	.6	.5	1.0	.0	.1	.1	1.4	3.1	4.5
FLAT. DSL 10000	.1	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2
TANK GAS 10000	.1	.3	.4	.0	.0	.1	.0	.0	.0	.1	.4	.5
TANK DSL 10000	.1	.4	.5	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.5
VAN GAS 6000	.1	.4	.6	.1	.1	.2	.0	.0	.0	.2	.5	.7
VAN GAS 8500	.3	1.0	1.2	.1	.1	.2	.0	.0	.0	.4	1.1	1.5
VAN GAS 10000	.9	2.8	3.7	.6	.5	1.2	.0	.1	.1	1.5	3.4	5.0
VAN DSL 10000	.1	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2
TRAC GAS NONCAL	.1	.2	.3	.0	.0	.1	.0	.0	.0	.1	.3	.4
TRAC DSL NONCAL	.2	.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	.8	1.0

*South Coast Air Basin portion only.

Table 21. 1975 Organic Emissions Summary for Orange County (Tons/Day)

ORANGE COUNTY	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	4.3	12.6	16.9	2.4	1.6	4.0	.1	.4	.5	6.7	14.6	21.4
WEEK END	2.9	10.4	13.3	2.4	1.6	4.0	.1	.3	.4	5.3	12.3	17.6
SPRING												
WEEK DAY	4.7	15.0	19.6	2.4	1.6	4.0	.1	.4	.5	7.1	17.0	24.1
WEEK END	3.2	13.0	16.2	2.4	1.6	4.0	.1	.4	.4	5.6	15.0	20.6
SUMMER												
WEEK DAY	4.5	15.4	20.0	2.4	1.6	4.0	.1	.5	.6	7.0	17.5	24.5
WEEK END	3.1	13.1	16.2	2.4	1.6	4.0	.1	.4	.4	5.6	15.0	20.6
FALL												
WEEK DAY	4.4	13.8	18.2	2.4	1.6	4.0	.1	.4	.5	6.9	15.8	22.7
WEEK END	2.9	11.5	14.4	2.4	1.6	4.0	.1	.3	.4	5.3	13.4	18.8
ANNUAL AVG.												
WEEK DAY	4.5	14.2	18.7	2.4	1.6	4.0	.1	.4	.5	6.9	16.2	23.2
WEEK END	3.0	12.0	15.0	2.4	1.6	4.0	.1	.3	.4	5.5	13.9	19.4
DAY	4.1	13.6	17.6	2.4	1.6	4.0	.1	.4	.5	6.5	15.6	22.1
PICKUP GAS 6000	.8	2.6	3.4	.6	.4	1.0	.0	.1	.1	1.4	3.1	4.5
PICKUP GAS 8500	1.7	5.7	7.4	1.0	.7	1.7	.0	.2	.3	2.8	6.6	9.4
TRAC. GAS 10000	.1	.4	.5	.0	.0	.1	.0	.0	.0	.2	.5	.6
TRAC. DSL 10000	.4	1.6	2.0	0.0	0.0	0.0	0.0	0.0	0.0	.4	1.6	2.0
BUS GAS 10000	.1	.2	.4	.1	.1	.1	.0	.0	.0	.2	.3	.5
BUS DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
DUMP GAS 10000	.0	.1	.2	.0	.0	.1	.0	.0	.0	.1	.2	.3
DUMP DSL 10000	.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.1
FLAT. GAS 6000	.0	.1	.2	.1	.0	.1	.0	.0	.0	.1	.2	.3
FLAT. GAS 8500	.1	.3	.4	.1	.1	.1	.0	.0	.0	.2	.4	.6
FLAT. GAS 10000	.2	.6	.9	.2	.1	.3	.0	.0	.0	.4	.8	1.2
FLAT. DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
TANK GAS 10000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
TANK DSL 10000	.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.1
VAN GAS 6000	.0	.1	.2	.0	.0	.0	.0	.0	.0	.1	.1	.2
VAN GAS 8500	.1	.3	.3	.0	.0	.1	.0	.0	.0	.1	.3	.4
VAN GAS 10000	.2	.7	.9	.2	.1	.3	.0	.0	.0	.4	.8	1.2
VAN DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
TRAC GAS NONCAL	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
TRAC DSL NONCAL	.1	.2	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.3

Table 22. 1975 Organic Emissions Summary for Riverside County* (Tons/Day)

RIVERSIDE COUNTY

	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	1.1	2.4	3.5	1.4	1.0	2.4	.0	.1	.1	2.5	3.5	6.0
WEEK END	.9	2.5	3.5	1.4	1.0	2.4	.0	.1	.1	2.3	3.6	5.9
SPRING												
WEEK DAY	1.2	3.0	4.3	1.4	1.0	2.4	.0	.1	.1	2.6	4.1	6.8
WEEK END	1.0	3.4	4.4	1.4	1.0	2.4	.0	.1	.1	2.4	4.5	6.9
SUMMER												
WEEK DAY	1.0	3.3	4.3	1.4	1.0	2.4	.0	.1	.1	2.4	4.4	6.8
WEEK END	.8	3.4	4.2	1.4	1.0	2.4	.0	.1	.1	2.2	4.5	6.7
FALL												
WEEK DAY	1.1	2.7	3.7	1.4	1.0	2.4	.0	.1	.1	2.5	3.8	6.2
WEEK END	.8	2.9	3.8	1.4	1.0	2.4	.0	.1	.1	2.2	4.0	6.3
ANNUAL AVG.												
WEEK DAY	1.1	2.9	3.9	1.4	1.0	2.4	.0	.1	.1	2.5	3.9	6.4
WEEK END	.9	3.1	4.0	1.4	1.0	2.4	.0	.1	.1	2.3	4.1	6.4
DAY	1.0	2.9	3.9	1.4	1.0	2.4	.0	.1	.1	2.4	4.0	6.4
PICKUP GAS 6000	.2	.6	.8	.3	.2	.4	.0	.0	.0	.5	.8	1.2
PICKUP GAS 8500	.4	1.2	1.7	.8	.6	1.3	.0	.0	.1	1.2	1.9	3.1
TRAC. GAS 10000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.2
TRAC. DSL 10000	.1	.3	.4	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.4
BUS GAS 10000	.0	.0	.1	.0	.0	.1	.0	.0	.0	.1	.1	.2
BUS DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
DUMP GAS 10000	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
DUMP DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
FLAT. GAS 6000	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
FLAT. GAS 8500	.0	.1	.1	.1	.0	.1	.0	.0	.0	.1	.1	.2
FLAT. GAS 10000	.1	.1	.2	.1	.1	.1	.0	.0	.0	.1	.2	.3
FLAT. DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TANK GAS 10000	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TANK DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
VAN GAS 6000	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
VAN GAS 8500	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
VAN GAS 10000	.1	.1	.2	.1	.1	.1	.0	.0	.0	.1	.2	.3
VAN DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1

*South Coast Air Basin portion only.

Table 23. 1975 Organic Emissions Summary for San Bernardino County* (Tons/Day)

SAN BERNARDINO COUNTY	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	1.7	5.8	7.5	.6	.6	1.2	.0	.2	.2	2.4	6.6	9.0
WEEK END	1.4	5.3	6.7	.6	.6	1.2	.0	.2	.2	2.1	6.0	8.0
SPRING												
WEEK DAY	2.0	6.9	8.9	.6	.6	1.2	.0	.2	.2	2.6	7.7	10.3
WEEK END	1.5	6.5	8.0	.6	.6	1.2	.0	.2	.2	2.2	7.2	9.4
SUMMER												
WEEK DAY	1.6	7.0	8.6	.6	.6	1.2	.0	.2	.3	2.3	7.8	10.1
WEEK END	1.3	6.3	7.6	.6	.6	1.2	.0	.2	.2	1.9	7.1	9.0
FALL												
WEEK DAY	1.7	6.1	7.8	.6	.6	1.2	.0	.2	.2	2.4	6.9	9.3
WEEK END	1.3	5.6	6.9	.6	.6	1.2	.0	.2	.2	1.9	6.3	8.3
ANNUAL AVG.												
WEEK DAY	1.8	6.4	8.2	.6	.6	1.2	.0	.2	.2	2.4	7.2	9.6
WEEK END	1.4	5.9	7.3	.6	.6	1.2	.0	.2	.2	2.0	6.7	8.7
DAY	1.7	6.3	7.9	.6	.6	1.2	.0	.2	.2	2.3	7.1	9.4
PICKUP GAS 6000	.3	1.2	1.5	.2	.2	.4	.0	.0	.0	.5	1.4	1.9
PICKUP GAS 8500	.7	2.7	3.4	.2	.2	.5	.0	.1	.1	1.0	3.0	3.9
TRAC. GAS 10000	.0	.2	.2	.0	.0	.0	.0	.0	.0	.1	.2	.3
TRAC. DSL 10000	.2	.7	.9	0.0	0.0	0.0	0.0	0.0	0.0	.2	.7	.9
BUS GAS 10000	.1	.1	.2	.0	.0	.0	.0	.0	.0	.1	.1	.2
BUS DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
DUMP GAS 10000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
DUMP DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
FLAT. GAS 6000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
FLAT. GAS 8500	.0	.1	.2	.0	.0	.0	.0	.0	.0	.1	.2	.2
FLAT. GAS 10000	.1	.3	.4	.0	.0	.1	.0	.0	.0	.1	.3	.5
FLAT. DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TANK GAS 10000	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.0	.1
TANK DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
VAN GAS 6000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
VAN GAS 8500	.0	.1	.2	.0	.0	.0	.0	.0	.0	.0	.1	.2
VAN GAS 10000	.1	.3	.4	.0	.0	.1	.0	.0	.0	.1	.4	.5
VAN DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.1

*South Coast Air Basin portion only.

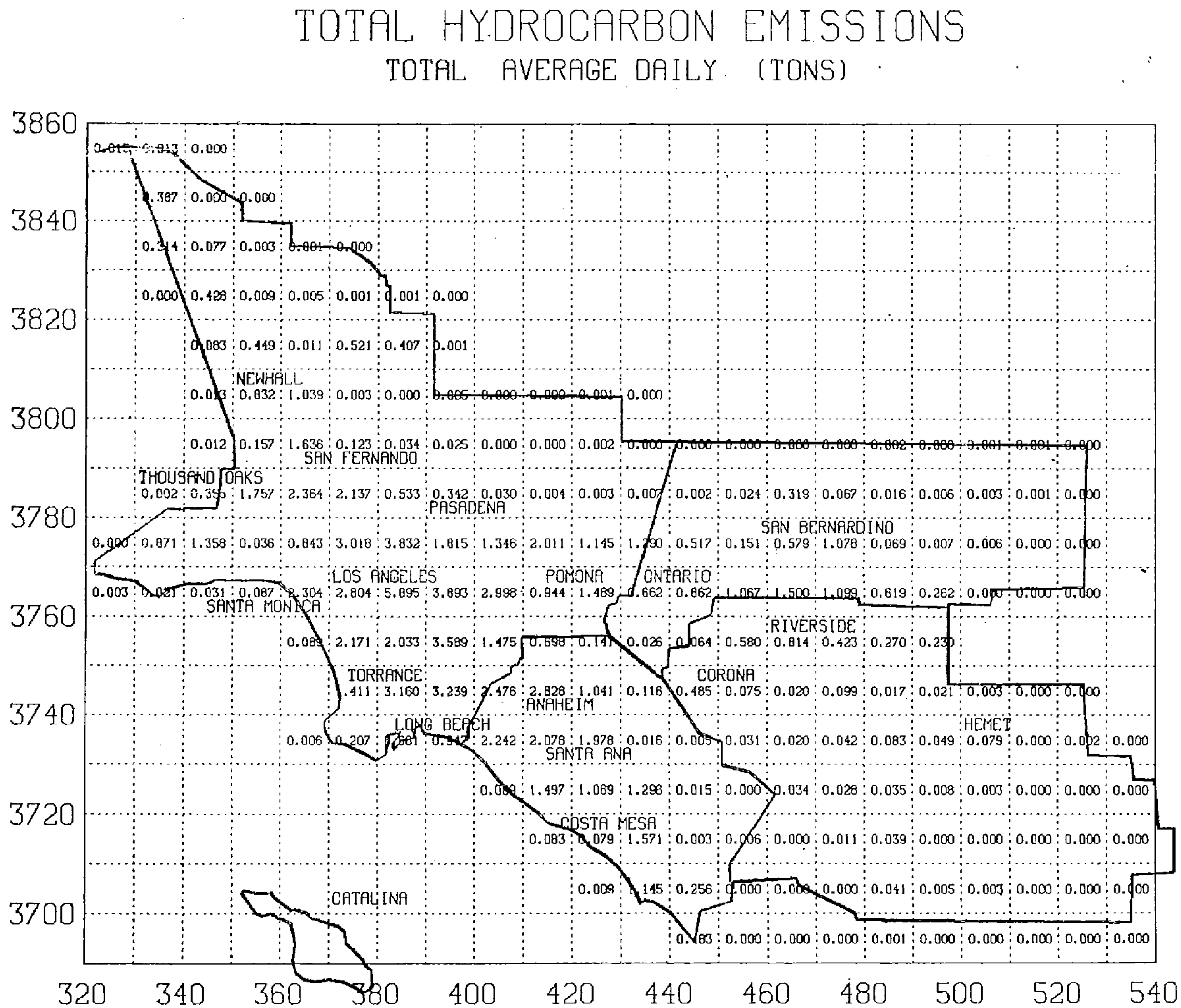

Figure 31. Average Daily Organic Emissions - Total (Tons/Day)
1975 Inventory

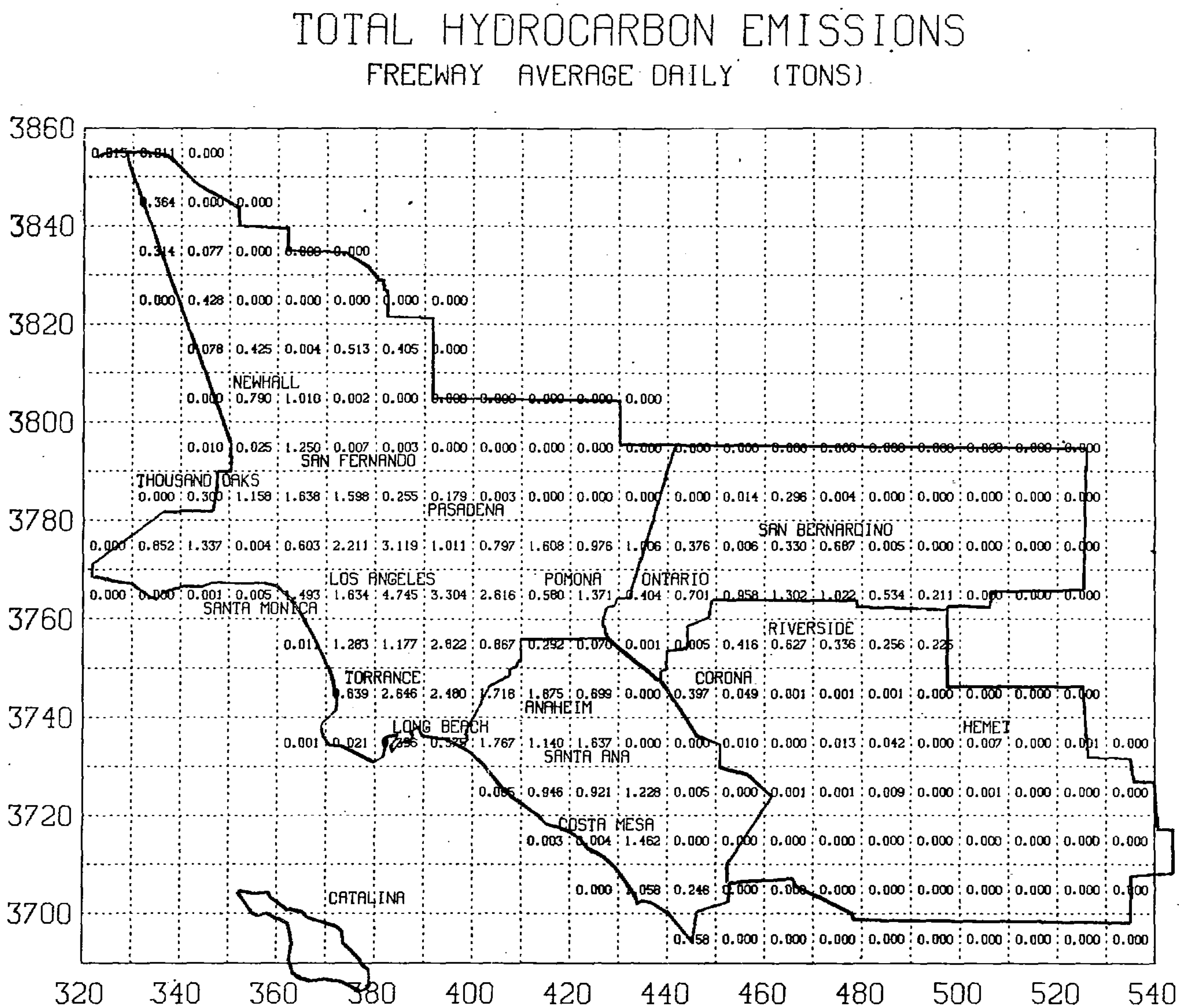

Figure 32. Average Daily Organic Emissions - Freeway (Tons/Day)
1975 Inventory

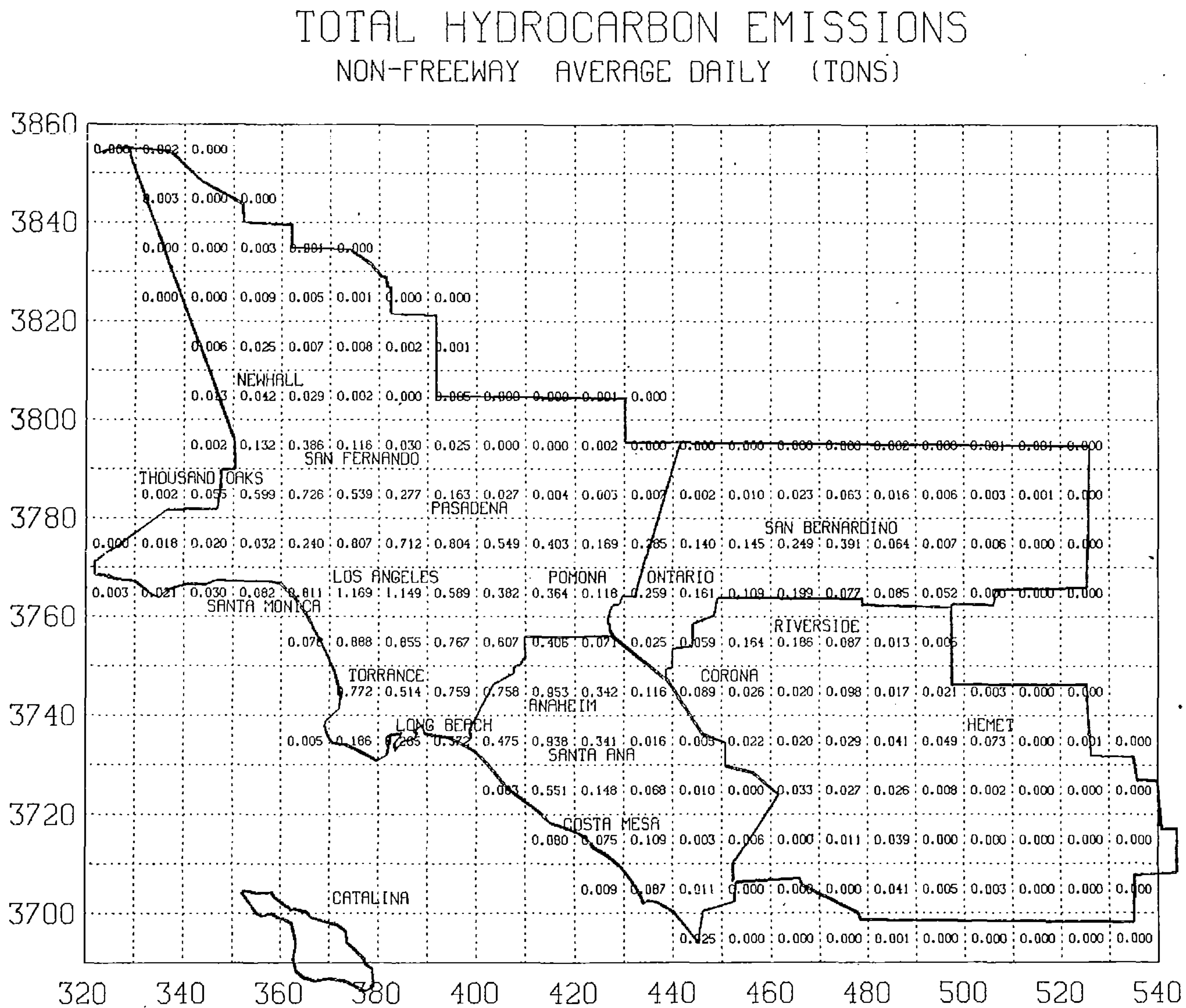

Figure 33. Average Daily Organic Emissions - Non-Freeway (Tons/Day)
1975 Inventory

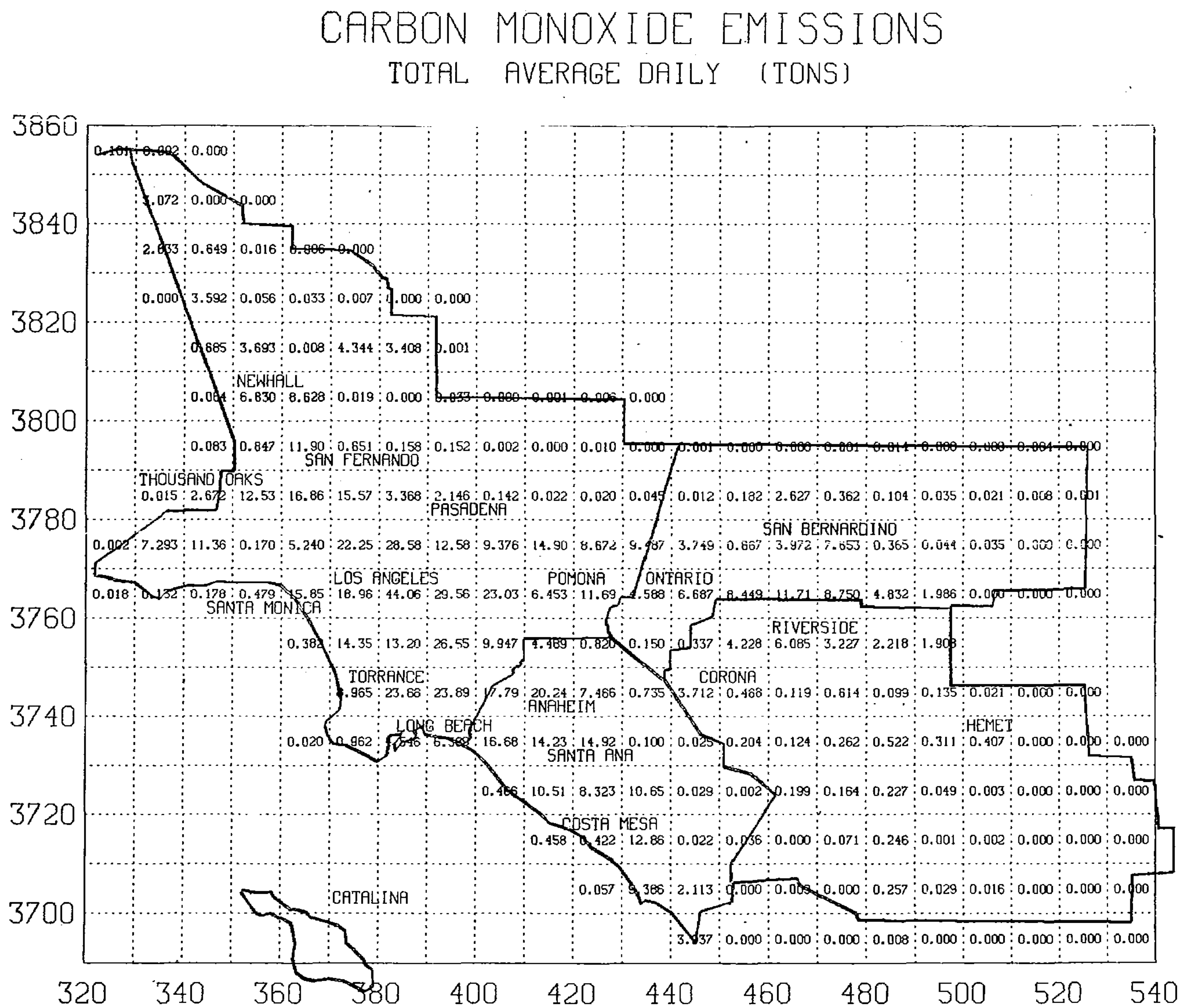

Figure 34. Average Daily Carbon Monoxide Emissions - Total (Tons/Day)
1975 Inventory

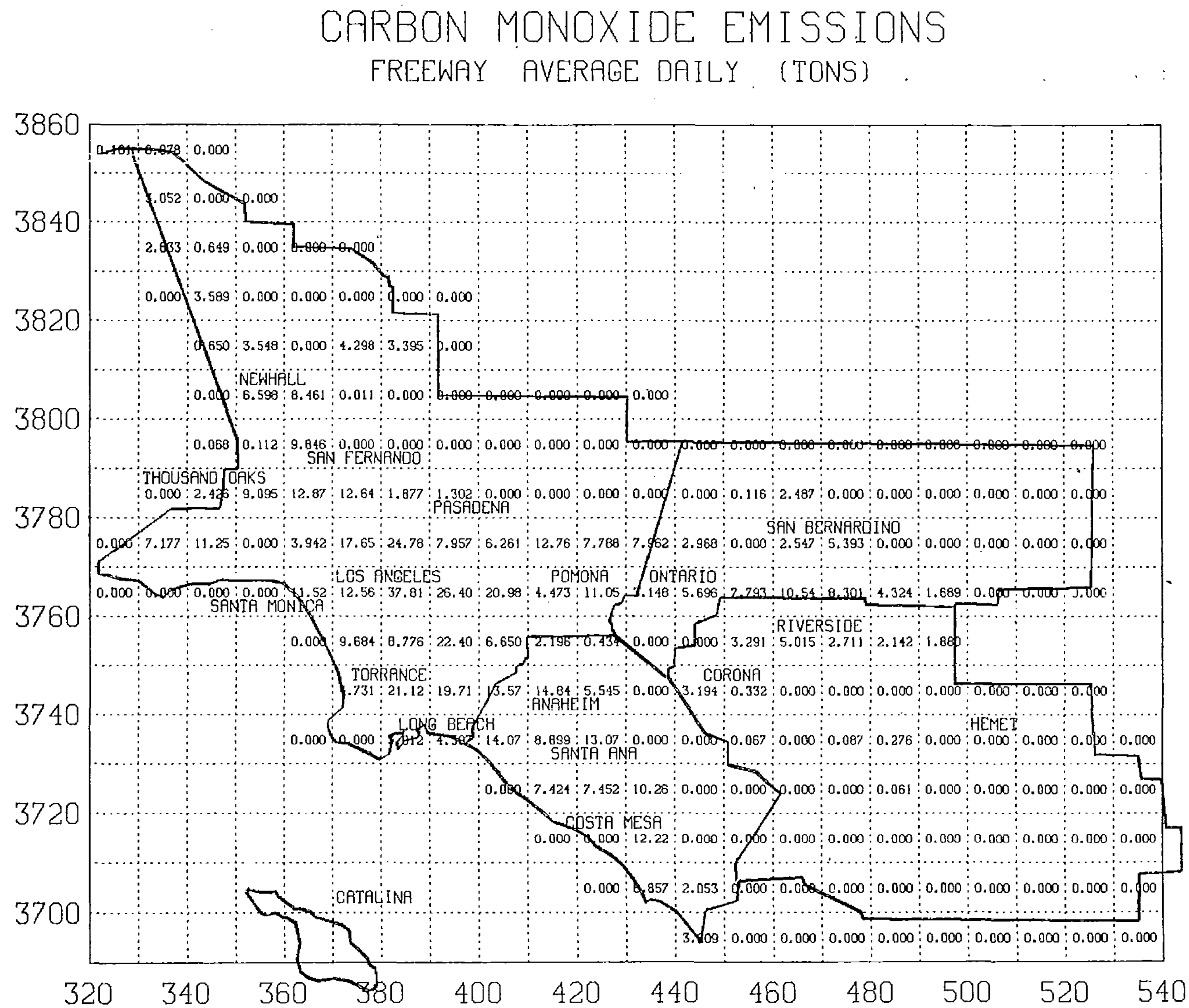

Figure 35. Average Daily Carbon Monoxide Emissions - Freeway (Tons/Day)
1975 Inventory

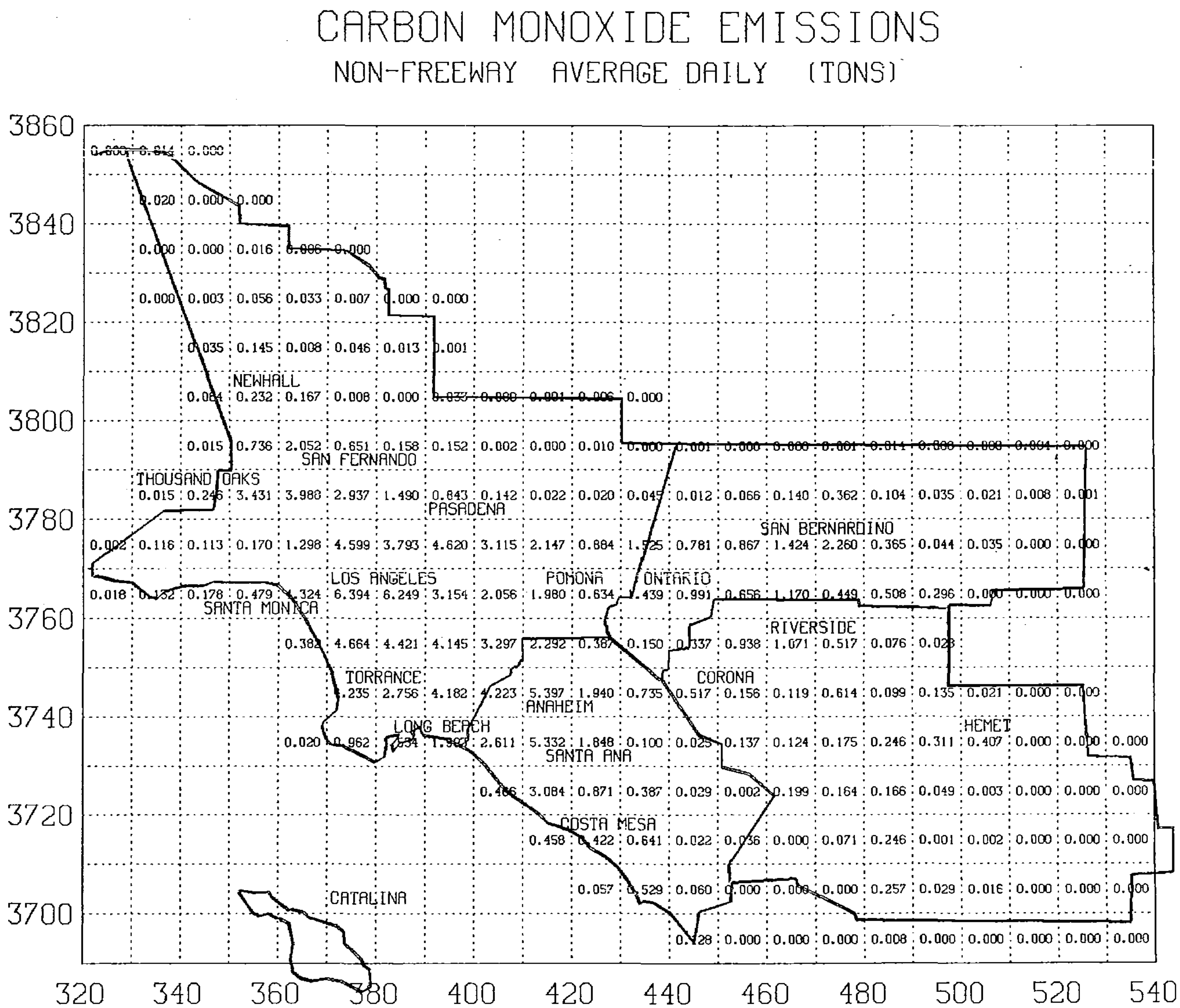

Figure 36. Average Daily Carbon Monoxide Emissions - Non-Freeway (Tons/Day)
1975 Inventory

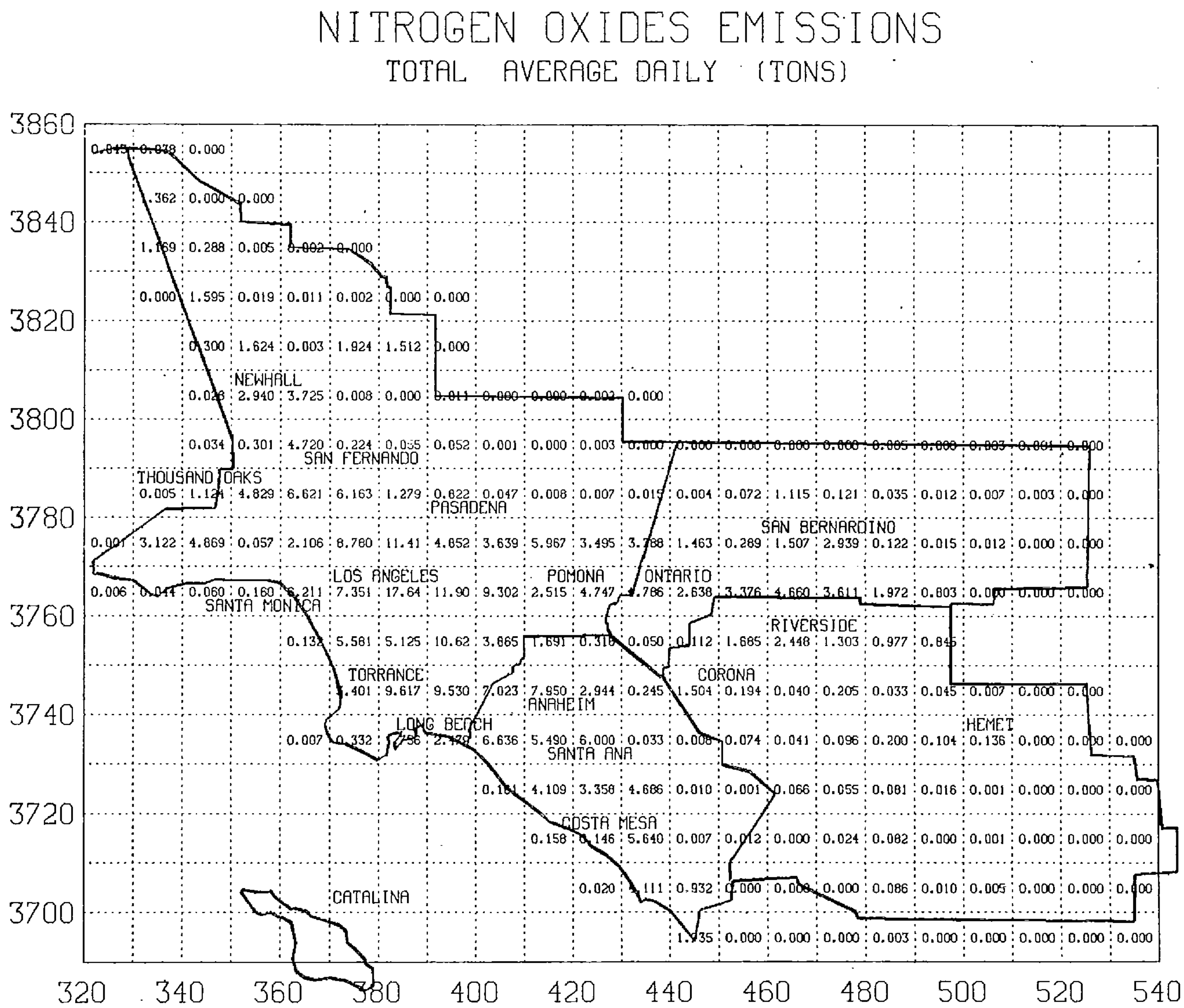

Figure 37. Average Daily Nitrogen Oxides Emissions - Total (Tons/Day)
1975 Inventory

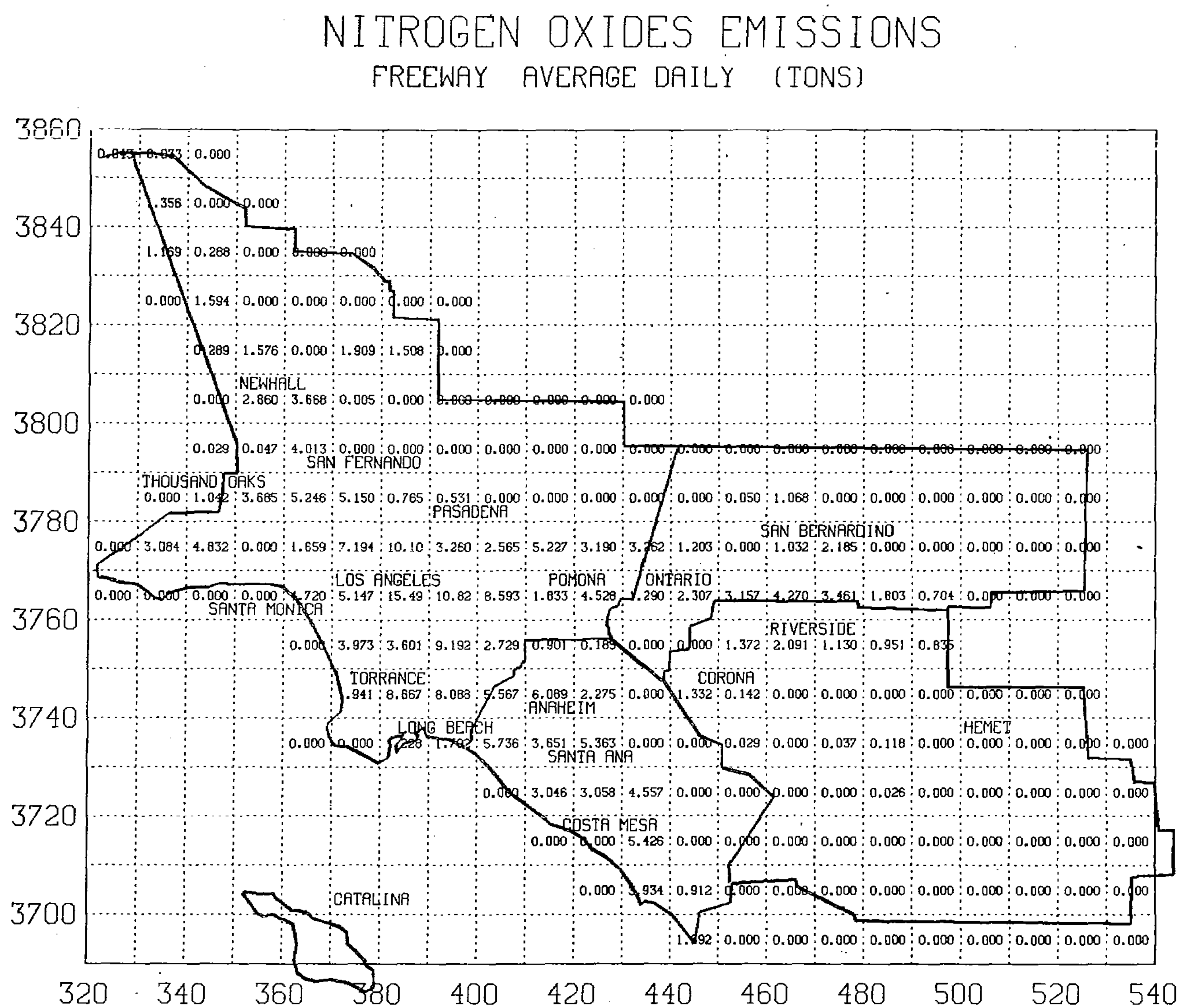

Figure 38. Average Daily Nitrogen Oxides Emissions - Freeway (Tons/Day) 1975 Inventory

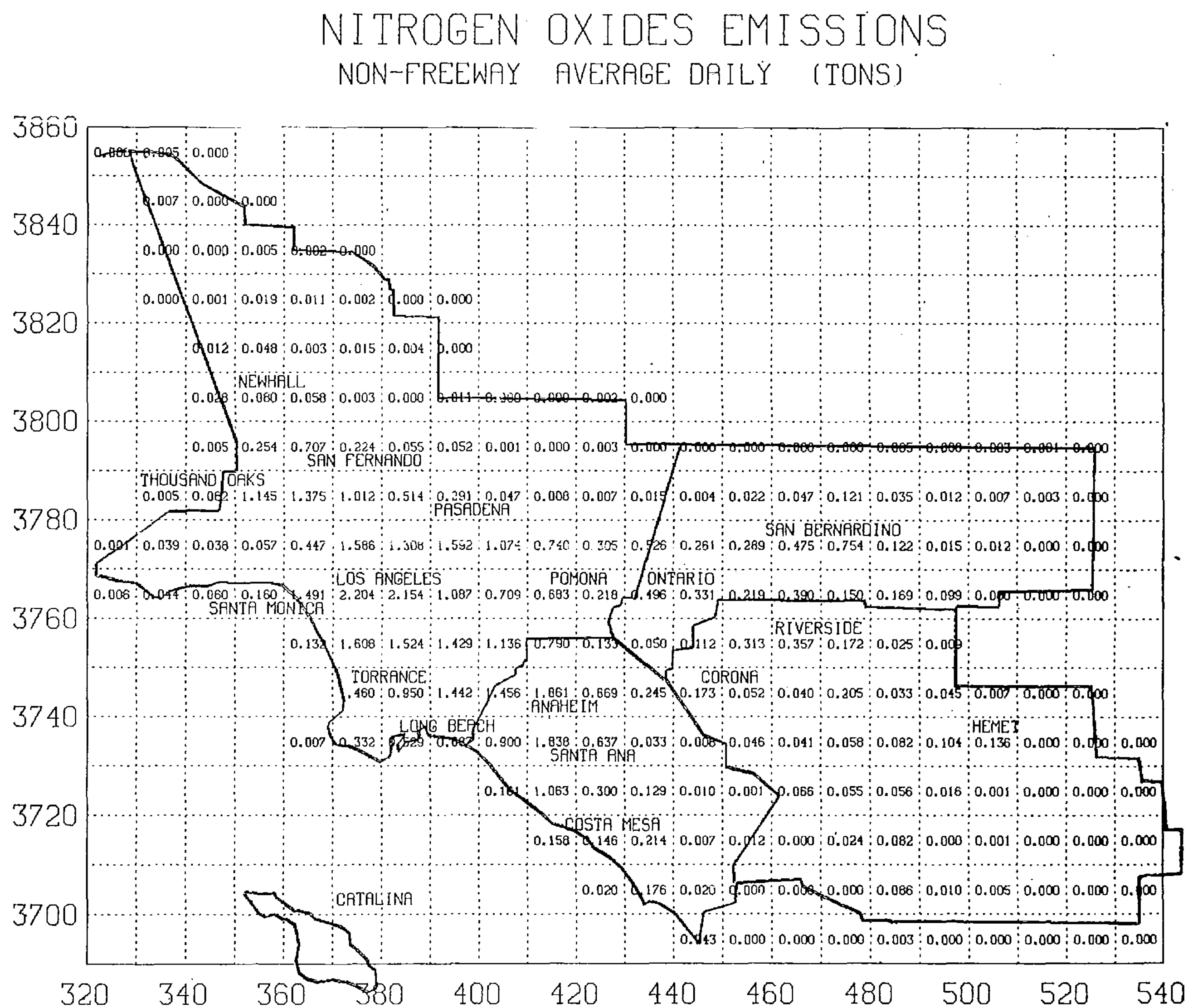

Figure 39. Average Daily Nitrogen Oxides Emissions - Non-Freeway (Tons/Day)
1975 Inventory

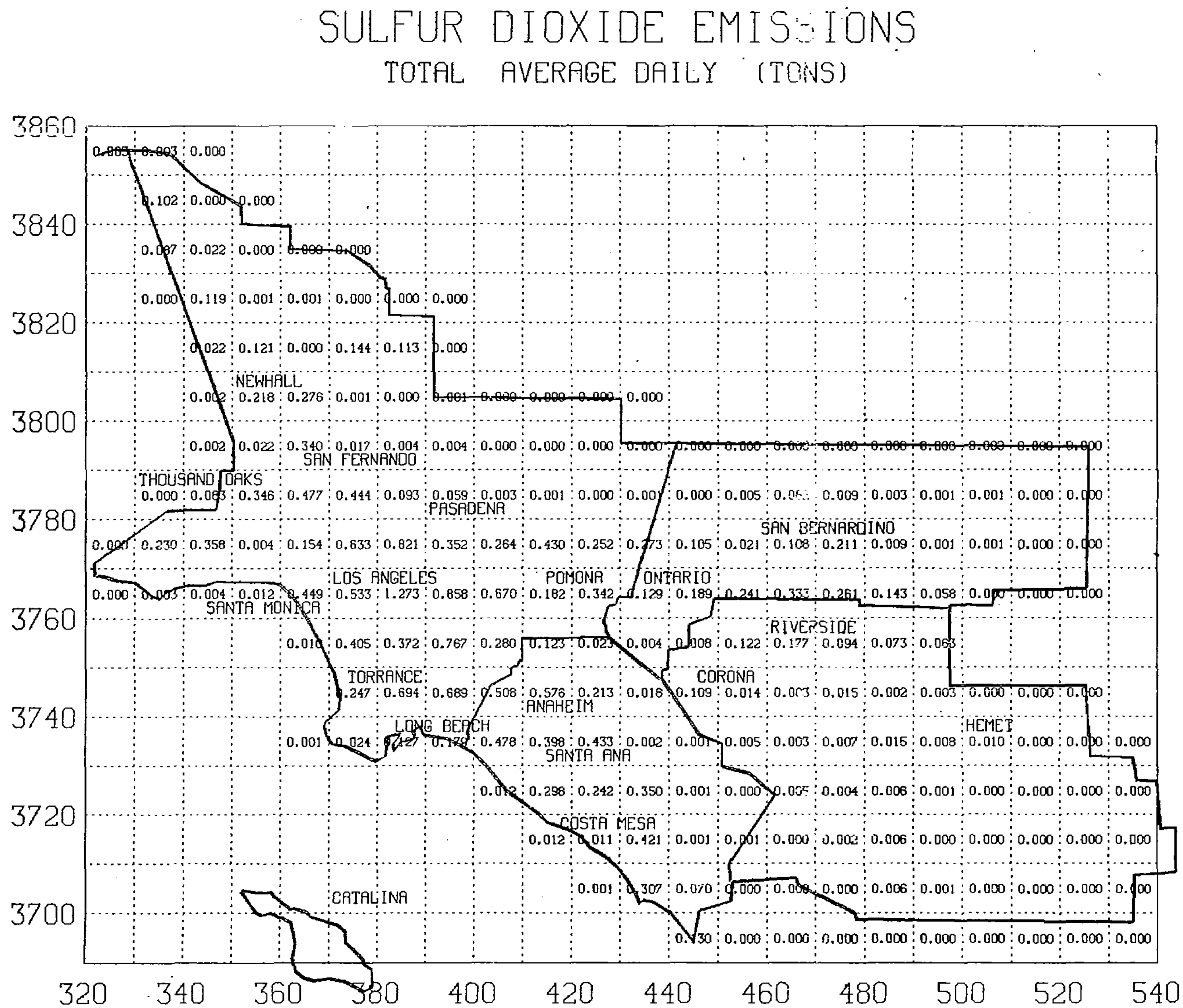

Figure 40. Average Daily Sulfur Dioxide Emissions - Total (Tons/Day)
1975 Inventory

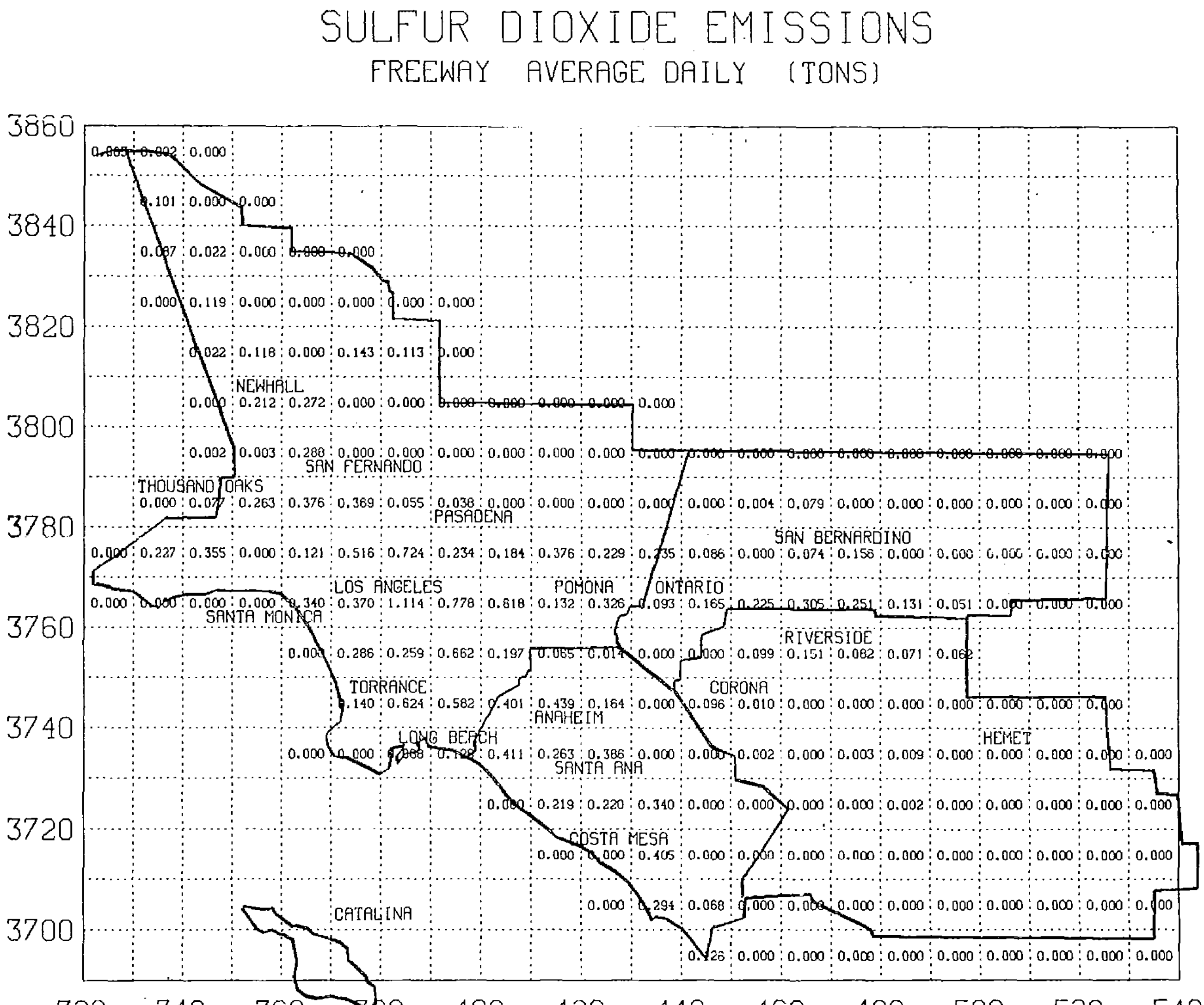

Figure 41. Average Daily Sulfur Dioxide Emissions - Freeway (Tons/Day)
1975 Inventory

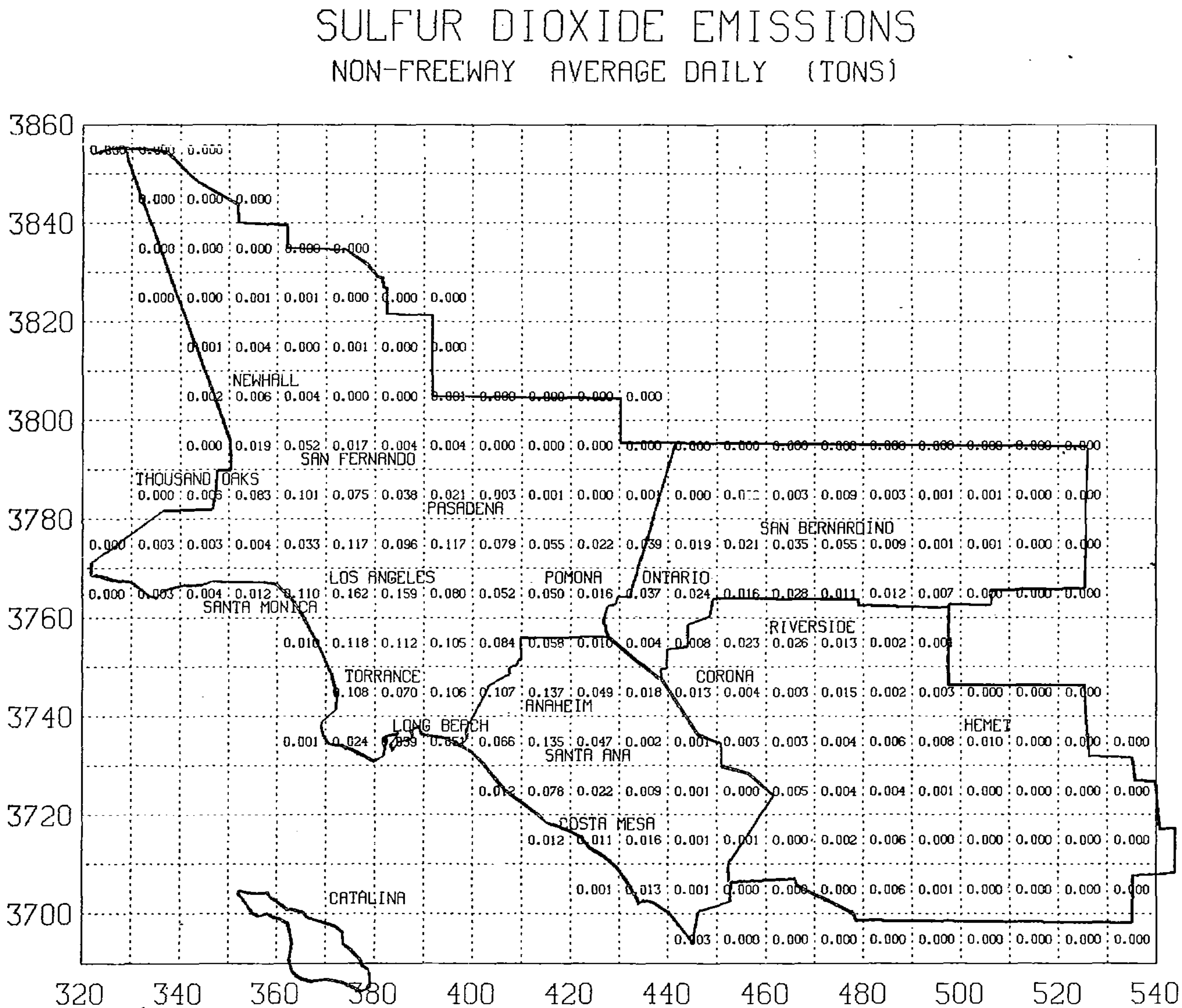

Figure 42. Average Daily Sulfur Dioxide Emissions - Non-Freeway (Tons/Day)
1975 Inventory

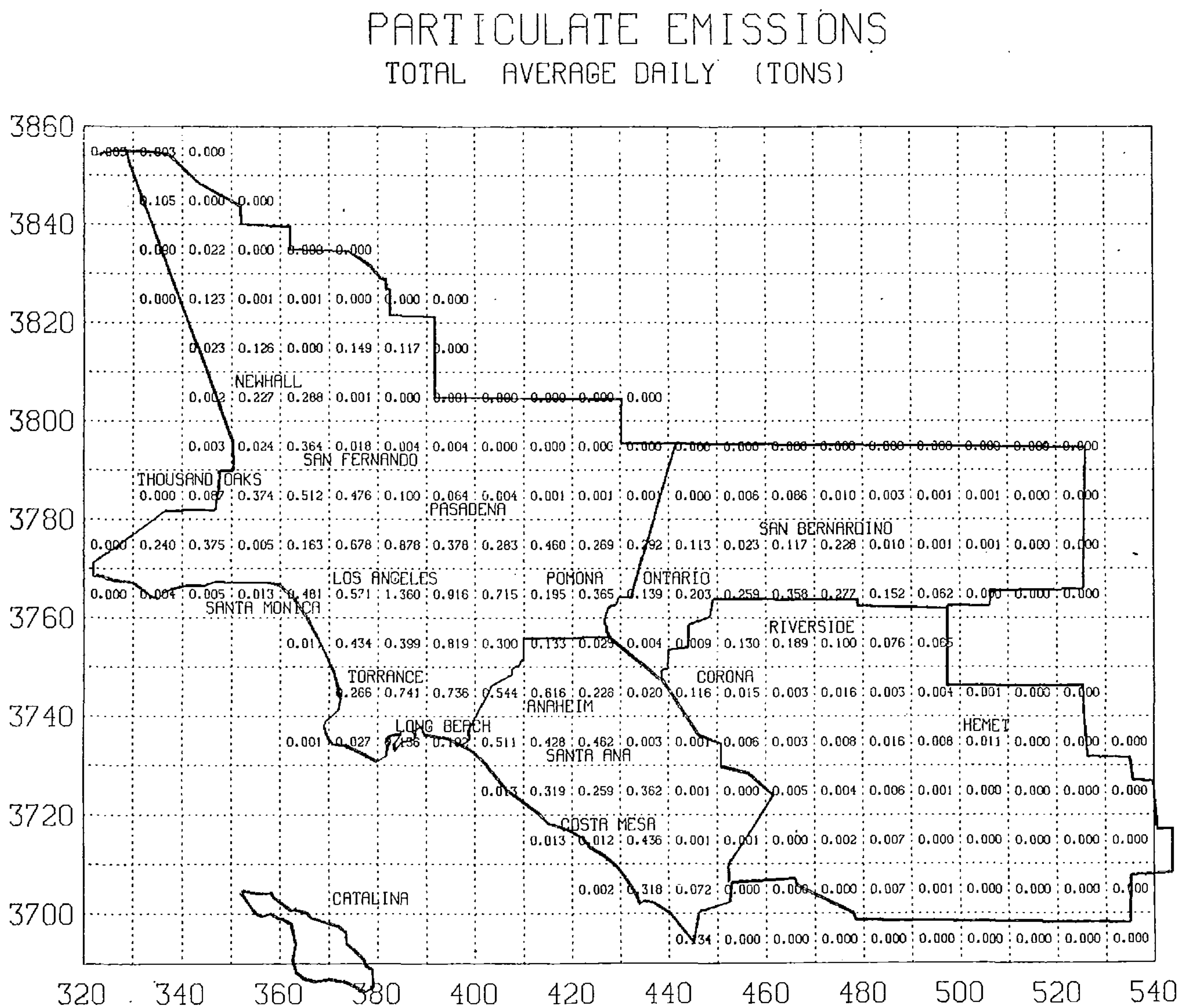

Figure 43. Average Daily Particulate Emissions - Total (Tons/Day)
1975 Inventory

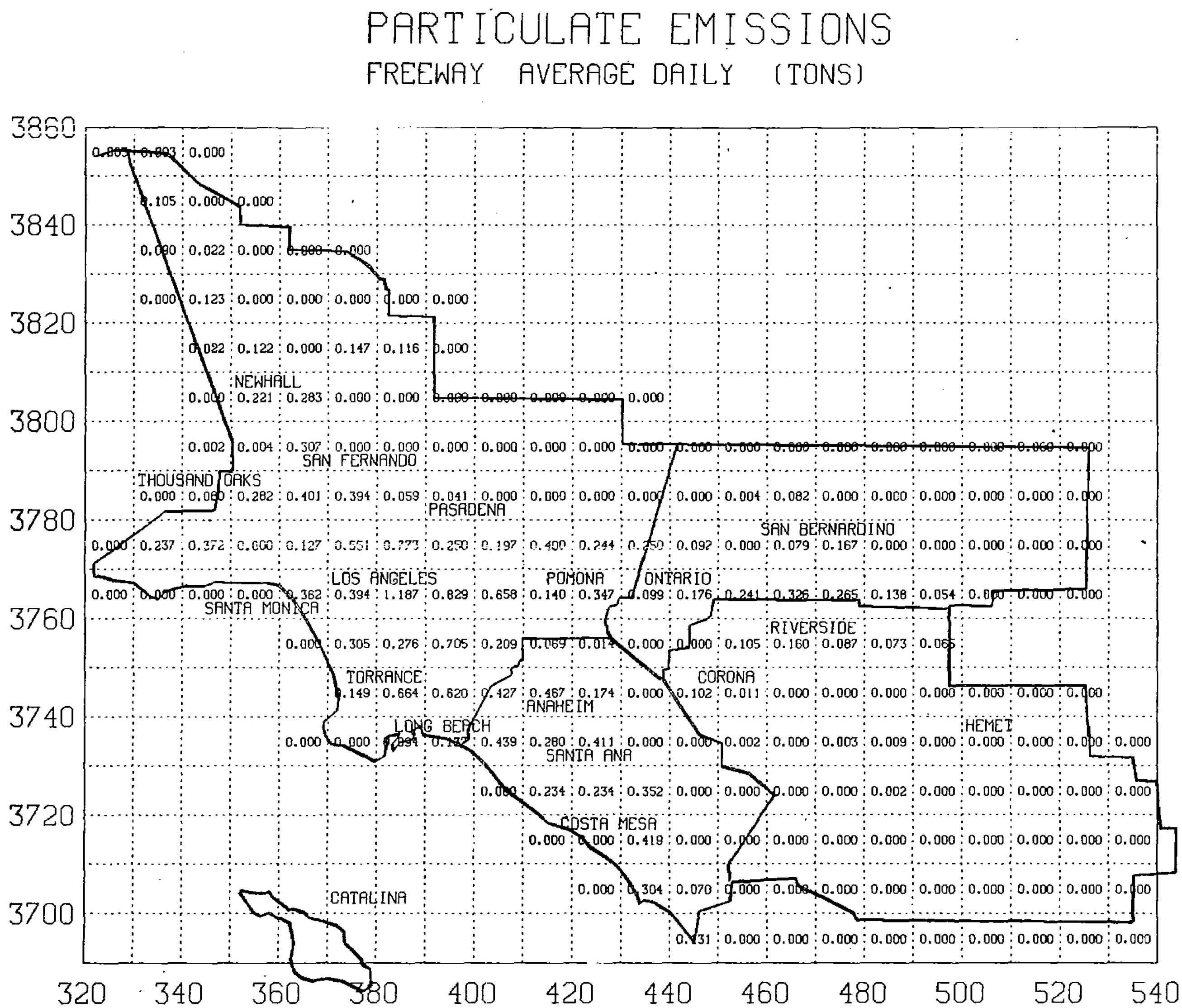

Figure 44. Average Daily Particulate Emissions - Freeway (Tons/Day)
1975 Inventory

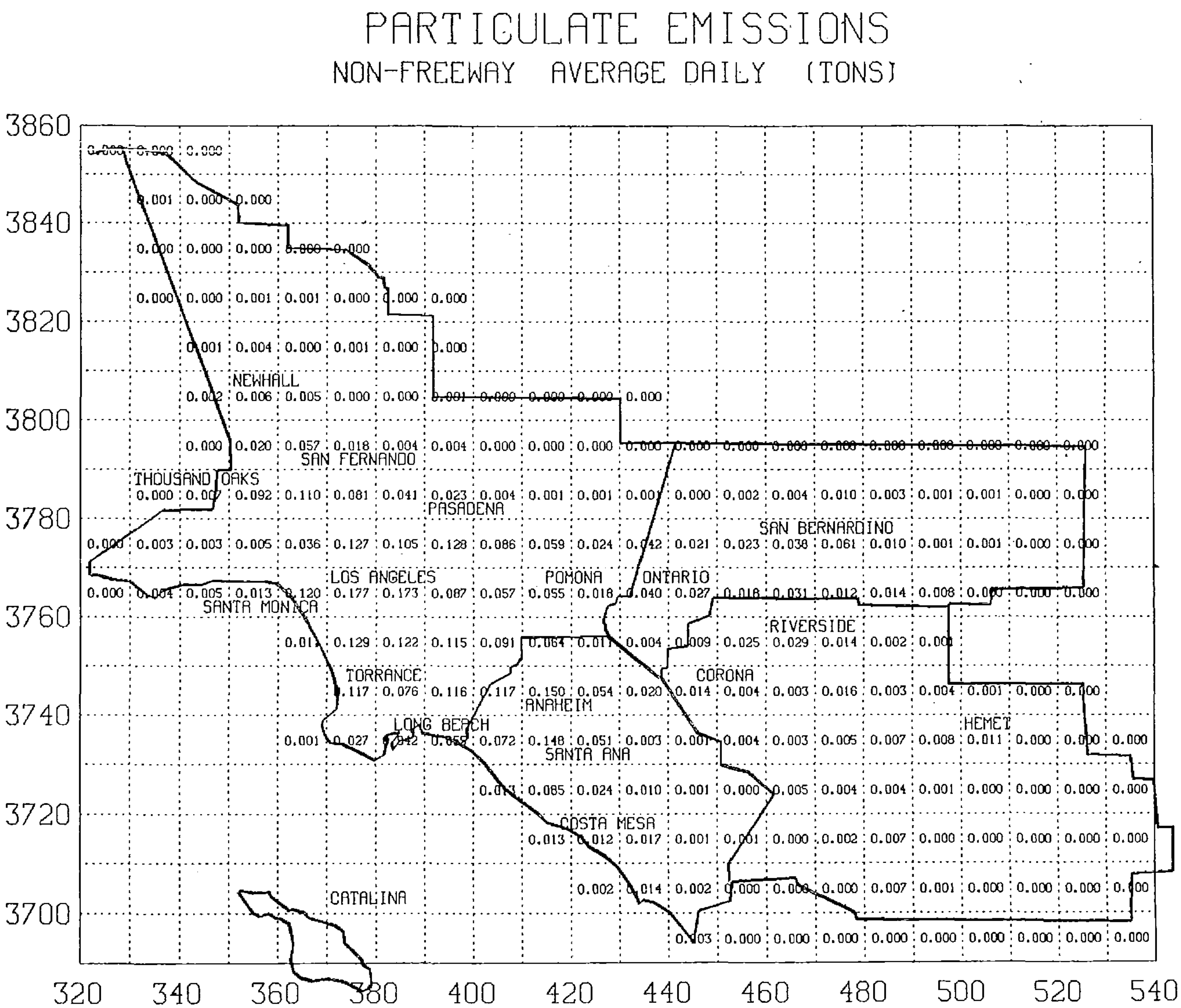

Figure 45. Average Daily Particulate Emissions - Non-Freeway (Tons/Day)
1975 Inventory

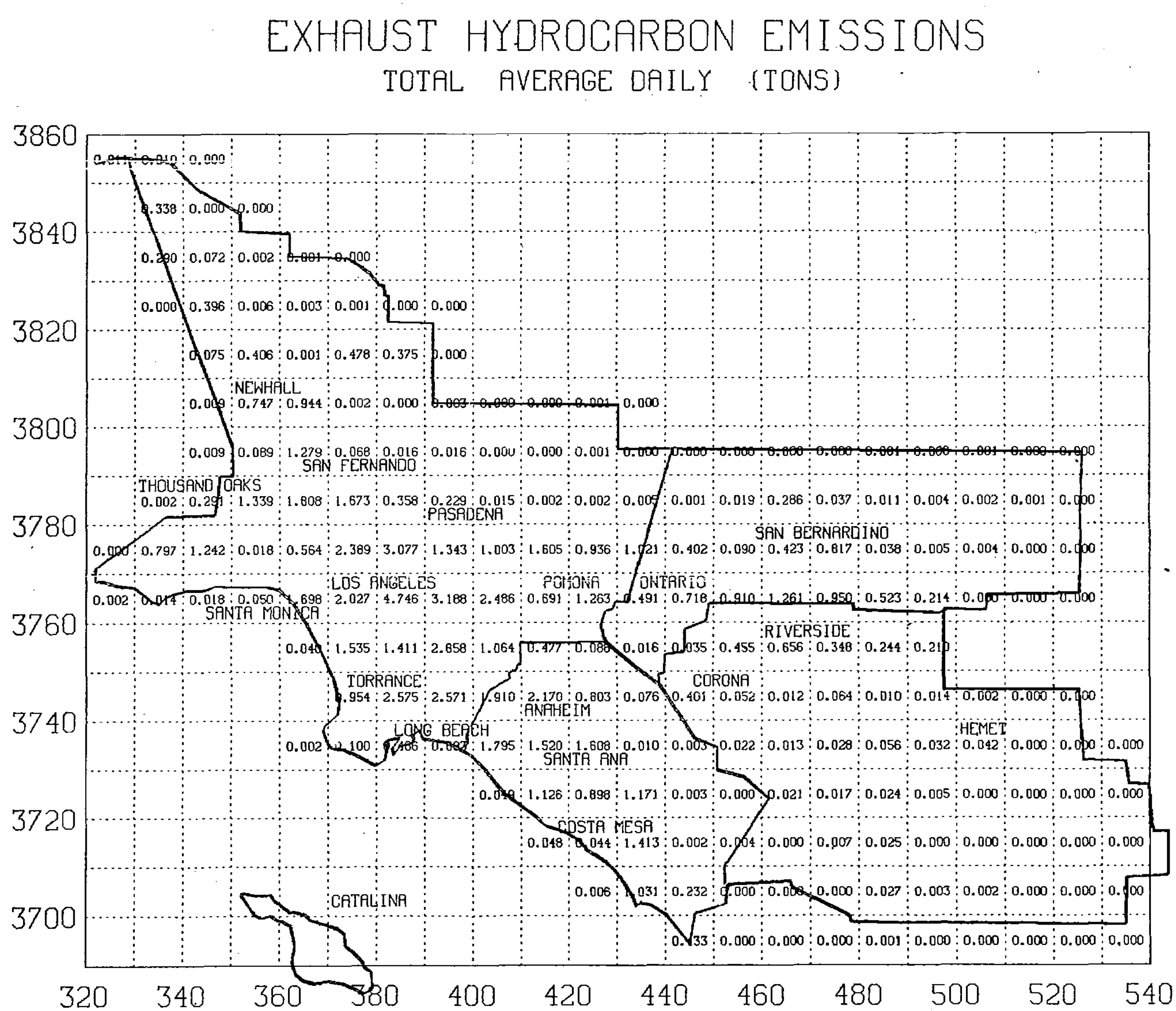

Figure 46. Average Daily Exhaust Organic Emissions - Total (Tons/Day)
1975 Inventory

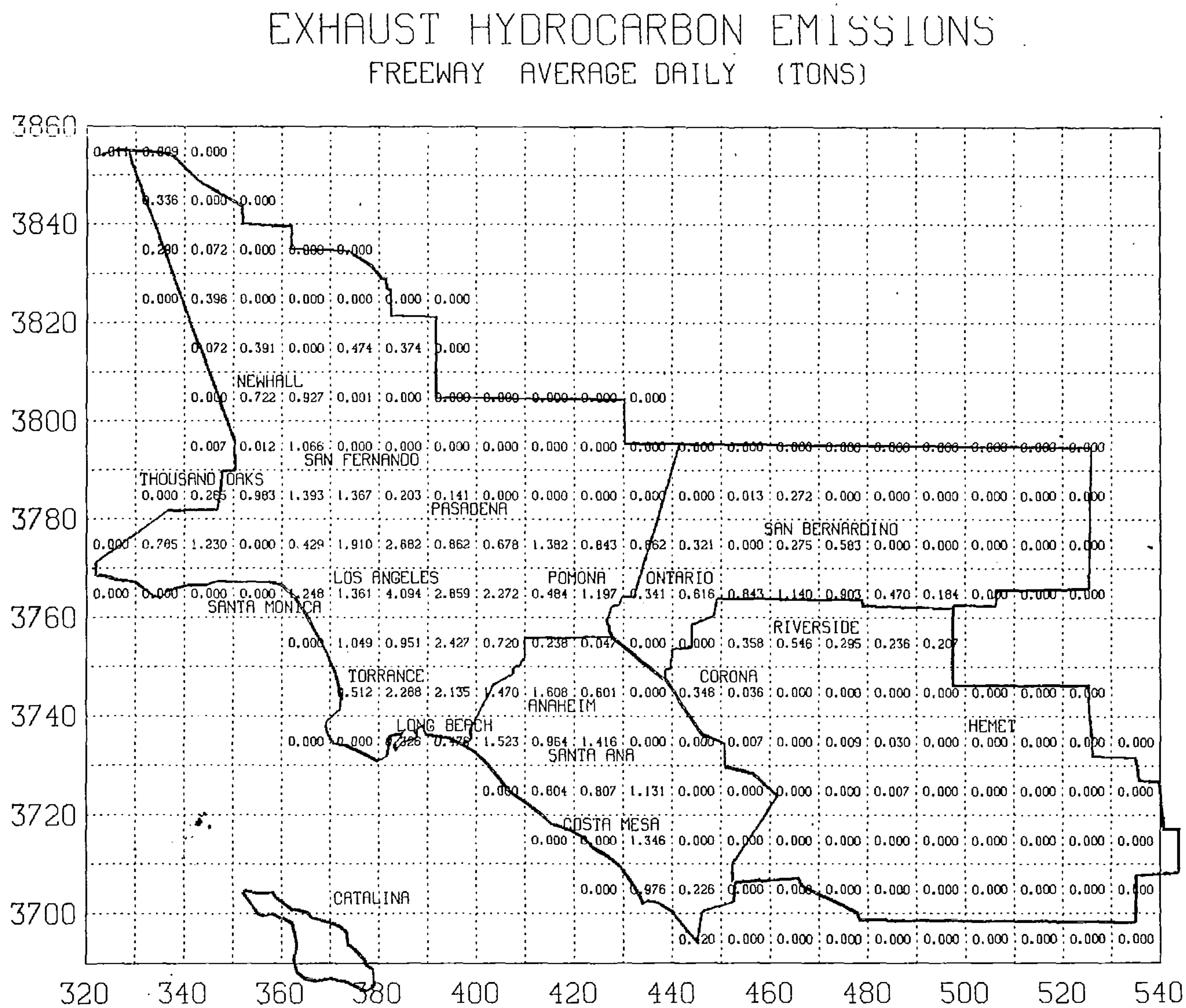

Figure 47. Average Daily Exhaust Organic Emissions - Freeway (Tons/Day)
1975 Inventory

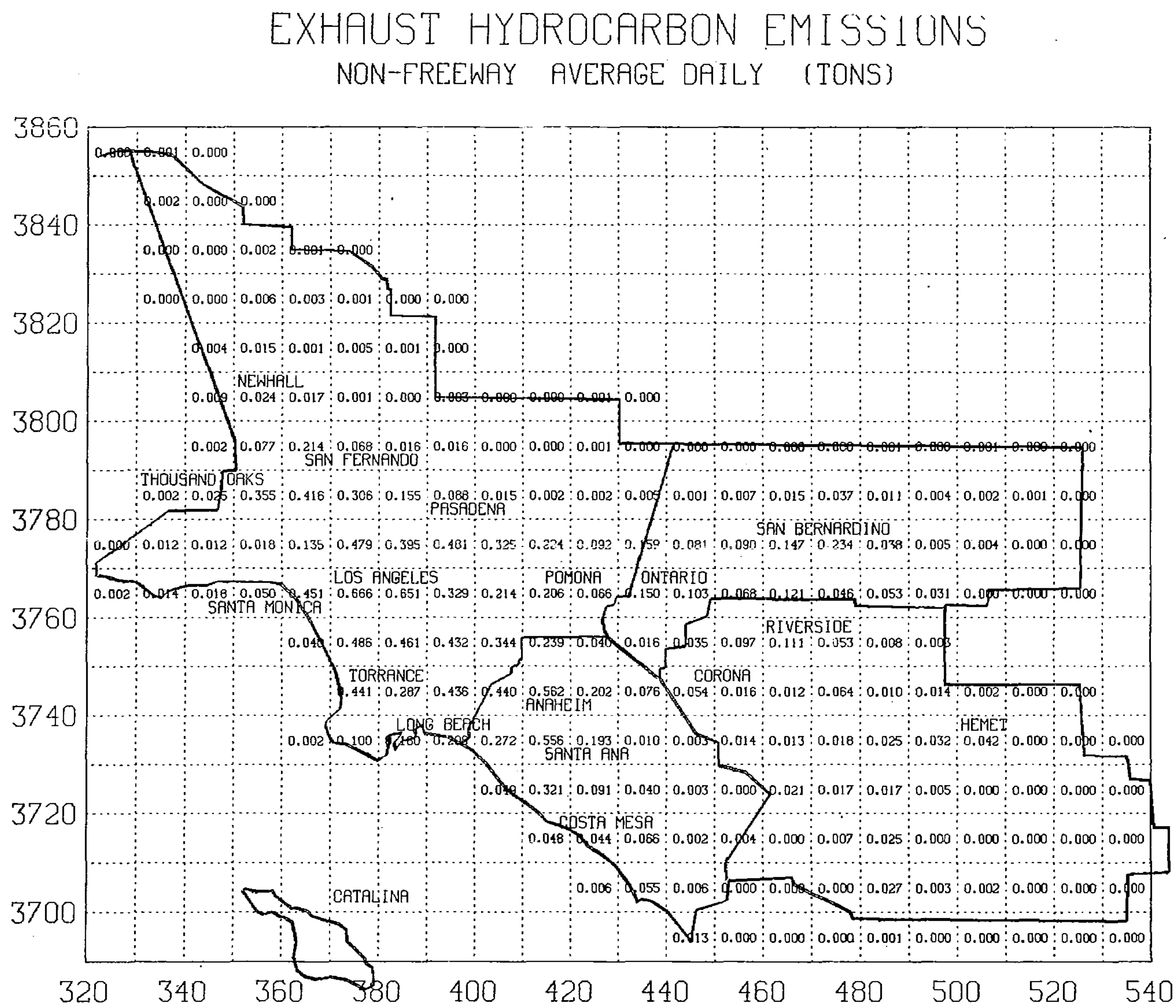

Figure 48. Average Daily Exhaust Organic Emissions - Non-Freeway (Tons/Day) 1975 Inventory

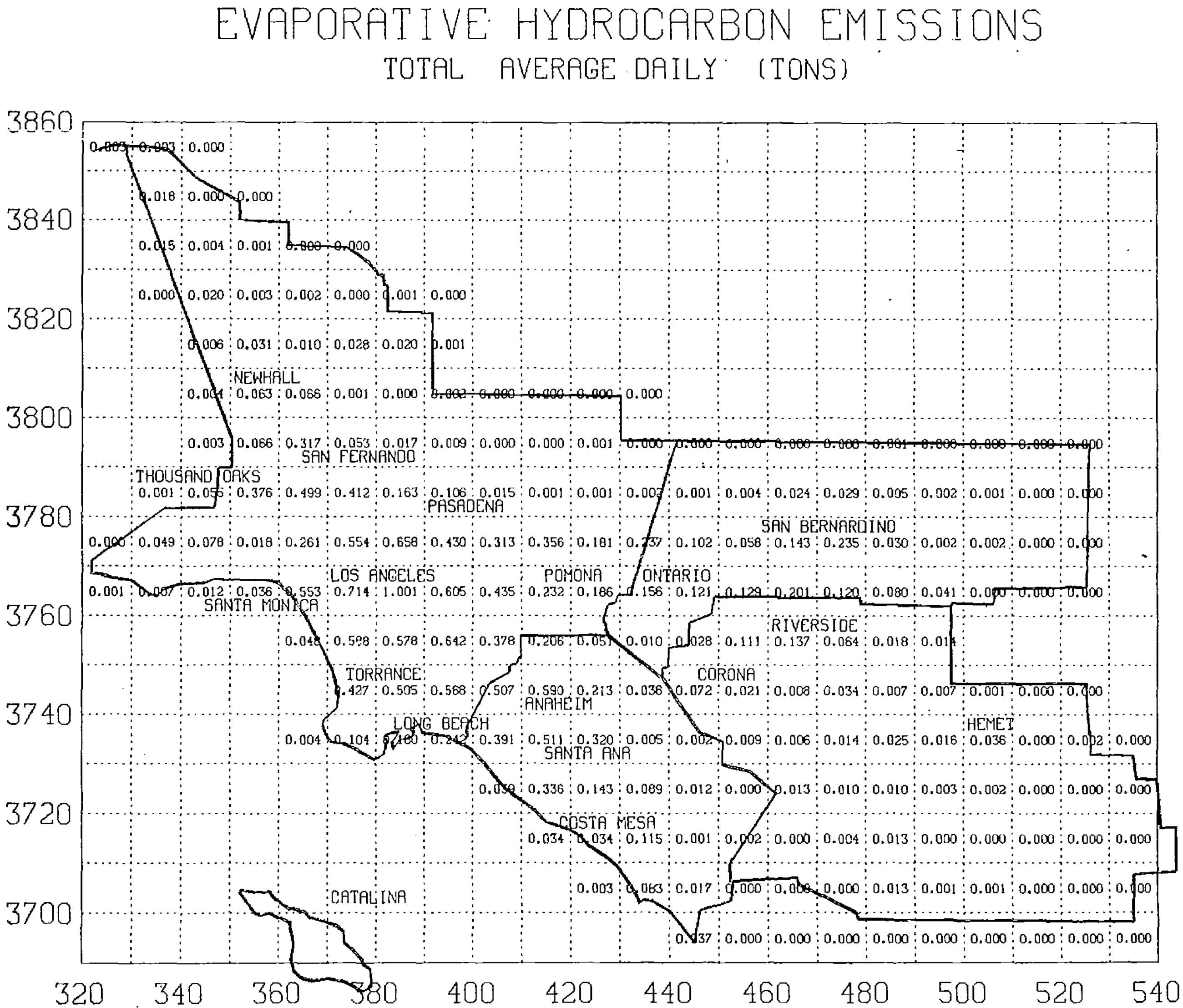

Figure 49. Average Daily Evaporative Organic Emissions - Total (Tons/Day)
1975 Inventory

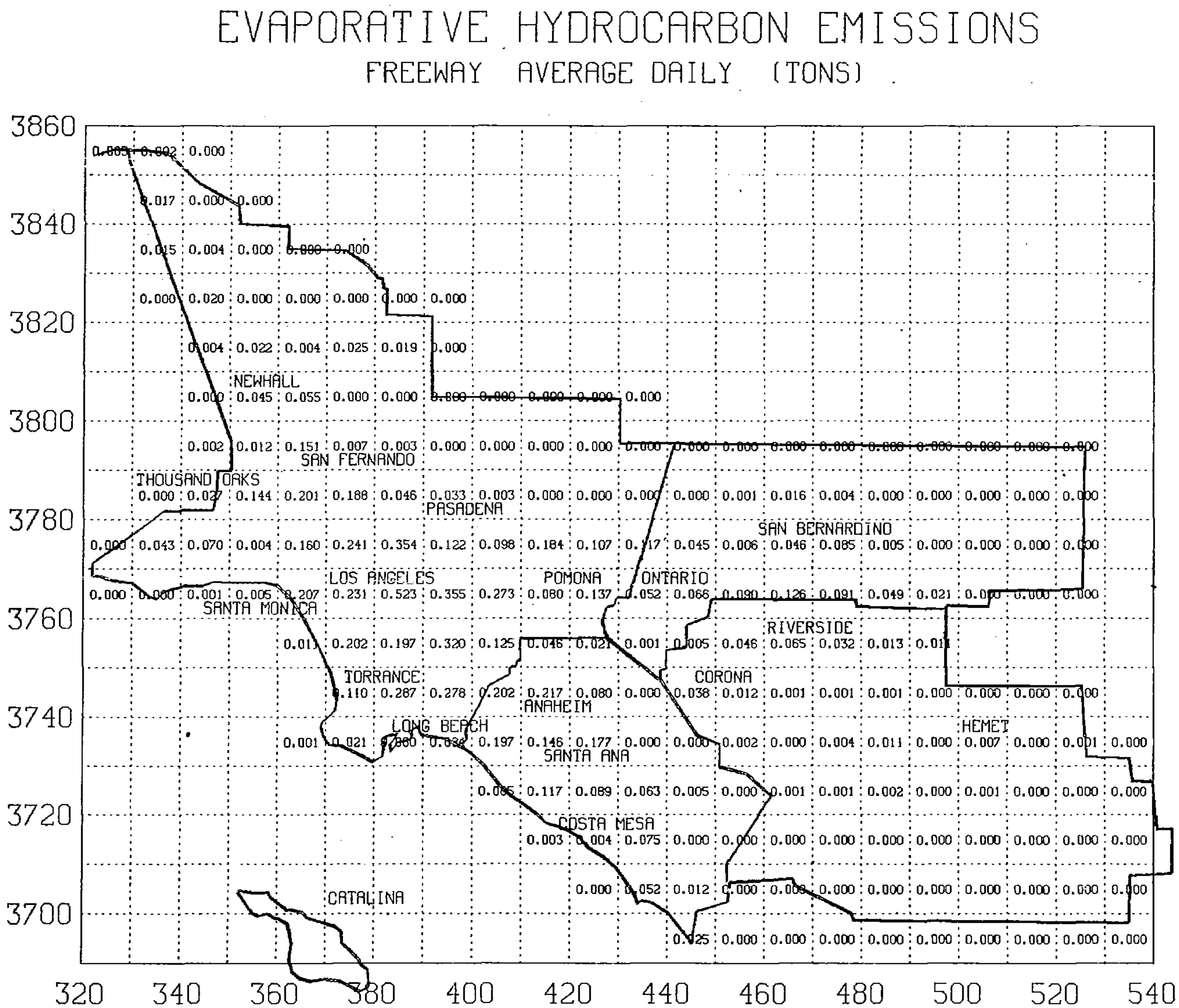

Figure 50. Average Daily Evaporative Organic Emissions - Freeway (Tons/Day)
1975 Inventory

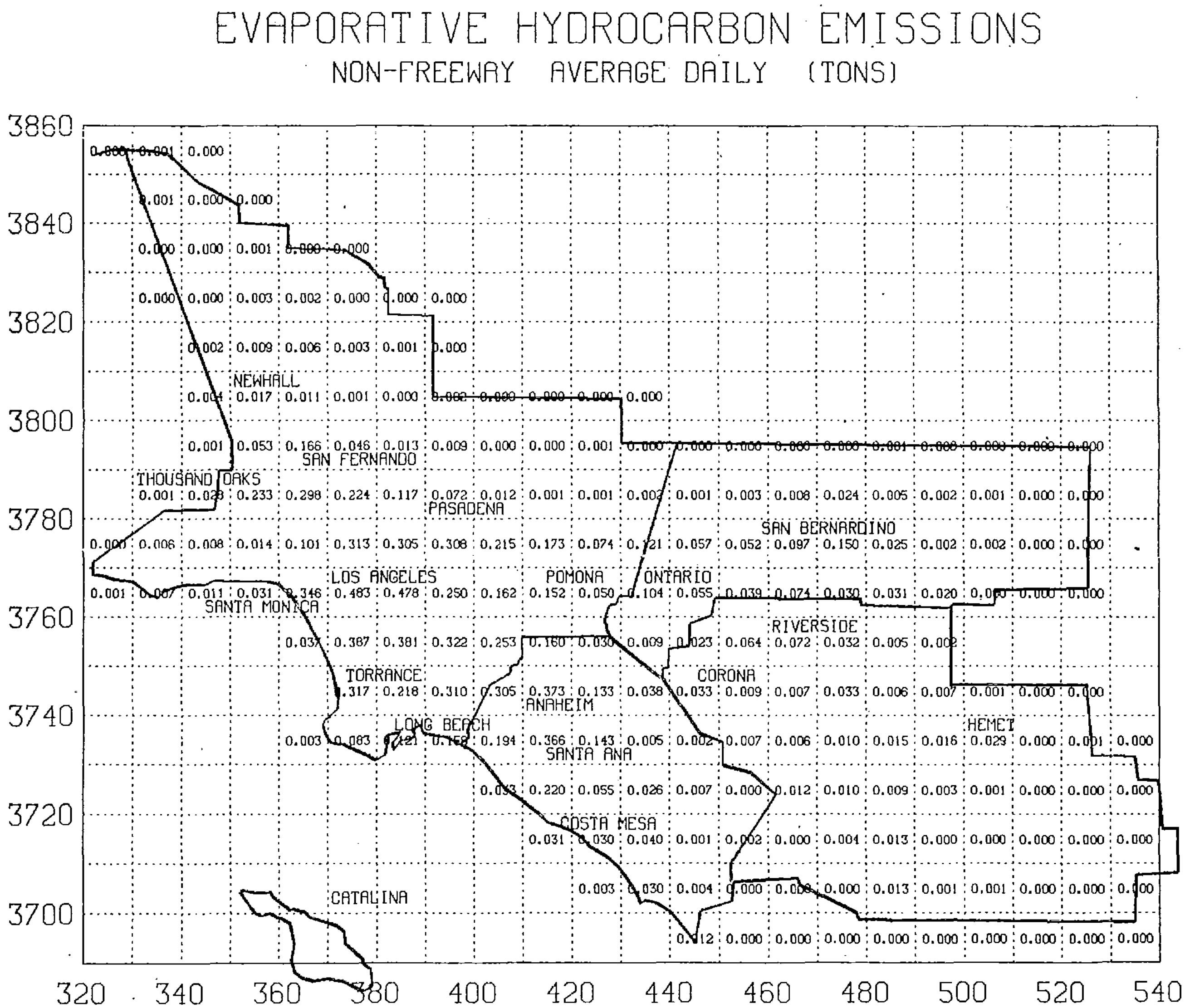

Figure 51. Average Daily Evaporative Organic Emissions - Non-Freeway (Tons/Day)
1975 Inventory

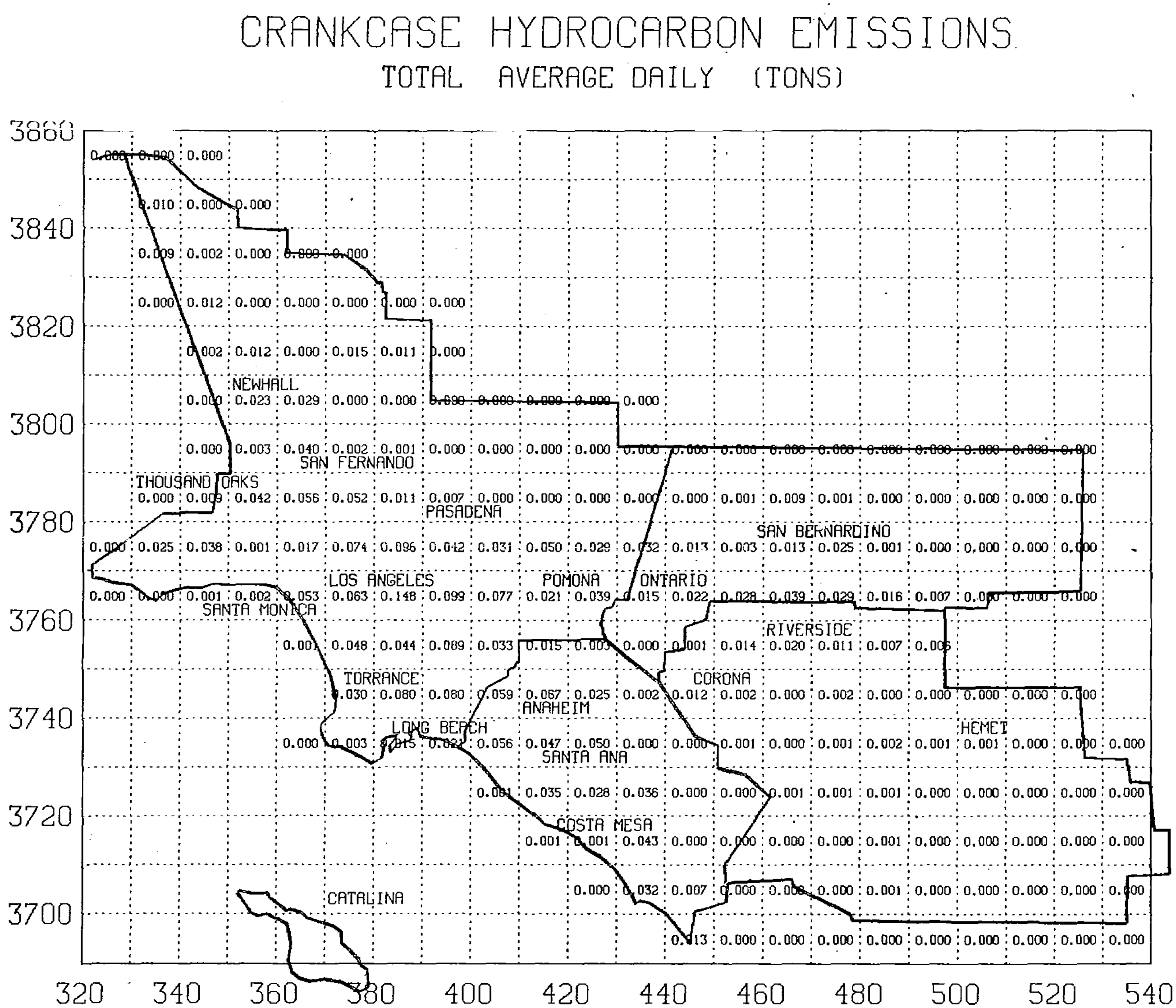

Figure 52. Average Daily Crankcase Organic Emissions - Total (Tons/Day)
1975 Inventory

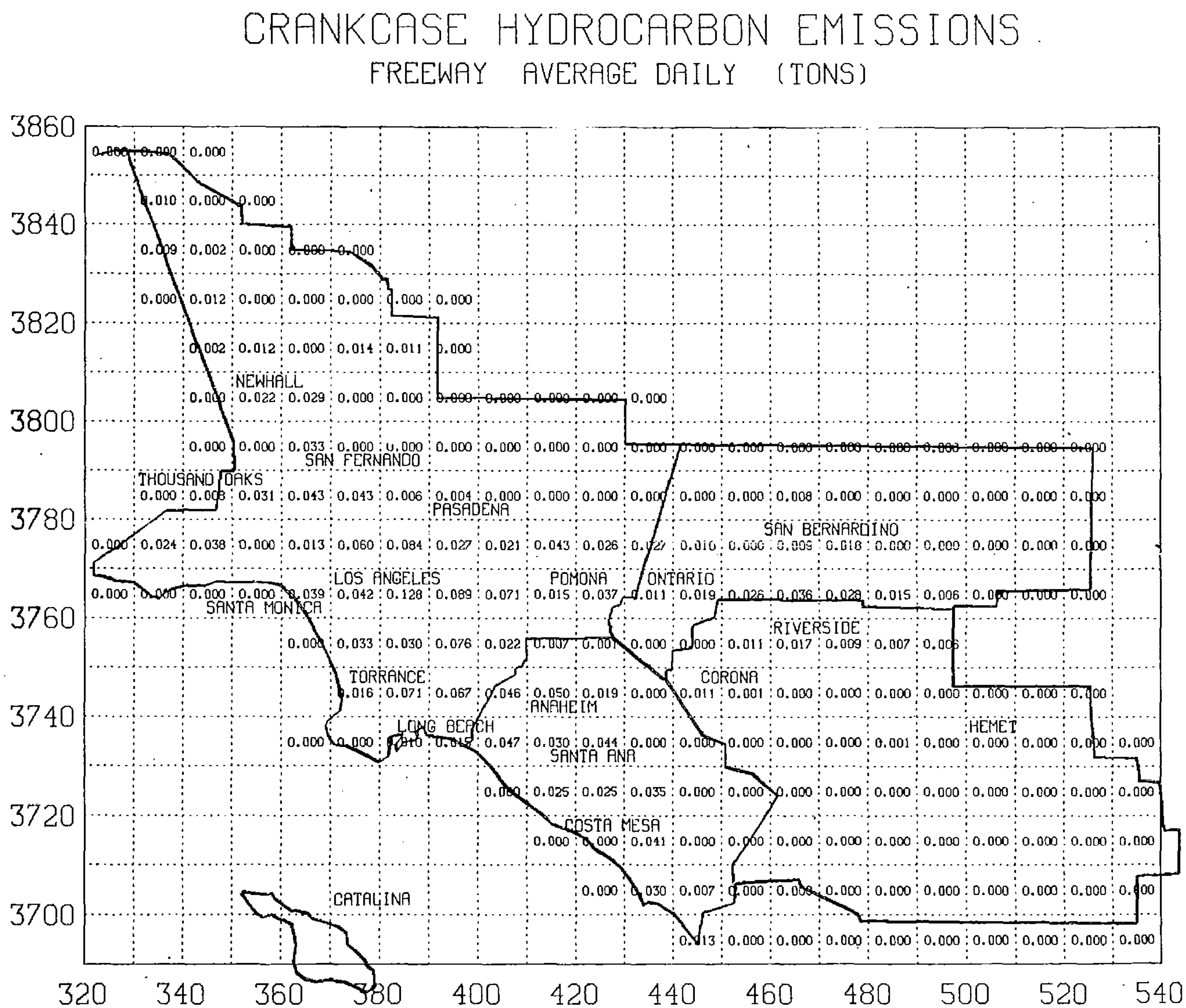

Figure 53. Average Daily Crankcase Organic Emissions - Freeway (Tons/Day) 1975 Inventory

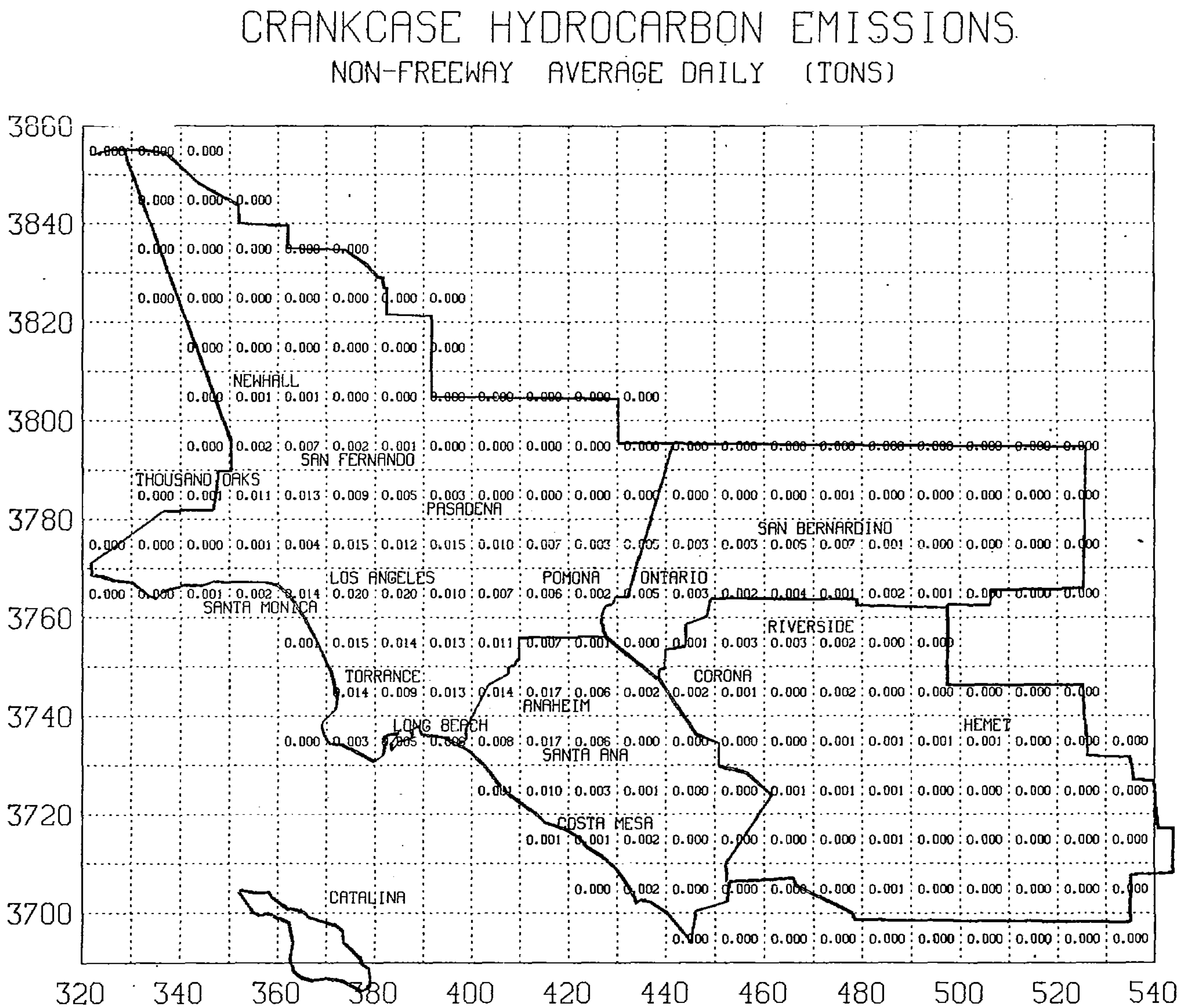

Figure 54. Average Daily Crankcase Organic Emissions - Non-Freeway (Tons/Day) 1975 Inventory

SECTION 10

ALTERNATIVE 1975 HEAVY-DUTY VEHICLE EMISSION INVENTORY

An alternative inventory was also developed. The assumptions and data used were identical except that AP-42, Supplement 5, emission factors were used [5].

Tables 24 through 33 and Figures 55 through 78 present the alternative 1975 heavy-duty vehicle emissions inventory for the South Coast Air Basin (4-county).

Tabulations:

Table 24 -	Alternative 1975 emissions inventory for	- SCAB
Table 25		- Los Angeles County (SCAB portion)
Table 26		- Orange County
Table 27		- Riverside County (SCAB portion)
Table 28		- San Bernardino Co. (SCAB portion)
Table 29 -	Alternative 1975 organic emissions summary	- SCAB
Table 30		- Los Angeles County (SCAB portion)
Table 31		- Orange County
Table 32		- Riverside County (SCAB portion)
Table 33		- San Bernardino Co. (SCAB portion)

Maps - Grid Square Summaries:

Figure 55 -	Average daily total organic emissions	- Total
Figure 56		- Freeway
Figure 57		- Non-freeway
Figure 58 -	Average daily carbon monoxide emissions	- Total
Figure 59 -		- Freeway
Figure 60		- Non-freeway
Figure 61 -	Average daily nitrogen oxides emissions	- Total
Figure 62 -		- Freeway
Figure 63		- Non-freeway
Figure 64 -	Average daily sulfur dioxide emissions	- Total
Figure 65		- Freeway
Figure 66		- Non-freeway
Figure 67 -	Average daily particulate emissions	- Total
Figure 68		- Freeway
Figure 69		- Non-freeway
Figure 70 -	Average daily exhaust organic emissions	- Total
Figure 71		- Freeway
Figure 72		- Non-freeway

Maps - Grid Square Summaries: (continued)

Table 24. Alternate 1975 Emissions Inventory for The South Coast Air Basin (Tons/Day)

SOUTH COAST AIR BASIN

	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	48.8	98.3	147.1	247.1	711.3	958.4	45.8	237.8	283.6	3.7	17.3	21.0	4.3	19.5	23.8
WEEK END	40.7	77.8	118.5	165.3	515.0	680.3	37.1	199.8	236.9	3.1	14.7	17.8	3.5	16.0	19.4
SPRING															
WEEK DAY	50.9	110.6	161.5	259.8	799.7	1059.5	48.2	268.7	316.9	3.8	19.1	22.9	4.4	21.5	25.9
WEEK END	42.1	90.1	132.2	173.7	606.8	780.4	39.3	236.8	276.0	3.2	16.9	20.1	3.6	18.4	22.0
SUMMER															
WEEK DAY	49.9	111.8	161.7	252.7	817.1	1069.8	47.5	278.6	326.1	3.8	20.1	23.9	4.4	22.5	27.0
WEEK END	41.6	90.3	131.9	170.2	613.8	784.1	39.1	242.8	281.9	3.3	17.6	20.9	3.6	19.2	22.8
FALL															
WEEK DAY	49.4	102.4	151.8	250.1	740.6	990.7	46.8	250.6	297.4	3.7	18.2	22.0	4.4	20.4	24.8
WEEK END	40.4	81.2	121.6	160.7	539.8	700.4	36.6	212.1	248.7	3.1	15.5	18.6	3.4	16.9	20.3
ANNUAL AVG.															
WEEK DAY	49.8	105.7	155.5	252.4	767.2	1019.6	47.1	258.9	306.0	3.7	18.7	22.4	4.4	21.0	25.4
WEEK END	41.2	84.9	126.1	167.5	568.8	736.3	38.0	222.8	260.9	3.2	16.2	19.3	3.5	17.6	21.1
DAY	47.3	99.8	147.1	228.2	710.5	938.7	44.5	248.6	293.1	3.6	18.0	21.6	4.1	20.0	24.2
PICKUP GAS 6000	10.7	19.0	29.7	34.3	100.2	134.4	3.8	25.4	29.2	.2	1.1	1.4	.4	1.9	2.4
PICKUP GAS 8500	20.2	43.3	63.5	113.8	383.0	496.8	10.3	53.8	64.1	.3	1.4	1.7	.9	4.3	5.2
TRAC. GAS 10000	1.1	2.9	3.9	6.8	25.6	32.4	.6	3.5	4.1	.0	.1	.1	.1	.4	.5
TRAC. DSL 10000	2.4	9.3	11.7	11.5	25.2	36.7	17.9	105.8	123.6	2.1	11.0	13.1	1.6	8.7	10.3
BUS GAS 10000	1.5	1.9	3.4	8.2	12.8	21.0	.6	1.6	2.2	.0	.0	.1	.1	.2	.2
BUS DSL 10000	.1	.3	.4	.3	.6	1.0	.7	3.4	4.1	.1	.3	.4	.0	.2	.2
DUMP GAS 10000	.7	1.2	1.9	2.8	8.5	11.2	.2	1.0	1.2	.0	.0	.0	.0	.1	.1
DUMP DSL 10000	.2	.6	.8	1.0	1.9	2.9	1.5	7.0	8.5	.2	.7	.9	.1	.5	.6
FLAT. GAS 6000	.8	1.2	2.0	2.1	5.7	7.8	.2	1.3	1.5	.0	.1	.1	.0	.1	.1
FLAT. GAS 8500	1.4	2.6	4.0	6.8	20.4	27.2	.6	2.6	3.2	.0	.1	.1	.1	.3	.3
FLAT. GAS 10000	2.8	5.4	8.2	13.5	41.6	55.1	1.1	5.4	6.5	.0	.1	.2	.1	.6	.7
FLAT. DSL 10000	.1	.3	.3	.4	.8	1.2	.6	2.9	3.5	.1	.3	.4	.0	.2	.2
TANK GAS 10000	.3	.7	.9	1.6	5.8	7.4	.1	.8	.9	.0	.0	.0	.0	.1	.1
TANK DSL 10000	.2	.6	.7	.8	1.6	2.4	1.2	6.9	8.1	.1	.7	.8	.1	.4	.5
VAN GAS 6000	.5	.9	1.3	1.5	4.6	6.1	.2	1.1	1.3	.0	.1	.1	.0	.1	.1
VAN GAS 8500	.8	1.9	2.8	5.0	17.2	22.2	.4	2.4	2.8	.0	.1	.1	.0	.2	.2
VAN GAS 10000	3.1	5.9	9.1	15.7	48.6	64.3	1.4	6.6	7.9	.0	.2	.2	.1	.6	.7
VAN DSL 10000	.1	.3	.3	.4	.8	1.2	.6	2.9	3.5	.1	.3	.4	.0	.2	.2
TRAC GAS NONCAL	.1	.4	.5	.8	3.3	4.1	.1	.4	.5	.0	.0	.0	.0	.1	.1
TRAC DSL NONCAL	.3	1.2	1.5	1.1	2.3	3.4	2.4	13.8	16.1	.3	1.4	1.6	.2	1.1	1.3

Table 25. Alternate 1975 Emissions Inventory for Los Angeles County* (Tons/Day)

LOS ANGELES COUNTY	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	32.6	68.7	101.2	171.0	504.8	675.8	30.0	164.5	194.5	2.4	12.0	14.5	2.9	13.5	16.4
WEEK END	26.6	51.4	78.0	110.9	339.4	450.2	23.9	131.6	155.5	2.1	9.7	11.7	2.2	10.5	12.8
SPRING															
WEEK DAY	33.9	76.8	110.7	178.9	562.8	741.8	31.5	184.2	215.6	2.5	13.1	15.7	2.9	14.8	17.7
WEEK END	27.5	58.8	86.4	116.4	394.1	510.5	25.3	153.8	179.0	2.1	11.0	13.1	2.3	12.0	14.3
SUMMER															
WEEK DAY	33.7	76.8	110.5	177.8	568.0	745.8	31.7	188.3	220.0	2.6	13.6	16.2	3.0	15.3	18.3
WEEK END	27.5	58.9	86.5	117.0	398.6	515.5	25.8	157.6	183.4	2.2	11.4	13.6	2.4	12.5	14.9
FALL															
WEEK DAY	33.1	70.9	104.0	174.4	519.4	693.8	30.9	171.2	202.1	2.5	12.5	15.0	2.9	14.0	17.0
WEEK END	26.6	52.8	79.4	109.3	348.5	457.8	23.9	136.9	160.8	2.0	10.0	12.1	2.2	10.9	13.2
ANNUAL AVG.															
WEEK DAY	33.3	73.3	106.6	175.5	538.8	714.3	31.0	177.0	208.1	2.5	12.8	15.3	2.9	14.4	17.3
WEEK END	27.1	55.5	82.6	113.4	370.2	483.5	24.7	145.0	169.7	2.1	10.5	12.6	2.3	11.5	13.8
DAY	31.5	68.2	99.7	157.8	490.6	648.4	29.2	167.9	197.1	2.4	12.2	14.6	2.8	13.6	16.3
PICKUP GAS 6000	7.0	13.0	20.0	23.5	69.3	92.8	2.5	17.1	19.6	.2	.8	.9	.3	1.3	1.6
PICKUP GAS 8500	13.3	29.4	42.7	78.5	262.6	341.0	6.7	36.4	43.1	.2	.9	1.1	.6	2.9	3.5
TRAC. GAS 10000	.7	2.0	2.7	4.8	17.4	22.1	.4	2.3	2.7	.0	.1	.1	.1	.3	.3
TRAC. DSL 10000	1.7	6.3	8.0	8.2	17.7	25.9	11.8	71.1	82.8	1.4	7.4	8.8	1.1	5.8	6.9
BUS GAS 10000	1.0	1.3	2.3	5.7	8.8	14.5	.4	1.1	1.5	.0	.0	.0	.0	.1	.2
BUS DSL 10000	.1	.2	.3	.2	.5	.7	.4	2.3	2.8	.0	.2	.3	.0	.1	.2
DUMP GAS 10000	.4	.8	1.3	1.9	6.0	7.9	.1	.7	.8	.0	.0	.0	.0	.1	.1
DUMP DSL 10000	.1	.4	.6	.7	1.4	2.1	1.0	4.9	5.8	.1	.5	.6	.1	.3	.4
FLAT. GAS 6000	.5	.8	1.4	1.4	4.1	5.5	.1	.9	1.0	.0	.0	.1	.0	.1	.1
FLAT. GAS 8500	.9	1.8	2.7	4.7	14.4	19.1	.4	1.8	2.2	.0	.0	.1	.0	.2	.2
FLAT. GAS 10000	1.9	3.8	5.7	9.4	29.3	38.7	.7	3.7	4.5	.0	.1	.1	.1	.4	.5
FLAT. DSL 10000	.1	.2	.2	.3	.6	.8	.4	2.0	2.4	.0	.2	.2	.0	.1	.2
TANK GAS 10000	.2	.4	.6	1.1	4.0	5.1	.1	.5	.6	.0	.0	.0	.0	.1	.1
TANK DSL 10000	.1	.4	.5	.5	1.1	1.7	.8	4.6	5.4	.1	.5	.6	.1	.3	.4
VAN GAS 6000	.3	.6	.9	1.0	3.2	4.2	.1	.8	.9	.0	.0	.0	.0	.1	.1
VAN GAS 8500	.6	1.3	1.9	3.4	11.8	15.2	.3	1.6	1.9	.0	.0	.1	.0	.1	.2
VAN GAS 10000	2.2	4.2	6.4	10.9	34.3	45.1	.9	4.5	5.4	.0	.1	.1	.1	.4	.5
VAN DSL 10000	.1	.2	.2	.3	.6	.8	.4	2.0	2.4	.0	.2	.2	.0	.1	.1
TRAC GAS NONCAL	.1	.3	.4	.6	2.2	2.8	.0	.3	.3	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.2	.8	1.0	.8	1.6	2.4	1.6	9.2	10.8	.2	.9	1.1	.1	.7	.9

*South Coast Air Basin portion only.

Table 26. Alternate 1975 Emissions Inventory for Orange County (Tons/Day)

ORANGE COUNTY	Hydrocarbons			Carbon Monoxide			Nitrogen Oxides			Sulfur Dioxide			Particulates		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	9.2	17.3	26.5	45.6	125.5	171.1	9.6	44.1	53.6	.8	3.2	4.0	.9	3.6	4.5
WEEK END	7.7	14.7	22.3	30.2	100.1	130.3	7.6	39.3	47.0	.6	2.9	3.5	.7	3.1	3.8
SPRING															
WEEK DAY	9.6	19.7	29.3	47.8	142.7	190.5	10.1	50.4	60.5	.8	3.6	4.4	.9	4.0	4.9
WEEK END	7.9	17.4	25.3	31.7	120.6	152.3	8.1	47.8	55.8	.7	3.4	4.1	.7	3.7	4.4
SUMMER															
WEEK DAY	9.5	20.4	29.8	47.2	149.7	196.9	10.1	53.7	63.8	.8	3.9	4.7	.9	4.3	5.2
WEEK END	7.9	17.5	25.4	31.6	123.0	154.6	8.2	49.4	57.6	.7	3.6	4.3	.7	3.9	4.6
FALL															
WEEK DAY	9.3	18.5	27.9	46.4	135.0	181.4	9.9	48.0	57.8	.8	3.5	4.3	.9	3.9	4.8
WEEK END	7.6	15.9	23.5	29.6	109.4	139.0	7.6	43.6	51.2	.6	3.2	3.8	.7	3.5	4.2
ANNUAL AVG.															
WEEK DAY	9.4	19.0	28.4	46.7	138.2	185.0	9.9	49.0	58.9	.8	3.5	4.3	.9	3.9	4.8
WEEK END	7.8	16.4	24.1	30.8	113.3	144.0	7.9	45.0	52.9	.6	3.3	3.9	.7	3.6	4.3
DAY	8.9	18.2	27.2	42.2	131.1	173.3	9.3	47.9	57.2	.7	3.5	4.2	.8	3.8	4.7
PICKUP GAS 6000	2.1	3.5	5.5	6.4	18.4	24.8	.8	4.9	5.6	.0	.2	.3	.1	.4	.5
PICKUP GAS 8500	3.8	7.9	11.7	21.1	71.3	92.4	2.1	10.2	12.4	.1	.3	.3	.2	.8	1.0
TRAC. GAS 10000	.2	.5	.7	1.3	4.9	6.2	.1	.7	.8	.0	.0	.0	.0	.1	.1
TRAC. DSL 10000	.5	1.8	2.2	2.0	4.6	6.7	3.8	20.7	24.5	.4	2.2	2.6	.3	1.7	2.0
BUS GAS 10000	.3	.3	.6	1.5	2.4	3.9	.1	.3	.4	.0	.0	.0	.0	.0	.0
BUS DSL 10000	.0	.1	.1	.1	.1	.2	.1	.7	.8	.0	.1	.1	.0	.0	.0
DUMP GAS 10000	.1	.2	.3	.5	1.5	2.0	.0	.2	.2	.0	.0	.0	.0	.0	.0
DUMP DSL 10000	.0	.1	.2	.2	.3	.5	.3	1.3	1.6	.0	.1	.2	.0	.1	.1
FLAT. GAS 6000	.2	.2	.4	.4	1.0	1.4	.0	.2	.3	.0	.0	.0	.0	.0	.0
FLAT. GAS 8500	.3	.5	.7	1.3	3.6	4.9	.1	.5	.6	.0	.0	.0	.0	.0	.1
FLAT. GAS 10000	.5	1.0	1.5	2.5	7.4	9.9	.2	1.0	1.2	.0	.0	.0	.0	.1	.1
FLAT. DSL 10000	.0	.0	.1	.1	.1	.2	.1	.5	.7	.0	.1	.1	.0	.0	.0
TANK GAS 10000	.1	.1	.2	.3	1.1	1.4	.0	.2	.2	.0	.0	.0	.0	.0	.0
TANK DSL 10000	.0	.1	.1	.1	.3	.4	.3	1.4	1.6	.0	.1	.2	.0	.1	.1
VAN GAS 6000	.1	.2	.2	.3	.8	1.1	.0	.2	.3	.0	.0	.0	.0	.0	.0
VAN GAS 8500	.1	.4	.5	.9	3.2	4.1	.1	.5	.5	.0	.0	.0	.0	.0	.0
VAN GAS 10000	.6	1.0	1.6	2.9	8.6	11.5	.3	1.2	1.5	.0	.0	.0	.0	.1	.1
VAN DSL 10000	.0	.0	.1	.1	.1	.2	.1	.5	.7	.0	.1	.1	.0	.0	.0
TRAC GAS NONCAL	.0	.1	.1	.1	.6	.8	.0	.1	.1	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.1	.2	.3	.2	.4	.6	.5	2.7	3.2	.1	.3	.3	.0	.2	.3

Table 27. Alternate 1975 Emissions Inventory for Riverside County* (Tons/Day)

RIVERSIDE COUNTY	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	3.9	4.7	8.6	11.6	23.6	35.2	2.6	8.7	11.3	.2	.6	.8	.2	.7	.9
WEEK END	3.7	4.8	8.6	9.5	24.6	34.1	2.4	9.4	11.8	.2	.7	.9	.2	.7	1.0
SPRING															
WEEK DAY	4.1	5.3	9.4	12.7	28.5	41.2	2.8	10.6	13.4	.2	.7	1.0	.2	.8	1.1
WEEK END	3.8	5.7	9.5	10.0	31.6	41.6	2.5	12.1	14.7	.2	.9	1.1	.2	.9	1.2
SUMMER															
WEEK DAY	3.8	5.7	9.5	10.4	31.9	42.3	2.4	12.0	14.4	.2	.9	1.0	.2	1.0	1.2
WEEK END	3.6	5.7	9.4	8.4	32.0	40.4	2.1	12.5	14.6	.2	.9	1.1	.2	1.0	1.2
FALL															
WEEK DAY	3.9	5.0	8.9	11.1	26.1	37.2	2.5	9.8	12.3	.2	.7	.9	.2	.8	1.0
WEEK END	3.6	5.3	8.9	8.5	28.1	36.6	2.2	10.9	13.1	.2	.8	1.0	.2	.9	1.1
ANNUAL AVG.															
WEEK DAY	3.9	5.2	9.1	11.4	27.5	39.0	2.6	10.3	12.9	.2	.7	.9	.2	.8	1.0
WEEK END	3.7	5.4	9.1	9.1	29.1	38.2	2.3	11.2	13.5	.2	.8	1.0	.2	.9	1.1
DAY	3.9	5.3	9.1	10.8	28.0	38.7	2.5	10.6	13.1	.2	.8	.9	.2	.8	1.1
PICKUP GAS 6000	.9	1.0	1.9	1.7	3.9	5.6	.2	1.1	1.3	.0	.0	.1	.0	.1	.1
PICKUP GAS 8500	1.9	2.5	4.4	5.5	15.6	21.0	.6	2.3	2.9	.0	.1	.1	.1	.2	.2
TRAC. GAS 10000	.1	.1	.2	.3	1.1	1.4	.0	.2	.2	.0	.0	.0	.0	.0	.0
TRAC. DSL 10000	.1	.4	.5	.5	.9	1.4	1.0	4.6	5.5	.1	.5	.6	.1	.4	.5
BUS GAS 10000	.1	.1	.2	.4	.5	.9	.0	.1	.1	.0	.0	.0	.0	.0	.0
BUS DSL 10000	.0	.0	.0	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0	.0
DUMP GAS 10000	.1	.1	.1	.1	.3	.4	.0	.0	.1	.0	.0	.0	.0	.0	.0
DUMP DSL 10000	.0	.0	.0	.0	.1	.1	.1	.3	.4	.0	.0	.0	.0	.0	.0
FLAT. GAS 6000	.1	.1	.1	.1	.2	.3	.0	.0	.1	.0	.0	.0	.0	.0	.0
FLAT. GAS 8500	.1	.1	.3	.3	.7	1.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
FLAT. GAS 10000	.2	.3	.5	.6	1.5	2.1	.1	.2	.3	.0	.0	.0	.0	.0	.0
FLAT. DSL 10000	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
TANK GAS 10000	.0	.0	.1	.1	.2	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
TANK DSL 10000	.0	.0	.0	.0	.1	.1	.1	.3	.4	.0	.0	.0	.0	.0	.0
VAN GAS 6000	.0	.0	.1	.1	.2	.3	.0	.0	.1	.0	.0	.0	.0	.0	.0
VAN GAS 8500	.1	.1	.1	.2	.7	.9	.0	.1	.1	.0	.0	.0	.0	.0	.0
VAN GAS 10000	.2	.3	.5	.7	1.7	2.5	.1	.3	.3	.0	.0	.0	.0	.0	.0
VAN DSL 10000	.0	.0	.0	.0	.0	.0	.0	.1	.1	.0	.0	.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.0	.1	.2	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.0	.1	.0	.1	.1	.1	.6	.7	.0	.1	.1	.0	.0	.1

*South Coast Air Basin portion only.

Table 28. Alternate 1975 Emissions Inventory for San Bernardino County* (Tons/Day)

SAN BERNARDINO COUNTY

	HYDROCARBONS			CARBON MONOXIDE			NITROGEN OXIDES			SULFUR DIOXIDE			PARTICULATES		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER															
WEEK DAY	3.1	7.6	10.7	18.9	57.5	76.3	3.6	20.5	24.1	.3	1.5	1.8	.3	1.7	2.0
WEEK END	2.7	6.9	9.6	14.8	51.0	65.7	3.2	19.4	22.6	.3	1.4	1.7	.3	1.5	1.8
SPRING															
WEEK DAY	3.3	8.7	12.0	20.4	65.6	86.0	3.9	23.5	27.4	.3	1.6	1.9	.4	1.8	2.2
WEEK END	2.8	8.2	11.0	15.5	60.5	76.0	3.4	23.1	26.5	.3	1.6	1.9	.3	1.8	2.1
SUMMER															
WEEK DAY	3.0	8.9	11.8	17.3	67.5	84.8	3.4	24.5	27.9	.3	1.7	2.0	.3	2.0	2.3
WEEK END	2.6	8.1	10.7	13.3	60.2	73.6	3.0	23.3	26.3	.2	1.7	1.9	.3	1.8	2.1
FALL															
WEEK DAY	3.0	8.0	11.0	18.2	60.1	78.3	3.5	21.7	25.2	.3	1.5	1.8	.3	1.7	2.1
WEEK END	2.6	7.3	9.8	13.3	53.7	67.1	3.0	20.7	23.6	.2	1.5	1.7	.3	1.6	1.9
ANNUAL AVG.															
WEEK DAY	3.1	8.3	11.4	18.7	62.7	81.4	3.6	22.6	26.2	.3	1.6	1.9	.3	1.8	2.1
WEEK END	2.7	7.6	10.3	14.2	56.3	70.6	3.2	21.6	24.8	.3	1.5	1.8	.3	1.7	2.0
DAY	3.0	8.1	11.1	17.4	60.9	78.3	3.5	22.3	25.8	.3	1.6	1.9	.3	1.8	2.1
PICKUP GAS 6000	.7	1.6	2.2	2.7	8.5	11.2	.3	2.3	2.6	.0	.1	.1	.0	.2	.2
PICKUP GAS 8500	1.2	3.5	4.7	8.8	33.5	42.3	.8	4.9	5.7	.0	.1	.1	.1	.4	.5
TRAC. GAS 10000	.1	.2	.3	.5	2.2	2.7	.0	.3	.4	.0	.0	.0	.0	.0	.0
TRAC. DSL 10000	.2	.8	1.0	.8	2.0	2.8	1.4	9.4	10.7	.2	1.0	1.1	.1	.8	.9
BUS GAS 10000	.1	.2	.3	.6	1.1	1.7	.0	.1	.2	.0	.0	.0	.0	.0	.0
BUS DSL 10000	.0	.0	.0	.0	.0	.1	.1	.3	.4	.0	.0	.0	.0	.0	.0
DUMP GAS 10000	.0	.1	.1	.2	.7	.9	.0	.1	.1	.0	.0	.0	.0	.0	.0
DUMP DSL 10000	.0	.1	.1	.1	.1	.2	.1	.6	.7	.0	.1	.1	.0	.0	.0
FLAT. GAS 6000	.1	.1	.1	.2	.5	.6	.0	.1	.1	.0	.0	.0	.0	.0	.0
FLAT. GAS 8500	.1	.2	.3	.5	1.7	2.2	.0	.2	.3	.0	.0	.0	.0	.0	.0
FLAT. GAS 10000	.2	.4	.6	1.0	3.4	4.4	.1	.5	.6	.0	.0	.0	.0	.0	.1
FLAT. DSL 10000	.0	.0	.0	.0	.1	.1	.0	.3	.3	.0	.0	.0	.0	.0	.0
TANK GAS 10000	.0	.1	.1	.1	.5	.6	.0	.1	.1	.0	.0	.0	.0	.0	.0
TANK DSL 10000	.0	.0	.1	.1	.1	.2	.1	.6	.7	.0	.1	.1	.0	.0	.0
VAN GAS 6000	.0	.1	.1	.1	.4	.5	.0	.1	.1	.0	.0	.0	.0	.0	.0
VAN GAS 8500	.1	.2	.2	.4	1.5	1.9	.0	.2	.3	.0	.0	.0	.0	.0	.0
VAN GAS 10000	.2	.5	.7	1.2	4.0	5.2	.1	.6	.7	.0	.0	.0	.0	.0	.1
VAN DSL 10000	.0	.0	.0	.0	.1	.1	.0	.3	.3	.0	.0	.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.1	.3	.3	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.1	.1	.1	.2	.3	.2	1.2	1.4	.0	.1	.1	.0	.1	.1

*South Coast Air Basin portion only.

Table 29. Alternate 1975 Organic Emissions Summary for The South Coast Air Basin (Tons/Day)

SOUTH COAST AIR BASIN

	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	24.9	77.4	102.3	23.2	18.1	41.2	.7	2.8	3.5	48.8	98.3	147.1
WEEK END	17.1	57.8	74.9	23.2	18.0	41.2	.4	2.0	2.4	40.7	77.8	118.5
SPRING												
WEEK DAY	27.0	89.4	116.4	23.2	18.1	41.2	.7	3.1	3.8	50.9	110.6	161.5
WEEK END	18.5	69.8	88.3	23.2	18.0	41.2	.5	2.3	2.7	42.1	90.1	132.2
SUMMER												
WEEK DAY	26.0	90.5	116.5	23.2	18.1	41.2	.7	3.2	3.9	49.9	111.8	161.7
WEEK END	18.0	69.9	87.9	23.2	18.0	41.2	.5	2.4	2.8	41.6	90.3	131.9
FALL												
WEEK DAY	25.5	81.4	106.9	23.2	18.1	41.2	.7	2.9	3.6	49.4	102.4	151.8
WEEK END	16.8	61.1	77.9	23.2	18.0	41.2	.4	2.1	2.5	40.4	81.2	121.6
ANNUAL AVG.												
WEEK DAY	25.9	84.7	110.5	23.2	18.1	41.2	.7	3.0	3.7	49.8	105.7	155.5
WEEK END	17.6	64.7	82.2	23.2	18.0	41.2	.4	2.2	2.6	41.2	84.9	126.1
DAY	23.5	79.0	102.5	23.2	18.0	41.2	.6	2.8	3.4	47.3	99.8	147.1
PICKUP GAS 6000	3.8	13.5	17.3	6.8	5.3	12.1	.1	.2	.3	10.7	19.0	29.7
PICKUP GAS 8500	10.2	34.2	44.4	9.7	7.6	17.3	.3	1.6	1.9	20.2	43.3	63.5
TRAC. GAS 10000	.7	2.4	3.1	.4	.3	.7	.0	.1	.2	1.1	2.9	3.9
TRAC. DSL 10000	2.4	9.3	11.7	0.0	0.0	0.0	0.0	0.0	0.0	2.4	9.3	11.7
BUS GAS 10000	.8	1.3	2.1	.6	.5	1.1	.0	.1	.1	1.5	1.9	3.4
BUS DSL 10000	.1	.3	.4	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.4
DUMP GAS 10000	.3	.9	1.2	.4	.3	.6	.0	.1	.1	.7	1.2	1.9
DUMP DSL 10000	.2	.6	.8	0.0	0.0	0.0	0.0	0.0	0.0	.2	.6	.8
FLAT. GAS 6000	.2	.8	1.0	.6	.5	1.0	.0	.0	.0	.8	1.2	2.0
FLAT. GAS 8500	.6	2.0	2.6	.7	.6	1.3	.0	.1	.1	1.4	2.6	4.0
FLAT. GAS 10000	1.3	4.0	5.3	1.5	1.2	2.7	.1	.2	.3	2.8	5.4	8.2
FLAT. DSL 10000	.1	.3	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.3
TANK GAS 10000	.1	.6	.7	.1	.1	.2	.0	.0	.0	.3	.7	.9
TANK DSL 10000	.2	.6	.7	0.0	0.0	0.0	0.0	0.0	0.0	.2	.6	.7
VAN GAS 6000	.2	.6	.8	.3	.2	.5	.0	.0	.0	.5	.9	1.3
VAN GAS 8500	.5	1.6	2.0	.4	.3	.6	.0	.1	.1	.8	1.9	2.8
VAN GAS 10000	1.4	4.4	5.9	1.7	1.3	2.9	.0	.2	.3	3.1	5.9	9.1
VAN DSL 10000	.1	.3	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.3	.3
TRAC GAS NONCAL	.1	.3	.4	.1	.0	.1	.0	.0	.0	.1	.4	.5
TRAC DSL NONCAL	.3	1.2	1.5	0.0	0.0	0.0	0.0	0.0	0.0	.3	1.2	1.5

Table 30. Alternate 1975 Organic Emissions Summary - Los Angeles County* (Tons/Day)

LOS ANGELES COUNTY

	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	17.2	54.7	71.9	14.9	12.0	26.9	.5	2.0	2.4	32.6	68.7	101.2
WEEK END	11.4	38.1	49.5	14.9	12.0	26.9	.3	1.3	1.6	26.6	51.4	78.0
SPRING												
WEEK DAY	18.5	62.7	81.2	14.9	12.0	26.9	.5	2.1	2.6	33.9	76.8	110.7
WEEK END	12.3	45.4	57.7	14.9	12.0	26.9	.3	1.5	1.8	27.5	58.8	86.4
SUMMER												
WEEK DAY	18.2	62.6	80.9	14.9	12.0	26.9	.5	2.2	2.7	33.7	76.8	110.5
WEEK END	12.3	45.4	57.7	14.9	12.0	26.9	.3	1.6	1.9	27.5	58.9	86.5
FALL												
WEEK DAY	17.7	56.8	74.6	14.9	12.0	26.9	.5	2.0	2.5	33.1	70.9	104.0
WEEK END	11.4	39.4	50.8	14.9	12.0	26.9	.3	1.4	1.6	26.6	52.8	79.4
ANNUAL AVG.												
WEEK DAY	17.9	59.2	77.1	14.9	12.0	26.9	.5	2.1	2.5	33.3	73.3	106.6
WEEK END	11.9	42.1	53.9	14.9	12.0	26.9	.3	1.4	1.7	27.1	55.5	82.6
DAY	16.2	54.3	70.5	14.9	12.0	26.9	.4	1.9	2.3	31.5	68.2	99.7
PICKUP GAS 6000	2.6	9.2	11.8	4.4	3.6	8.0	.0	.2	.2	7.0	13.0	20.0
PICKUP GAS 8500	7.0	23.4	30.4	6.1	4.9	10.9	.2	1.1	1.3	13.3	29.4	42.7
TRAC. GAS 10000	.5	1.7	2.1	.3	.2	.5	.0	.1	.1	.7	2.0	2.7
TRAC. DSL 10000	1.7	6.3	8.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	6.3	8.0
BUS GAS 10000	.6	.9	1.5	.4	.3	.8	.0	.1	.1	1.0	1.3	2.3
BUS DSL 10000	.1	.2	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.3
DUMP GAS 10000	.2	.6	.8	.2	.2	.4	.0	.0	.1	.4	.8	1.3
DUMP DSL 10000	.1	.4	.6	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.6
FLAT. GAS 6000	.2	.5	.7	.4	.3	.7	.0	.0	.0	.5	.8	1.4
FLAT. GAS 8500	.4	1.4	1.8	.5	.4	.8	.0	.1	.1	.9	1.8	2.7
FLAT. GAS 10000	.9	2.8	3.7	1.0	.8	1.8	.0	.2	.2	1.9	3.8	5.7
FLAT. DSL 10000	.1	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2
TANK GAS 10000	.1	.4	.5	.1	.1	.1	.0	.0	.0	.2	.4	.6
TANK DSL 10000	.1	.4	.5	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.5
VAN GAS 6000	.1	.4	.5	.2	.2	.4	.0	.0	.0	.3	.6	.9
VAN GAS 8500	.3	1.1	1.4	.3	.2	.5	.0	.1	.1	.6	1.3	1.9
VAN GAS 10000	1.0	3.1	4.1	1.1	.9	2.1	.0	.1	.2	2.2	4.2	6.4
VAN DSL 10000	.1	.2	.2	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.2
TRAC GAS NONCAL	.1	.2	.3	.0	.0	.1	.0	.0	.0	.1	.3	.4
TRAC DSL NONCAL	.2	.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	.8	1.0

*South Coast Air Basin portion only.

Table 31. Alternate 1975 Organic Emissions Summary - Orange County (Tons/Day)

ORANGE COUNTY	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	4.7	13.8	18.4	4.4	3.0	7.4	.1	.5	.6	9.2	17.3	26.5
WEEK END	3.2	11.3	14.4	4.4	3.0	7.4	.1	.4	.5	7.7	14.7	22.3
SPRING												
WEEK DAY	5.0	16.1	21.1	4.4	3.0	7.4	.1	.6	.7	9.6	19.7	29.3
WEEK END	3.4	13.9	17.3	4.4	3.0	7.4	.1	.5	.5	7.9	17.4	25.3
SUMMER												
WEEK DAY	4.9	16.7	21.6	4.4	3.0	7.4	.1	.6	.8	9.5	20.4	29.8
WEEK END	3.4	14.1	17.4	4.4	3.0	7.4	.1	.5	.6	7.9	17.5	25.4
FALL												
WEEK DAY	4.8	15.0	19.8	4.4	3.0	7.4	.1	.5	.7	9.3	18.5	27.9
WEEK END	3.1	12.4	15.6	4.4	3.0	7.4	.1	.4	.5	7.6	15.9	23.5
ANNUAL AVG.												
WEEK DAY	4.8	15.4	20.2	4.4	3.0	7.4	.1	.6	.7	9.4	19.0	28.4
WEEK END	3.3	12.9	16.2	4.4	3.0	7.4	.1	.4	.5	7.8	16.4	24.1
DAY	4.4	14.7	19.1	4.4	3.0	7.4	.1	.5	.6	8.9	18.2	27.2
PICKUP GAS 6000	.7	2.5	3.2	1.3	.9	2.3	.0	.0	.1	2.1	3.5	5.5
PICKUP GAS 8500	1.9	6.4	8.3	1.8	1.3	3.1	.1	.3	.4	3.8	7.9	11.7
TRAC. GAS 10000	.1	.5	.6	.1	.0	.1	.0	.0	.0	.2	.5	.7
TRAC. DSL 10000	.5	1.8	2.2	0.0	0.0	0.0	0.0	0.0	0.0	.5	1.8	2.2
BUS GAS 10000	.2	.2	.4	.1	.1	.2	.0	.0	.0	.3	.3	.6
BUS DSL 10000	.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.1
DUMP GAS 10000	.1	.2	.2	.1	.0	.1	.0	.0	.0	.1	.2	.3
DUMP DSL 10000	.0	.1	.2	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.2
FLAT. GAS 6000	.0	.1	.2	.1	.1	.2	.0	.0	.0	.2	.2	.4
FLAT. GAS 8500	.1	.3	.5	.1	.1	.2	.0	.0	.0	.3	.5	.7
FLAT. GAS 10000	.2	.7	.9	.3	.2	.5	.0	.0	.1	.5	1.0	1.5
FLAT. DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
TANK GAS 10000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.1	.1	.2
TANK DSL 10000	.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.1
VAN GAS 6000	.0	.1	.1	.1	.0	.1	.0	.0	.0	.1	.2	.2
VAN GAS 8500	.1	.3	.4	.1	.0	.1	.0	.0	.0	.1	.4	.5
VAN GAS 10000	.3	.8	1.1	.3	.2	.5	.0	.0	.0	.6	1.0	1.6
VAN DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
TRAC GAS NONCAL	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
TRAC DSL NONCAL	.1	.2	.3	0.0	0.0	0.0	0.0	0.0	0.0	.1	.2	.3

Table 32. Alternate 1975 Organic Emissions Summary - Riverside County* (Tons/Day)

RIVERSIDE COUNTY

	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	1.2	2.6	3.8	2.7	2.0	4.7	.0	.1	.1	3.9	4.7	8.6
WEEK END	1.0	2.7	3.7	2.7	2.0	4.7	.0	.1	.1	3.7	4.8	8.6
SPRING												
WEEK DAY	1.3	3.2	4.6	2.7	2.0	4.7	.0	.1	.2	4.1	5.3	9.4
WEEK END	1.1	3.6	4.7	2.7	2.0	4.7	.0	.1	.1	3.8	5.7	9.5
SUMMER												
WEEK DAY	1.1	3.6	4.7	2.7	2.0	4.7	.0	.1	.2	3.8	5.7	9.5
WEEK END	.9	3.6	4.5	2.7	2.0	4.7	.0	.1	.2	3.6	5.7	9.4
FALL												
WEEK DAY	1.2	2.9	4.1	2.7	2.0	4.7	.0	.1	.1	3.9	5.0	8.9
WEEK END	.9	3.2	4.1	2.7	2.0	4.7	.0	.1	.1	3.6	5.3	8.9
ANNUAL AVG.												
WEEK DAY	1.2	3.1	4.3	2.7	2.0	4.7	.0	.1	.2	3.9	5.2	9.1
WEEK END	1.0	3.3	4.3	2.7	2.0	4.7	.0	.1	.1	3.7	5.4	9.1
DAY	1.1	3.1	4.3	2.7	2.0	4.7	.0	.1	.1	3.9	5.3	9.1
PICKUP GAS 6000	.2	.5	.7	.7	.5	1.1	.0	.0	.0	.9	1.0	1.9
PICKUP GAS 8500	.5	1.4	1.9	1.4	1.0	2.5	.0	.1	.1	1.9	2.5	4.4
TRAC. GAS 10000	.0	.1	.1	.0	.0	.1	.0	.0	.0	.1	.1	.2
TRAC. DSL 10000	.1	.4	.5	0.0	0.0	0.0	0.0	0.0	0.0	.1	.4	.5
BUS GAS 10000	.0	.1	.1	.1	.0	.1	.0	.0	.0	.1	.1	.2
BUS DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
DUMP GAS 10000	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1
DUMP DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
FLAT. GAS 6000	.0	.0	.0	.0	.0	.1	.0	.0	.0	.1	.1	.1
FLAT. GAS 8500	.0	.1	.1	.1	.1	.2	.0	.0	.0	.1	.1	.3
FLAT. GAS 10000	.1	.1	.2	.2	.1	.3	.0	.0	.0	.2	.3	.5
FLAT. DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TANK GAS 10000	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
TANK DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
VAN GAS 6000	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.1
VAN GAS 8500	.0	.1	.1	.0	.0	.1	.0	.0	.0	.1	.1	.1
VAN GAS 10000	.1	.2	.2	.1	.1	.2	.0	.0	.0	.2	.3	.5
VAN DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1

*South Coast Air Basin portion only.

Table 33. Alternate 1975 Organic Emissions Summary - San Bernardino County* (Tons/Day)

SAN BERNARDINO COUNTY

	EXHAUST HYDROCARBONS			EVAPORATIVE HYDROCARBONS			CRANKCASE HYDROCARBONS			TOTAL HYDROCARBONS		
	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL	N-FWY	FWY	TOTAL
WINTER												
WEEK DAY	1.9	6.3	8.2	1.1	1.0	2.2	.1	.2	.3	3.1	7.6	10.7
WEEK END	1.5	5.7	7.2	1.1	1.0	2.2	.0	.2	.2	2.7	6.9	9.6
SPRING												
WEEK DAY	2.1	7.4	9.5	1.1	1.0	2.2	.1	.3	.3	3.3	8.7	12.0
WEEK END	1.6	6.9	8.6	1.1	1.0	2.2	.0	.2	.3	2.8	8.2	11.0
SUMMER												
WEEK DAY	1.8	7.5	9.3	1.1	1.0	2.2	.1	.3	.3	3.0	8.9	11.8
WEEK END	1.4	6.8	8.2	1.1	1.0	2.2	.0	.2	.3	2.6	8.1	10.7
FALL												
WEEK DAY	1.9	6.7	8.5	1.1	1.0	2.2	.1	.2	.3	3.0	8.0	11.0
WEEK END	1.4	6.0	7.4	1.1	1.0	2.2	.0	.2	.2	2.6	7.3	9.8
ANNUAL AVG.												
WEEK DAY	1.9	7.0	8.9	1.1	1.0	2.2	.1	.3	.3	3.1	8.3	11.4
WEEK END	1.5	6.4	7.9	1.1	1.0	2.2	.0	.2	.3	2.7	7.6	10.3
DAY	1.8	6.8	8.6	1.1	1.0	2.2	.0	.2	.3	3.0	8.1	11.1
PICKUP GAS 6000	.3	1.2	1.5	.4	.4	.8	.0	.0	.0	.7	1.6	2.2
PICKUP GAS 8500	.8	3.0	3.8	.4	.4	.8	.0	.1	.2	1.2	3.5	4.7
TRAC. GAS 10000	.0	.2	.3	.0	.0	.0	.0	.0	.0	.1	.2	.3
TRAC. DSL 10000	.2	.8	1.0	0.0	0.0	0.0	0.0	0.0	0.0	.2	.8	1.0
BUS GAS 10000	.1	.1	.2	.0	.0	.1	.0	.0	.0	.1	.2	.3
BUS DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
DUMP GAS 10000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
DUMP DSL 10000	.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.1
FLAT. GAS 6000	.0	.1	.1	.0	.0	.1	.0	.0	.0	.1	.1	.1
FLAT. GAS 8500	.0	.2	.2	.0	.0	.1	.0	.0	.0	.1	.2	.3
FLAT. GAS 10000	.1	.3	.4	.1	.1	.1	.0	.0	.0	.2	.4	.6
FLAT. DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TANK GAS 10000	.0	.0	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
TANK DSL 10000	.0	.0	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.1
VAN GAS 6000	.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	.1	.1
VAN GAS 8500	.0	.1	.2	.0	.0	.0	.0	.0	.0	.1	.2	.2
VAN GAS 10000	.1	.4	.5	.1	.1	.2	.0	.0	.0	.2	.5	.7
VAN DSL 10000	.0	.0	.0	0.0	0.0	0.0	0.0	0.0	0.0	.0	.0	.0
TRAC GAS NONCAL	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
TRAC DSL NONCAL	.0	.1	.1	0.0	0.0	0.0	0.0	0.0	0.0	.0	.1	.1

*South Coast Air Basin portion only.

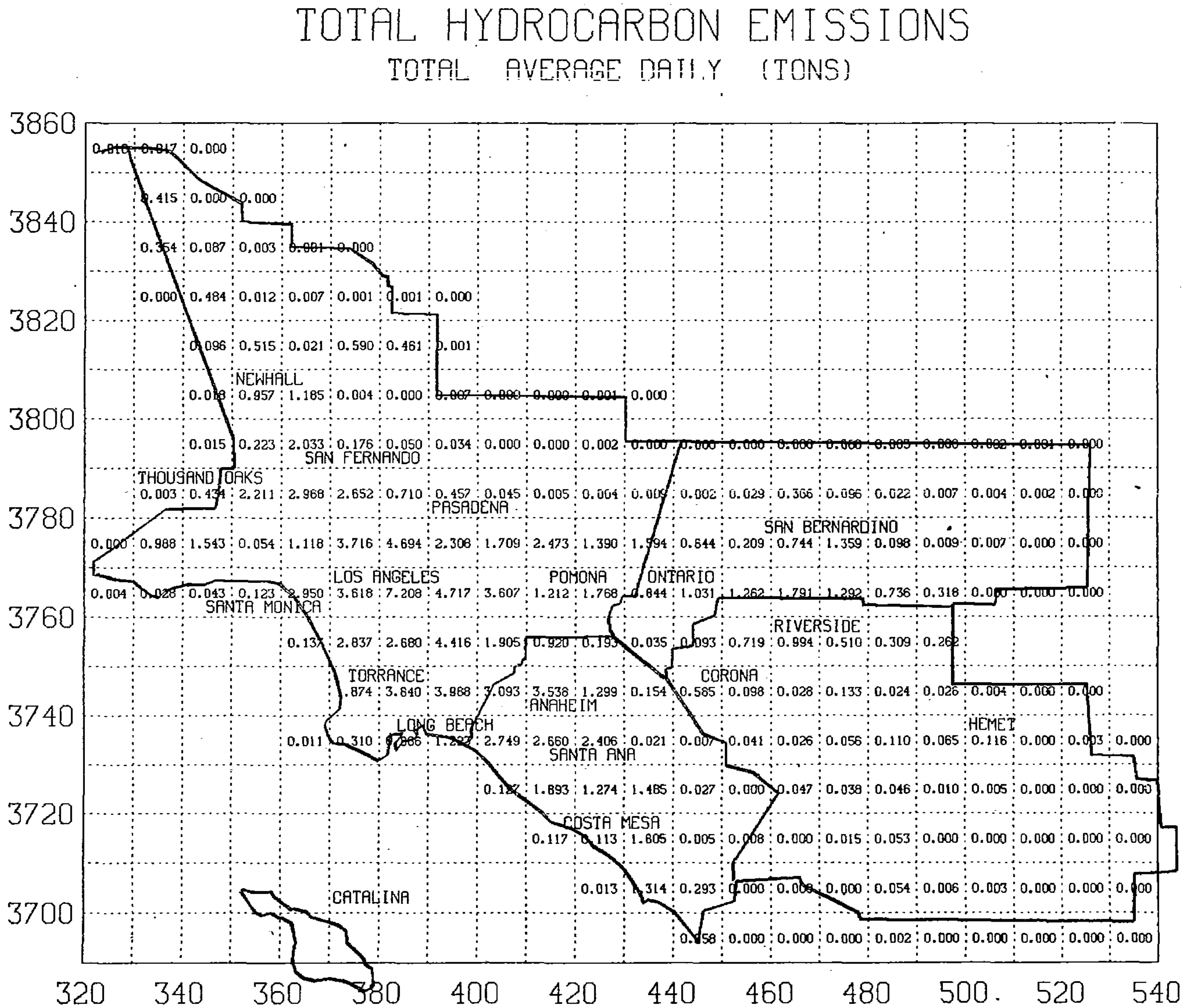

Figure 55. Average Daily Organic Emissions - Total (Tons/Day)
Alternate 1975 Inventory

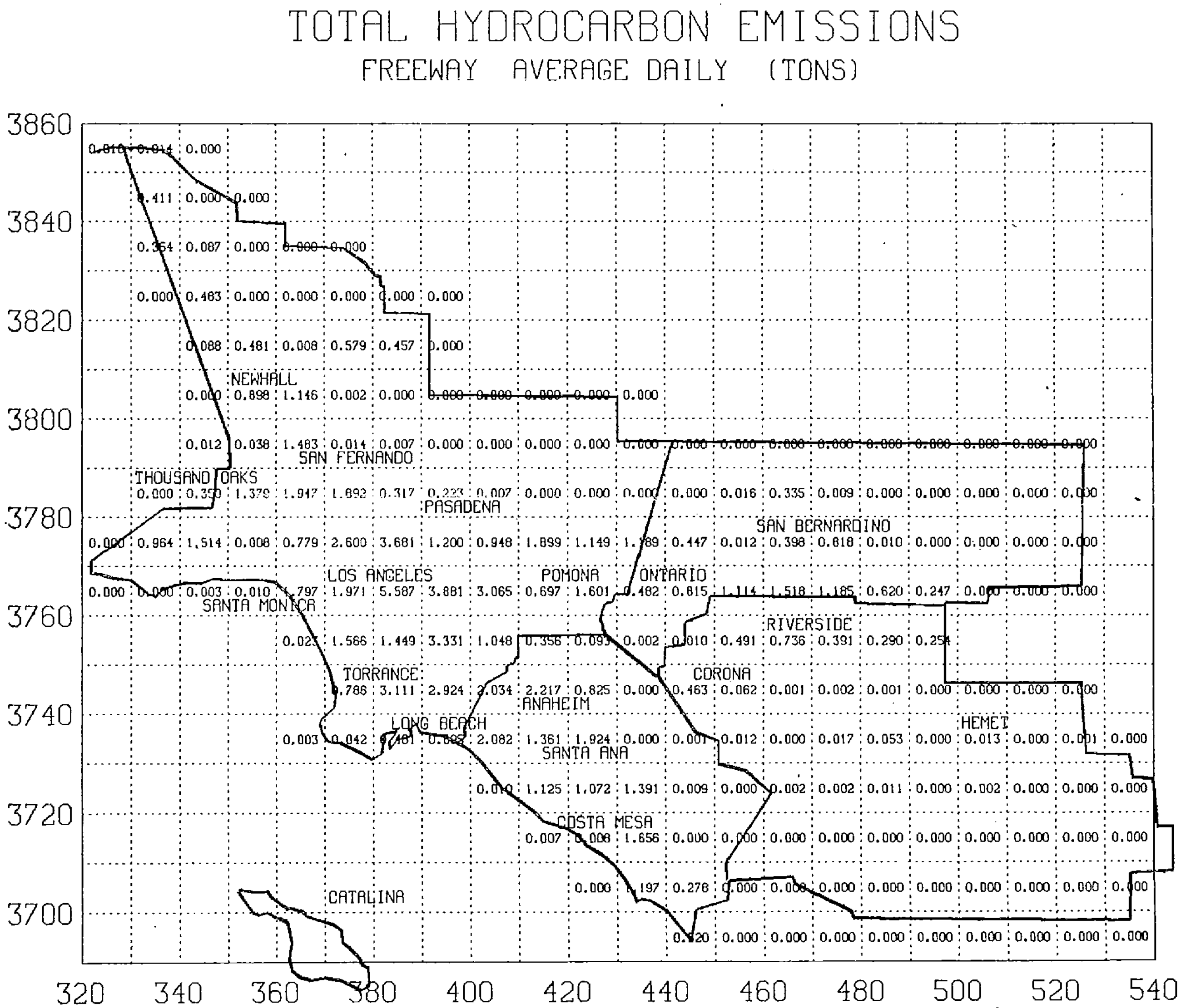

Figure 56. Average Daily Total Organic Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

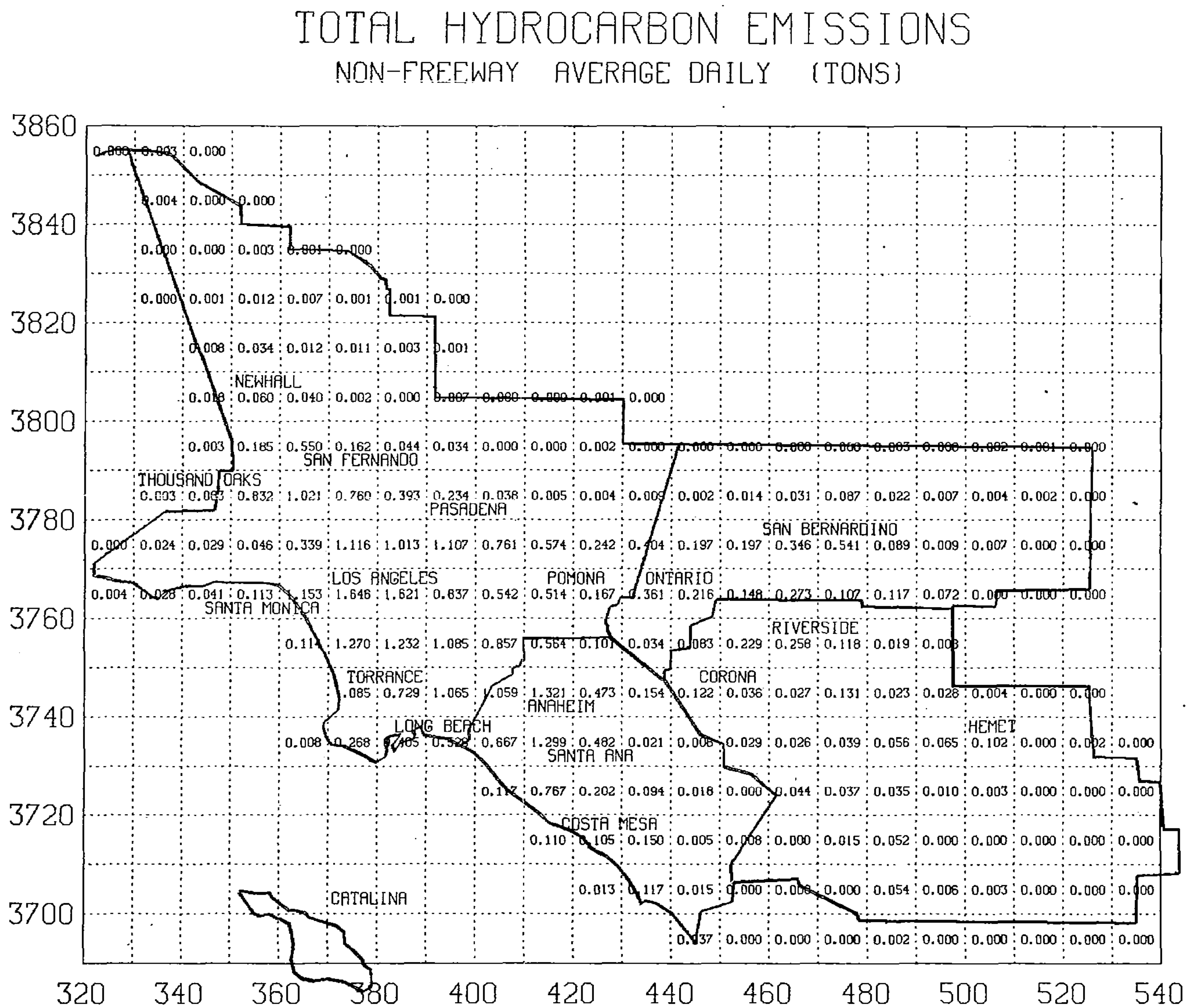

Figure 57. Average Daily Total Organic Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory

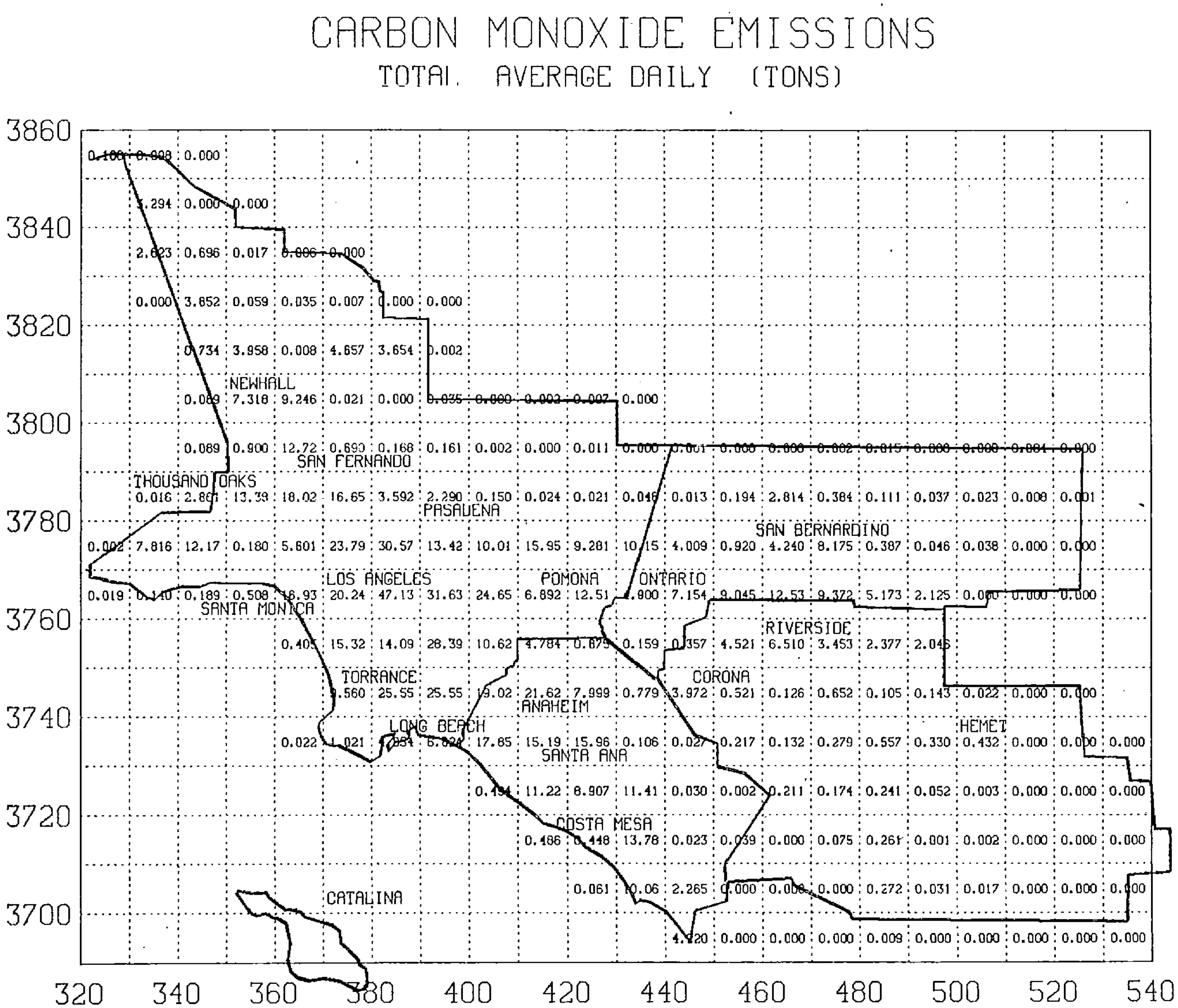

Figure 58. Average Daily Carbon Monoxide Emissions - Total (Tons/Day)
Alternate 1975 Inventory

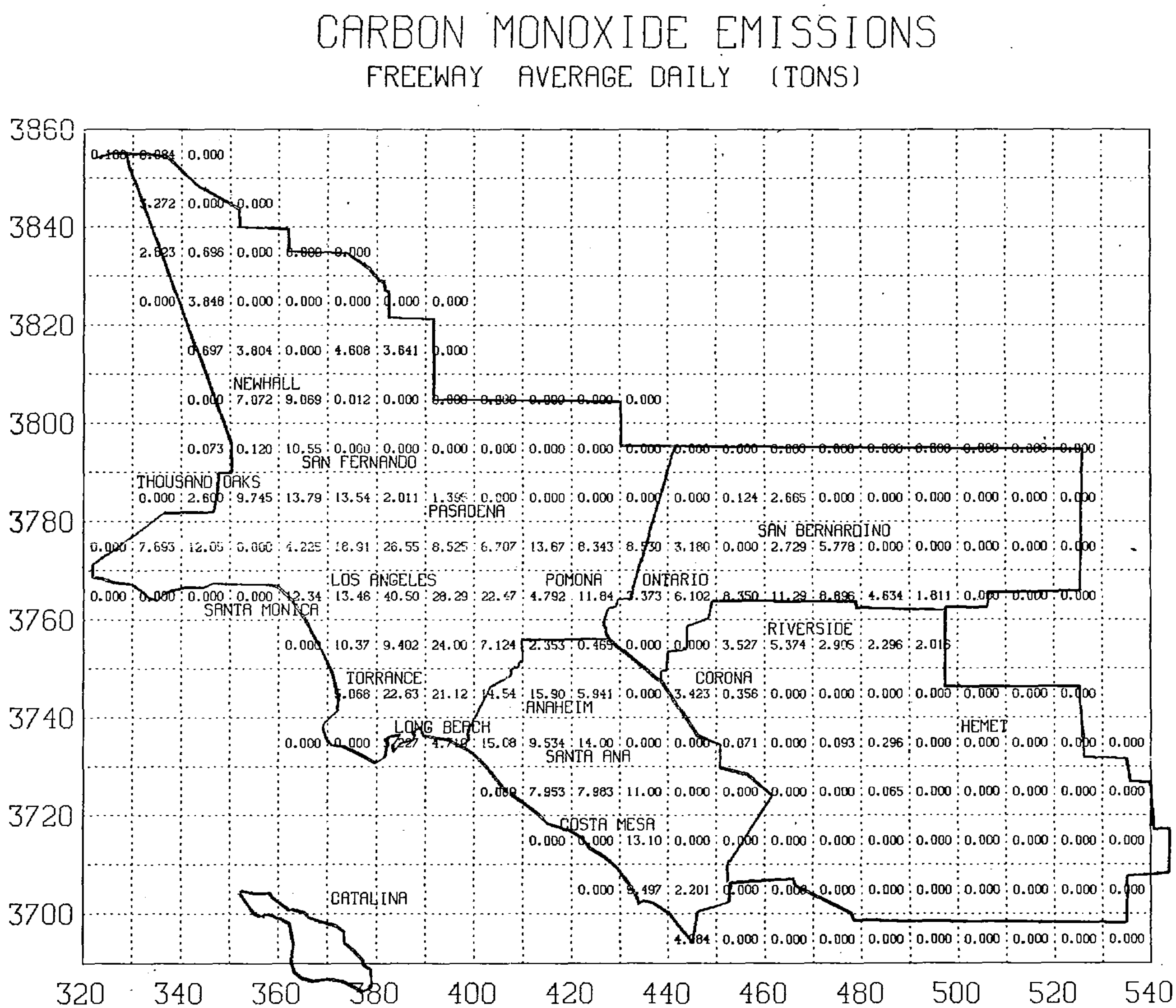

Figure 59. Average Daily Carbon Monoxide Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

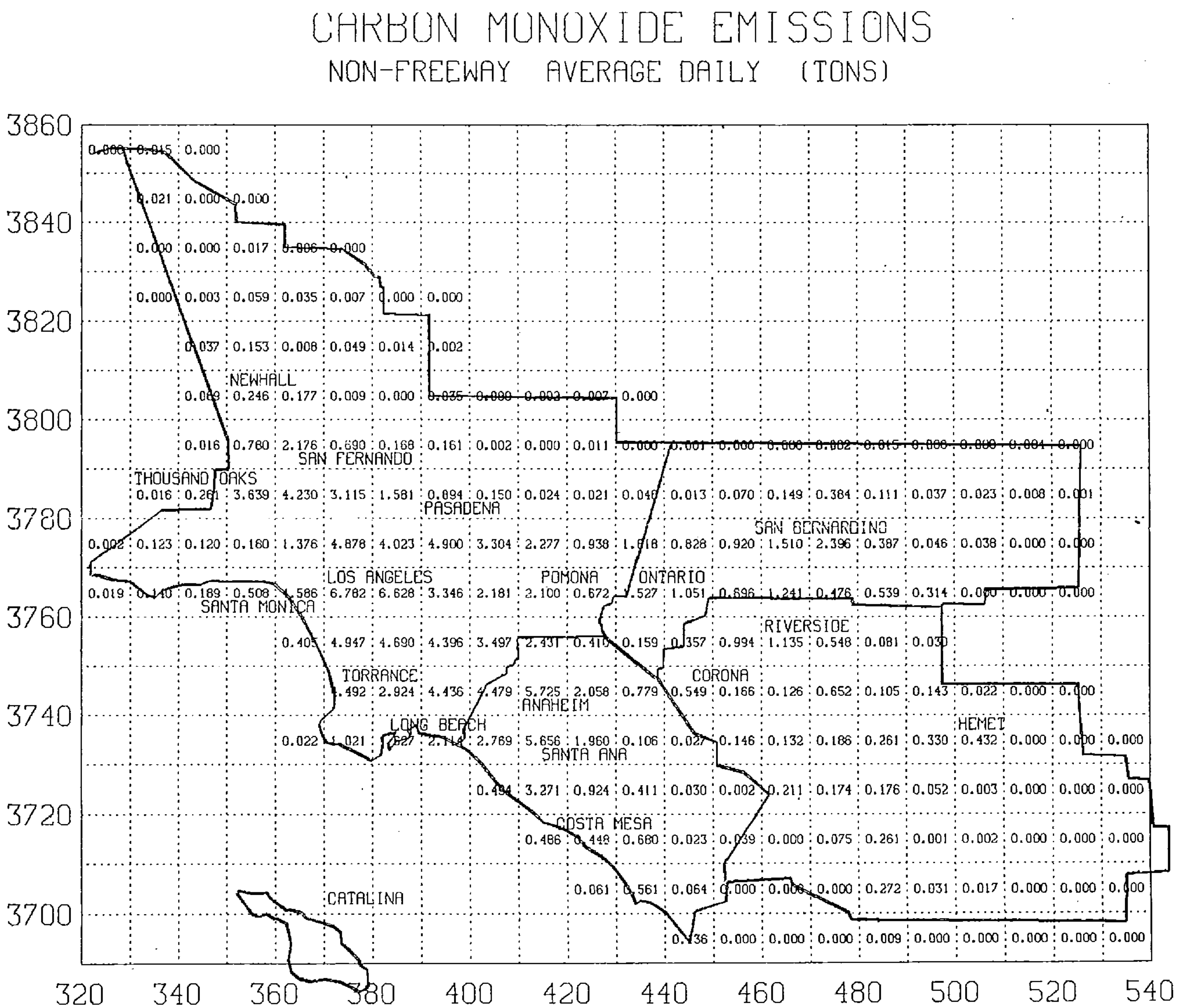

Figure 60. Average Daily Carbon Monoxide Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory

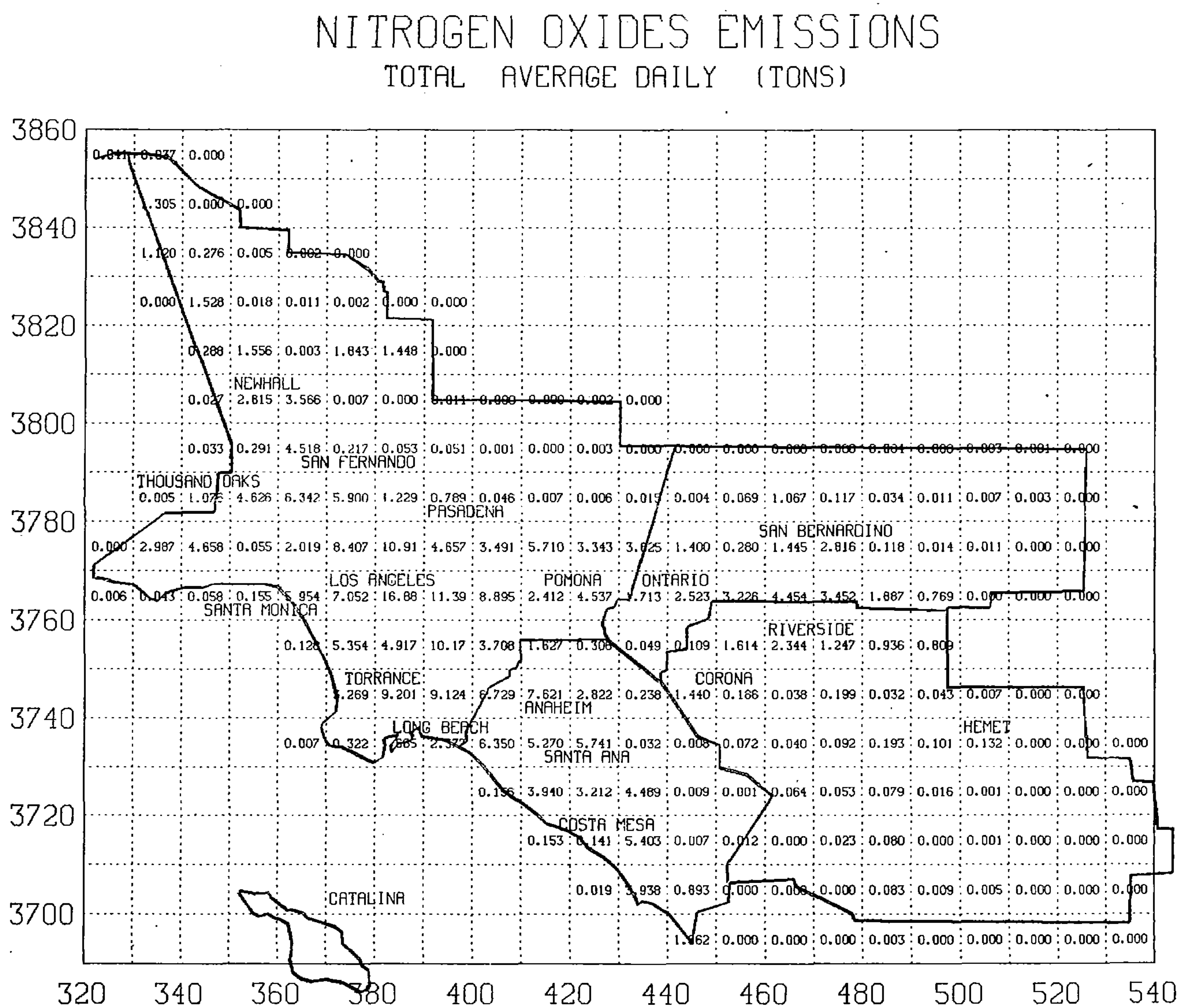

Figure 61. Average Daily Nitrogen Oxides Emissions - Total (Tons/Day)
Alternate 1975 Inventory

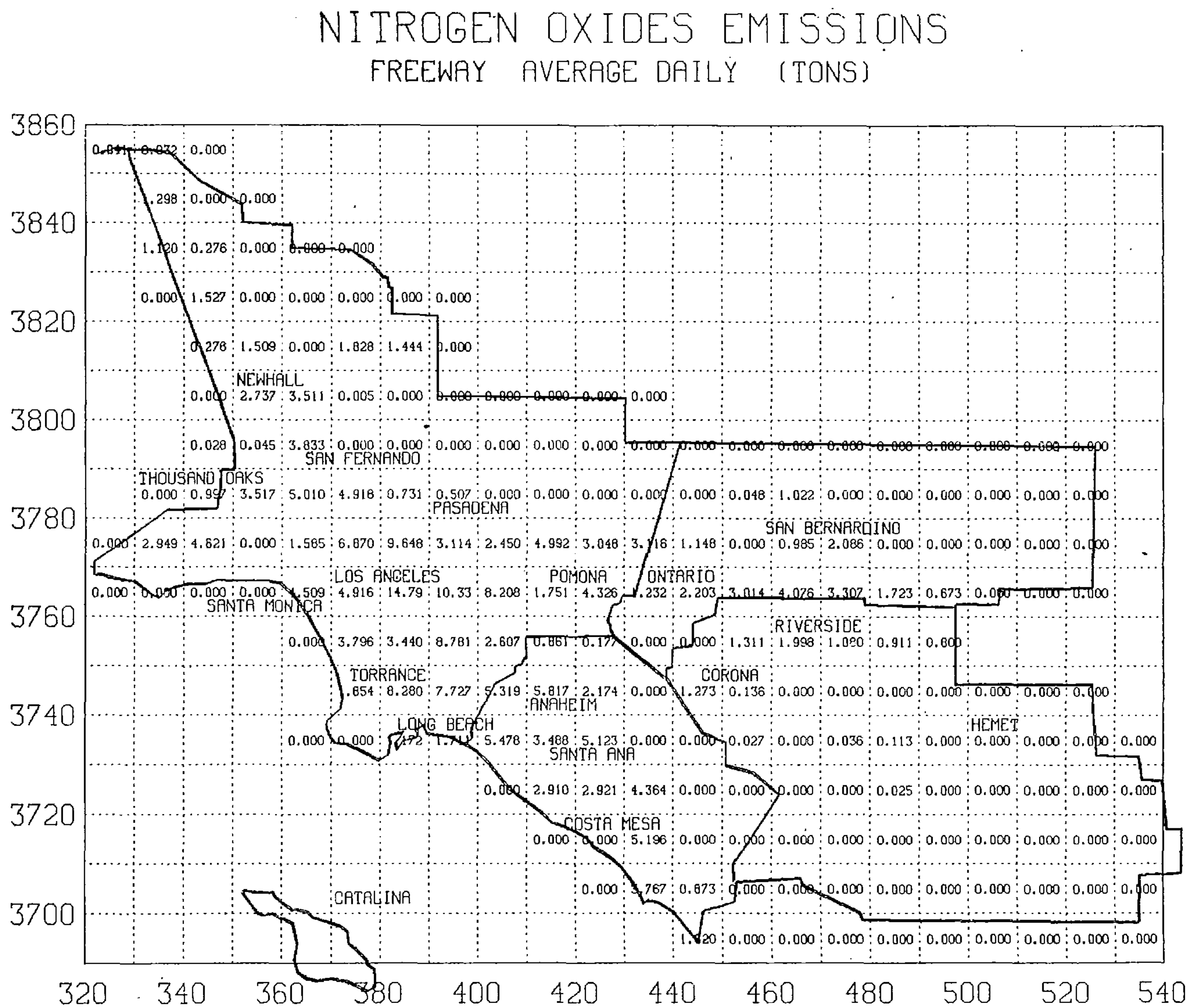

Figure 62. Average Daily Nitrogen Oxides Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

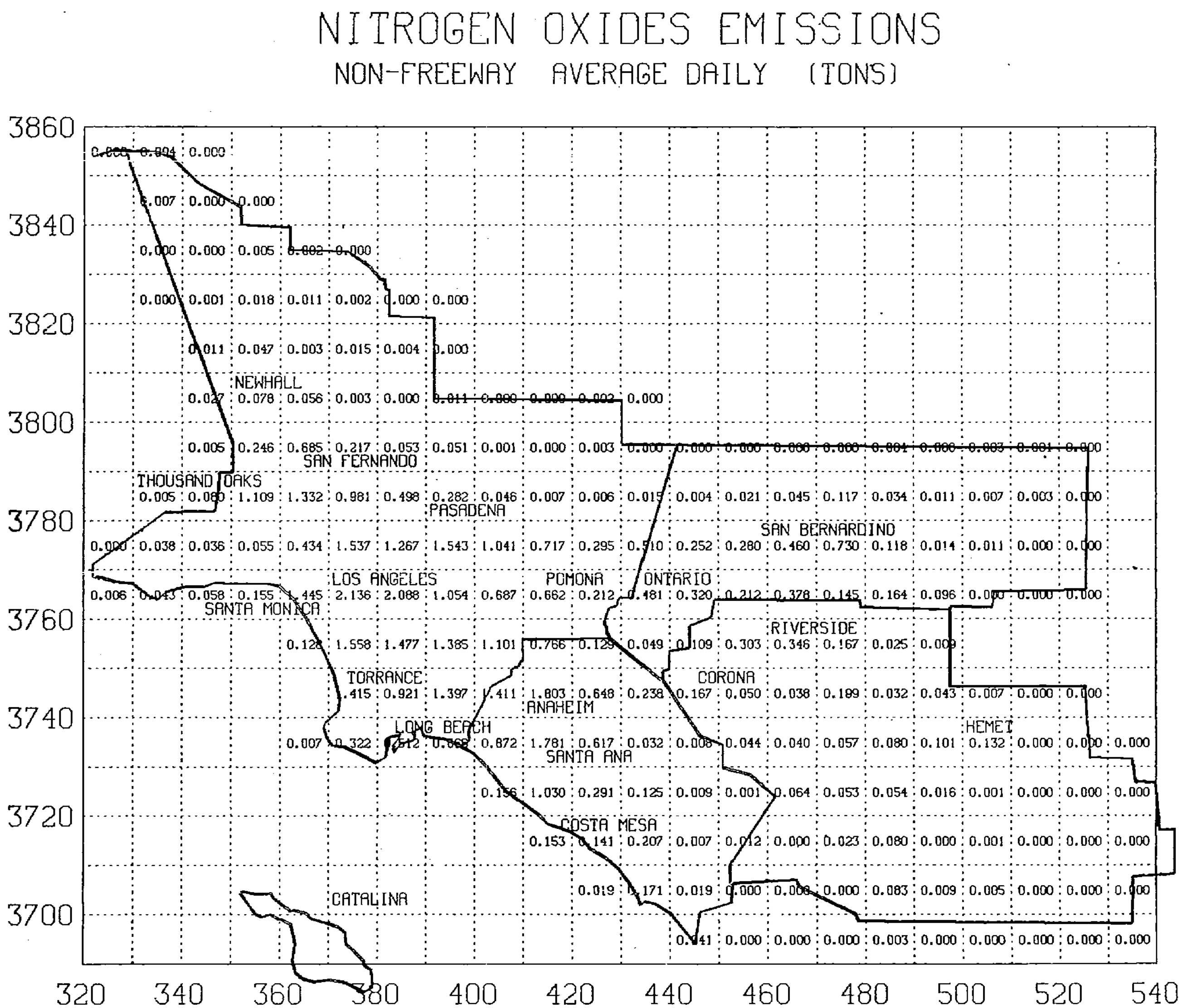

Figure 63. Average Daily Nitrogen Oxides Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory

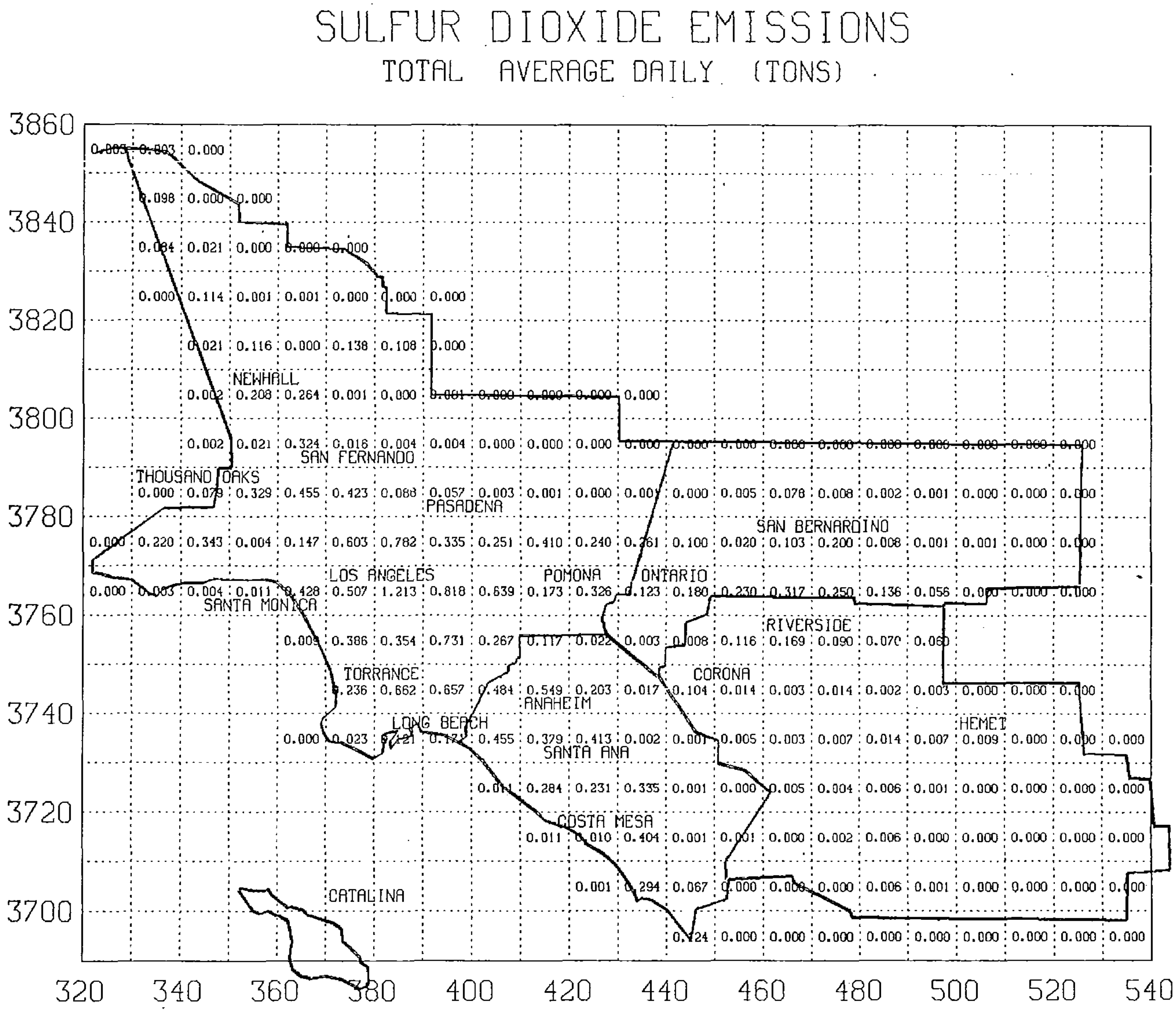

Figure 64. Average Daily Sulfur Dioxide Emissions - Total (Tons/Day)
Alternate 1975 Inventory

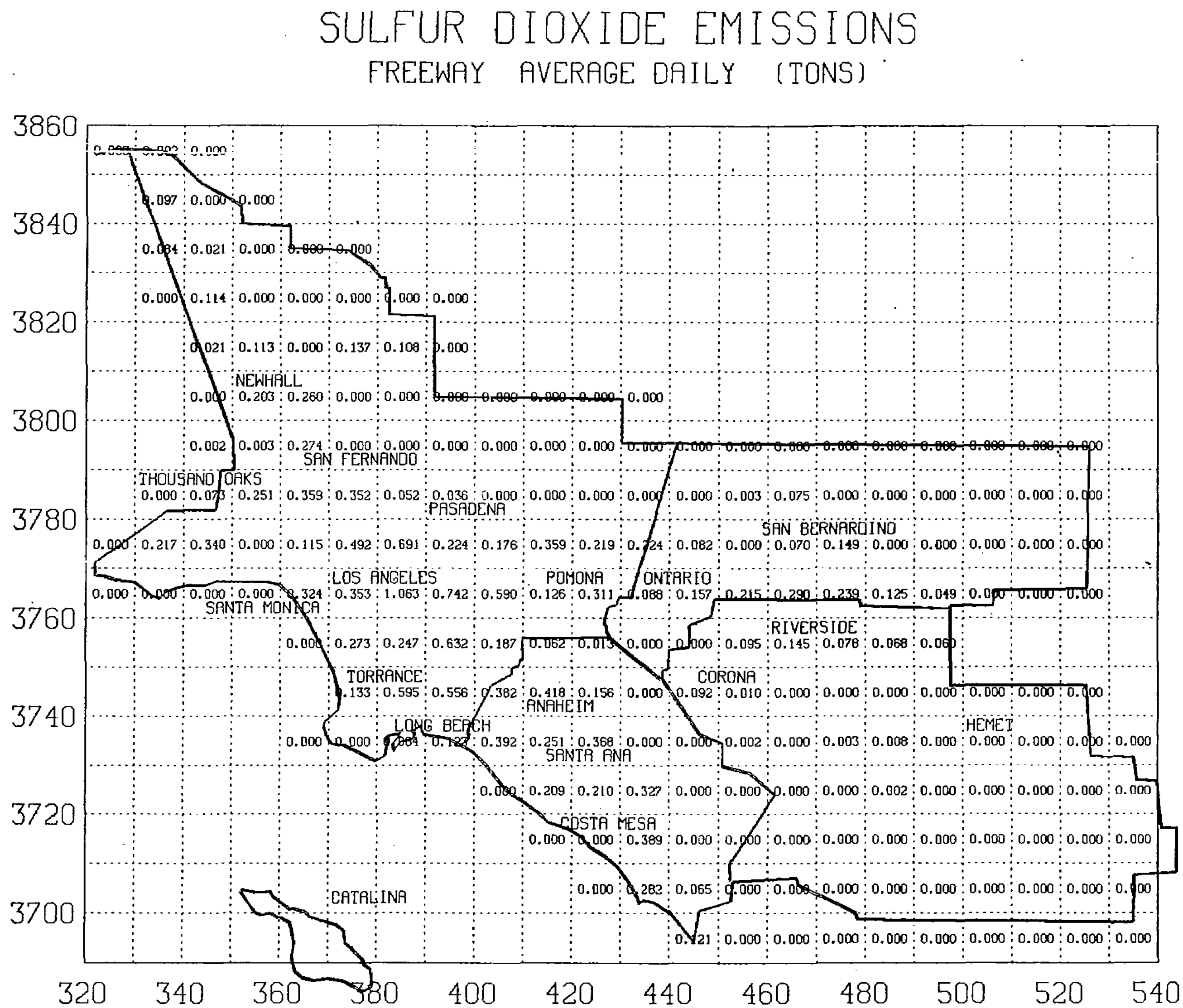

Figure 65. Average Daily Sulfur Dioxide Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

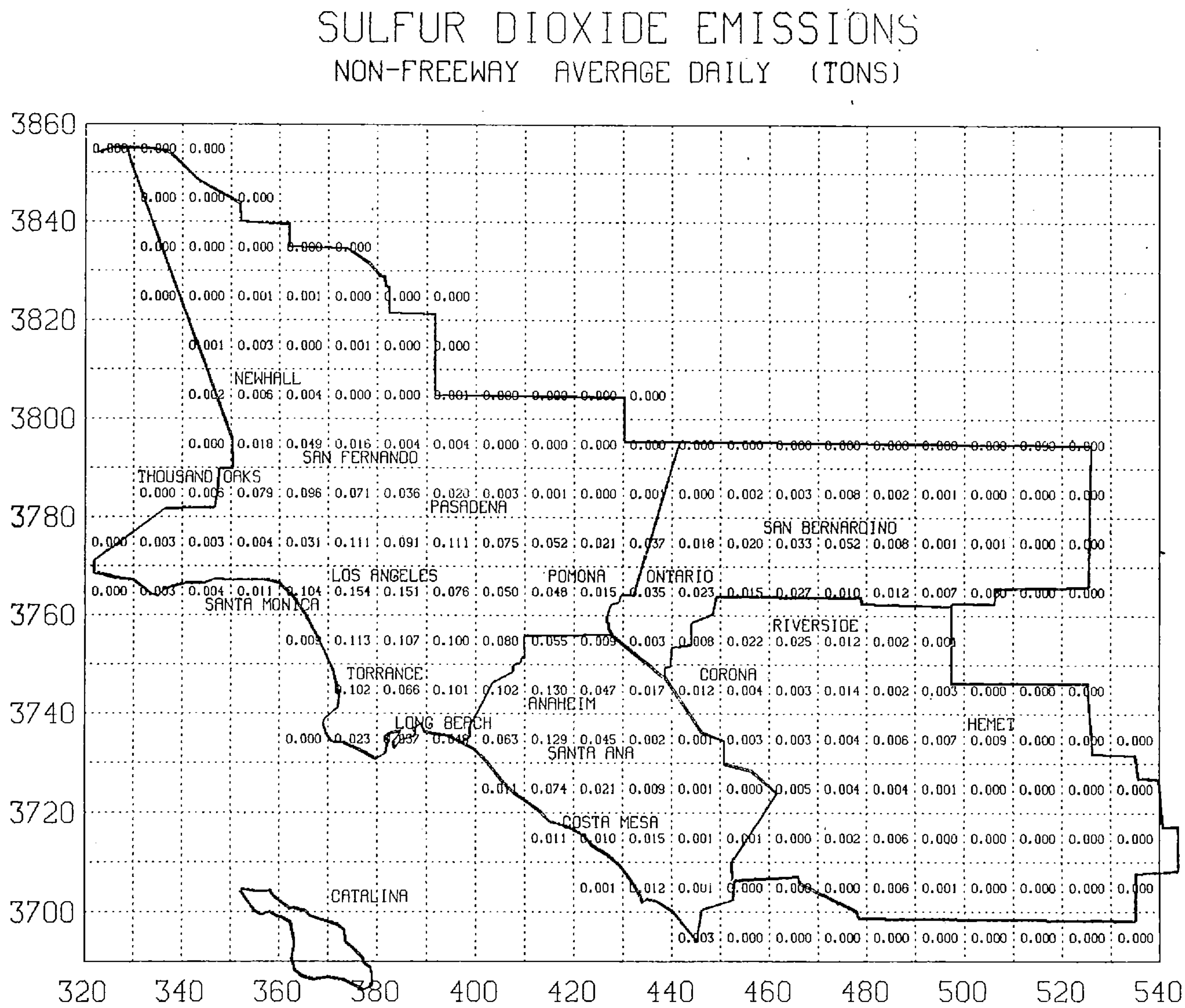

Figure 66. Average Daily Sulfur Dioxide Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory

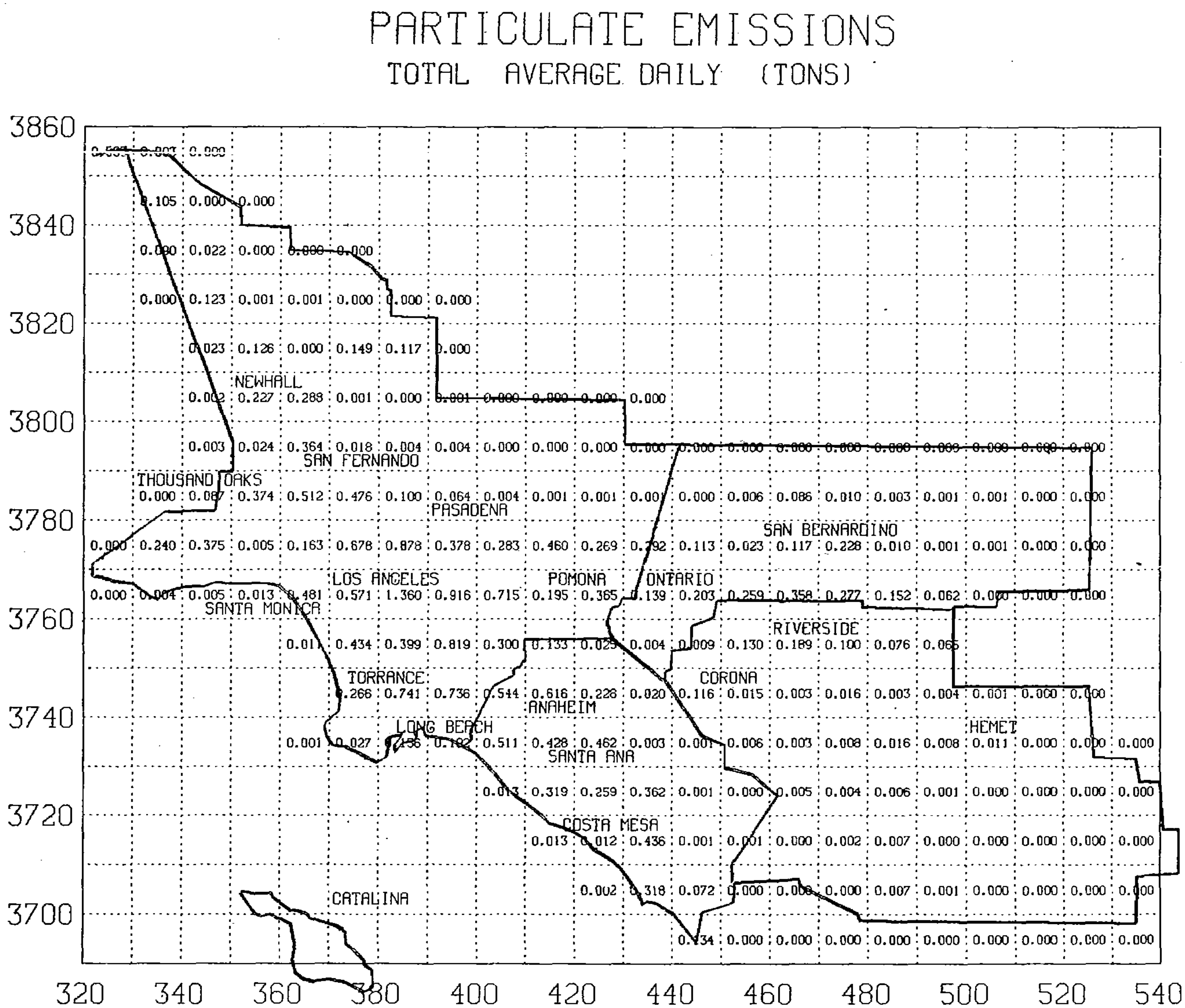

Figure 67. Average Daily Particulate Emissions - Total (Tons/Day)
Alternate 1975 Inventory

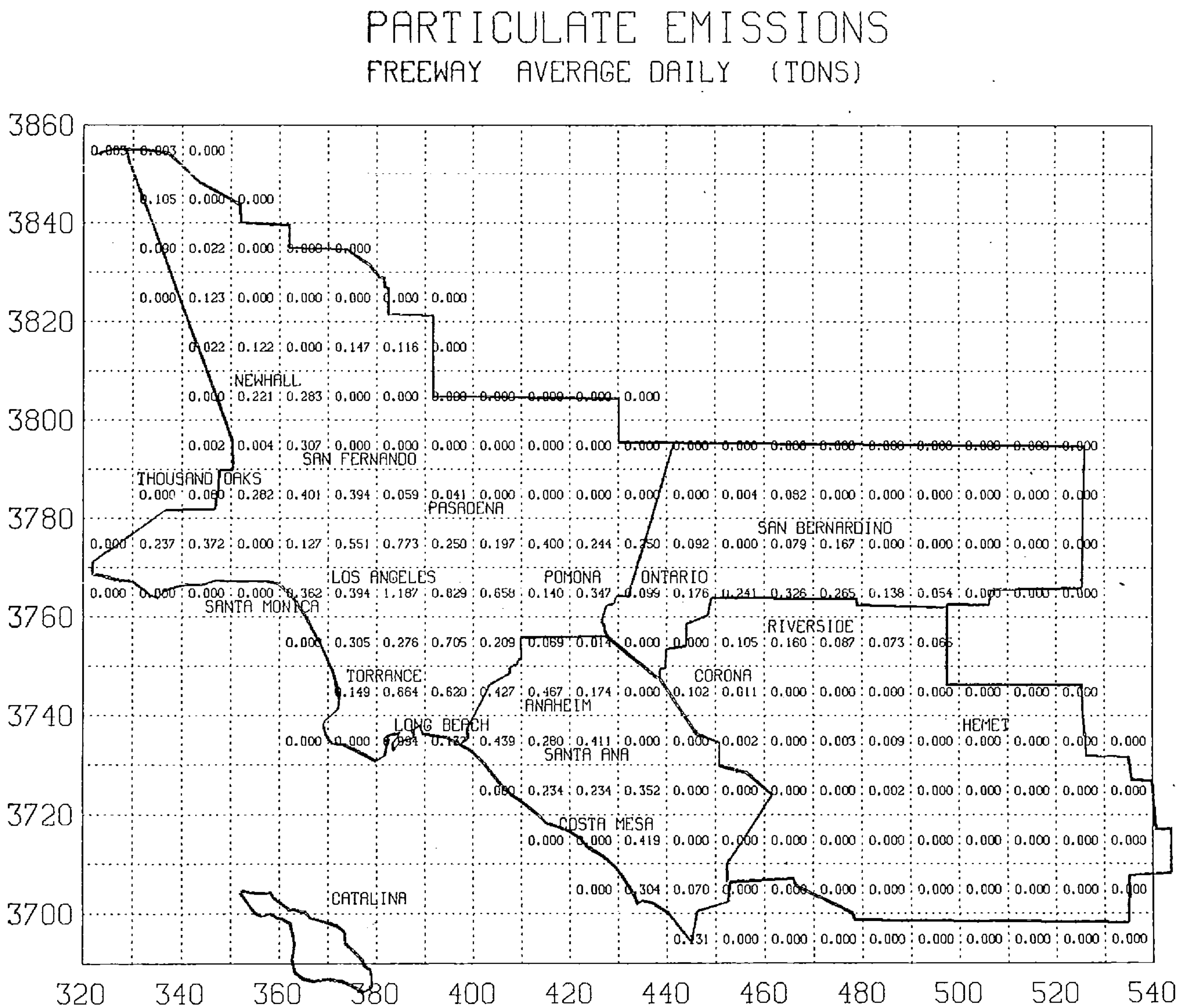

Figure 68. Average Daily Particulate Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

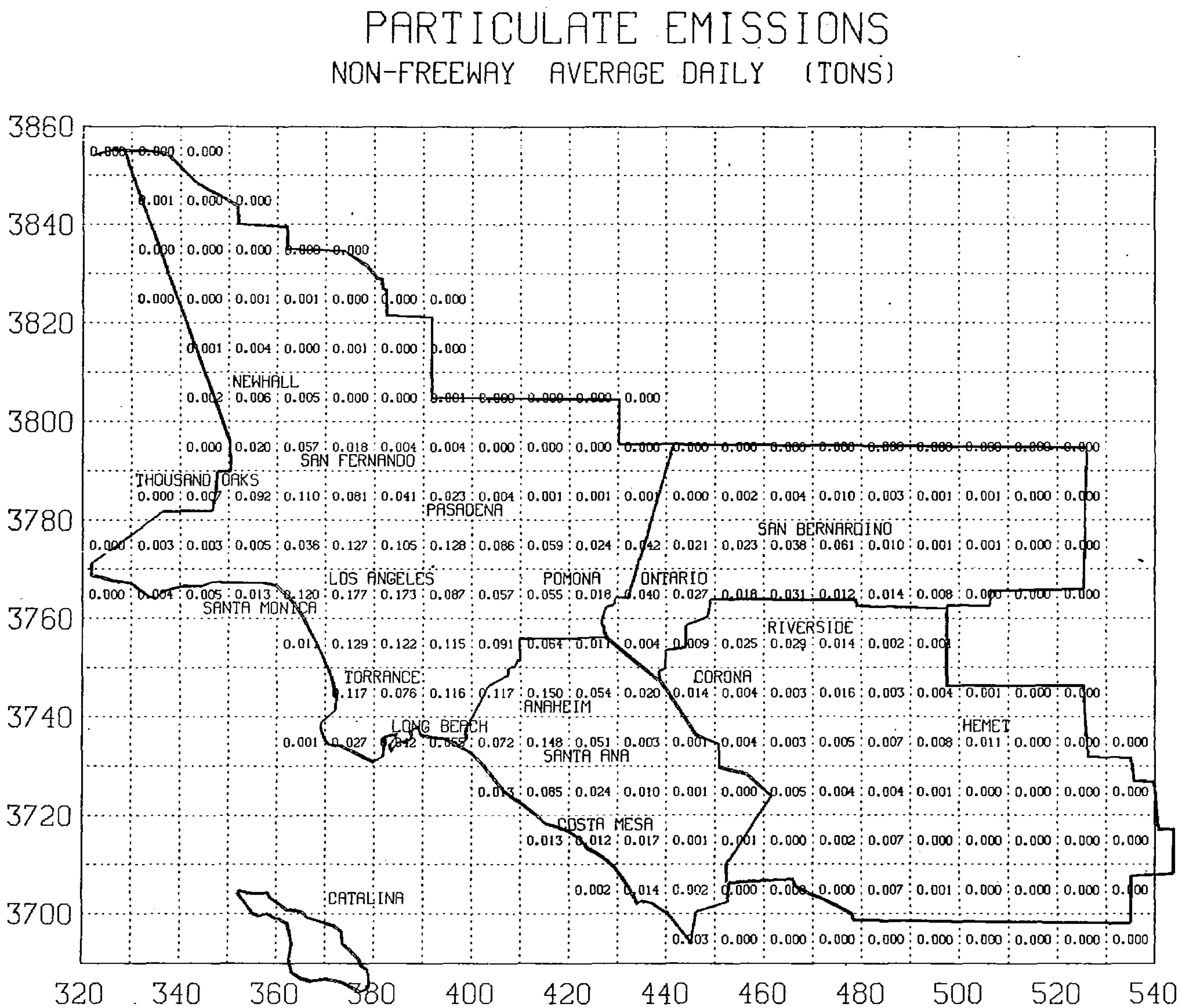

Figure 69. Average Daily Particulate Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory

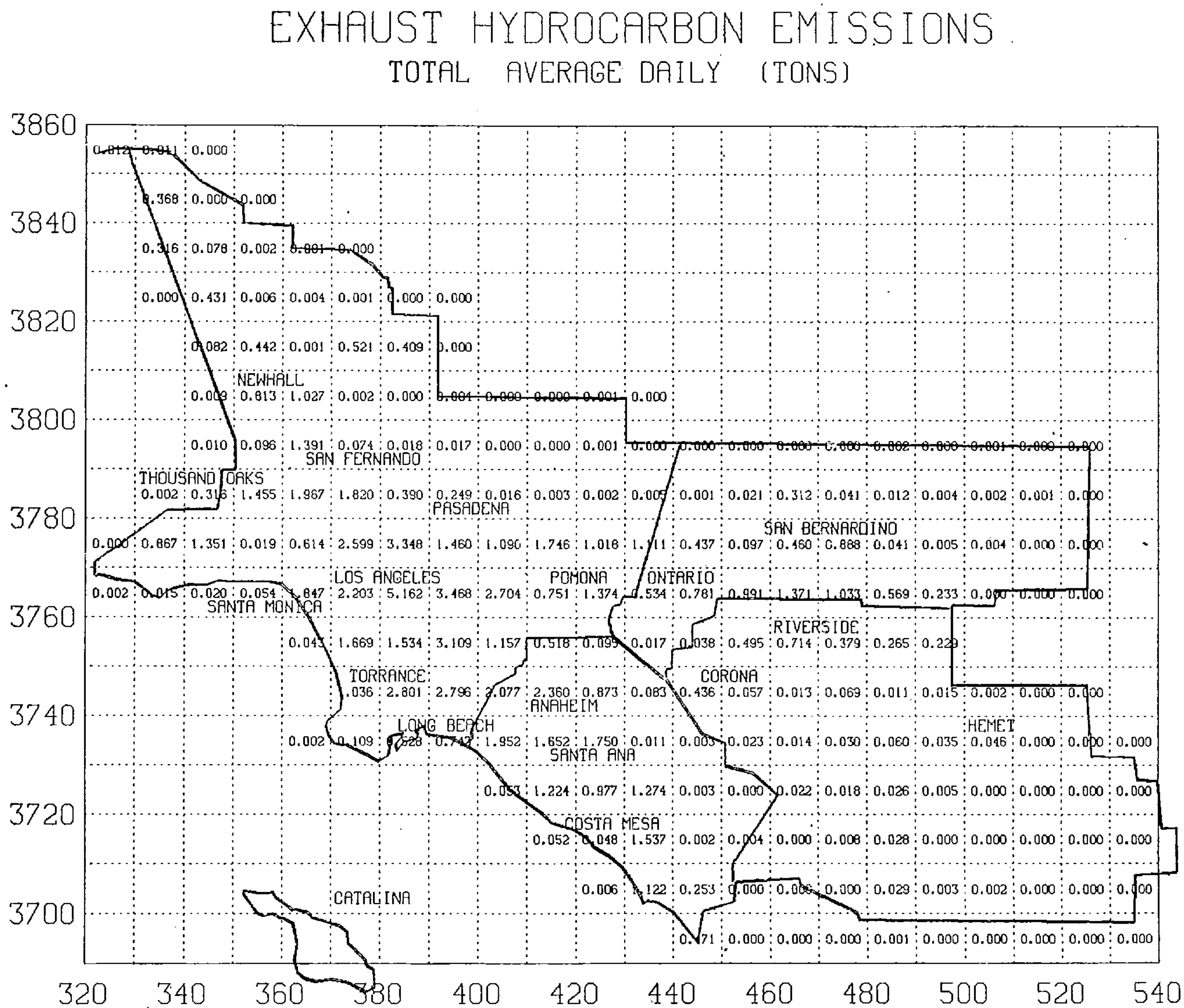

Figure 70. Average Daily Exhaust Organic Emissions - Total (Tons/Day)
Alternate 1975 Inventory

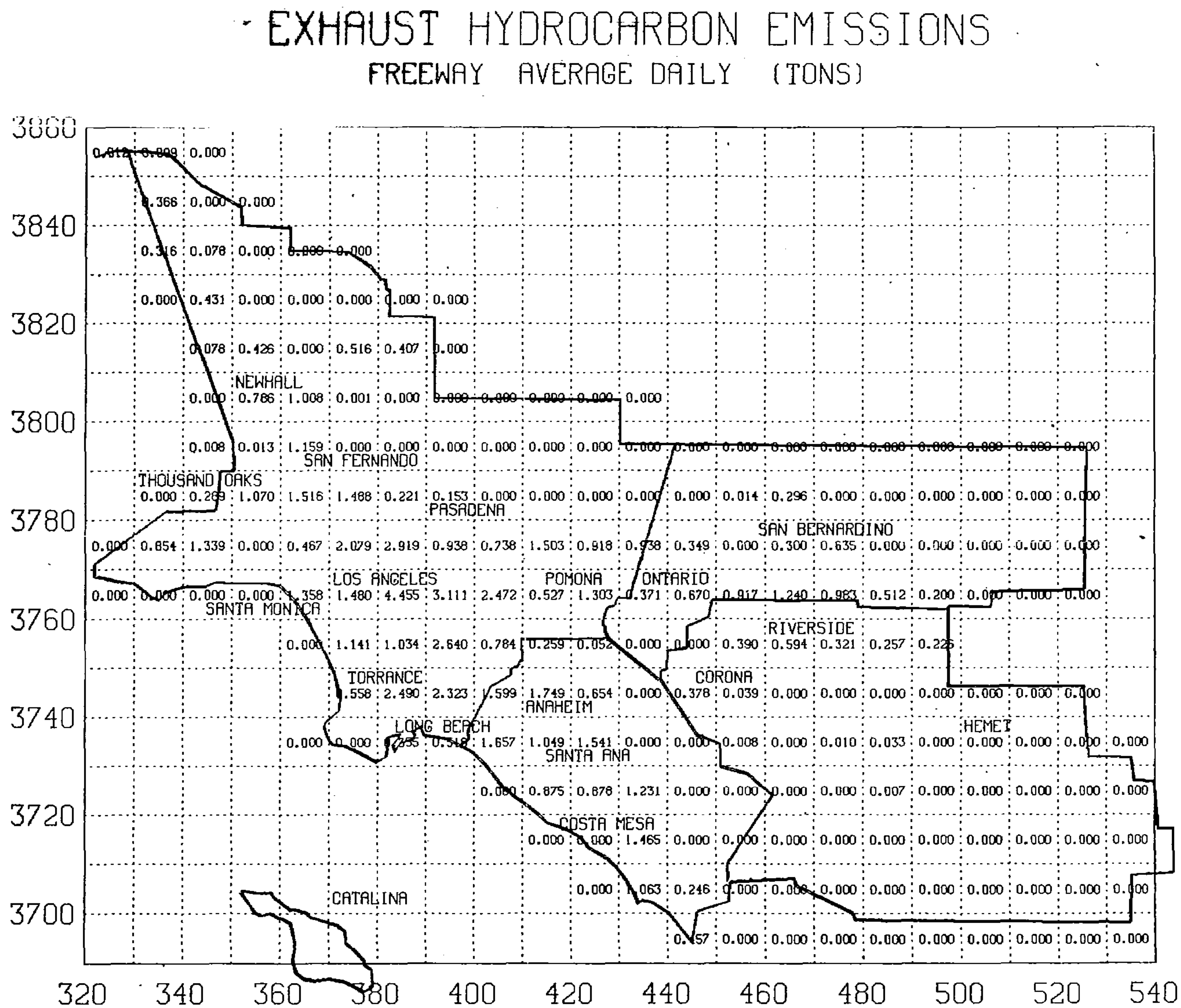

Figure 71. Average Daily Exhaust Organic Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

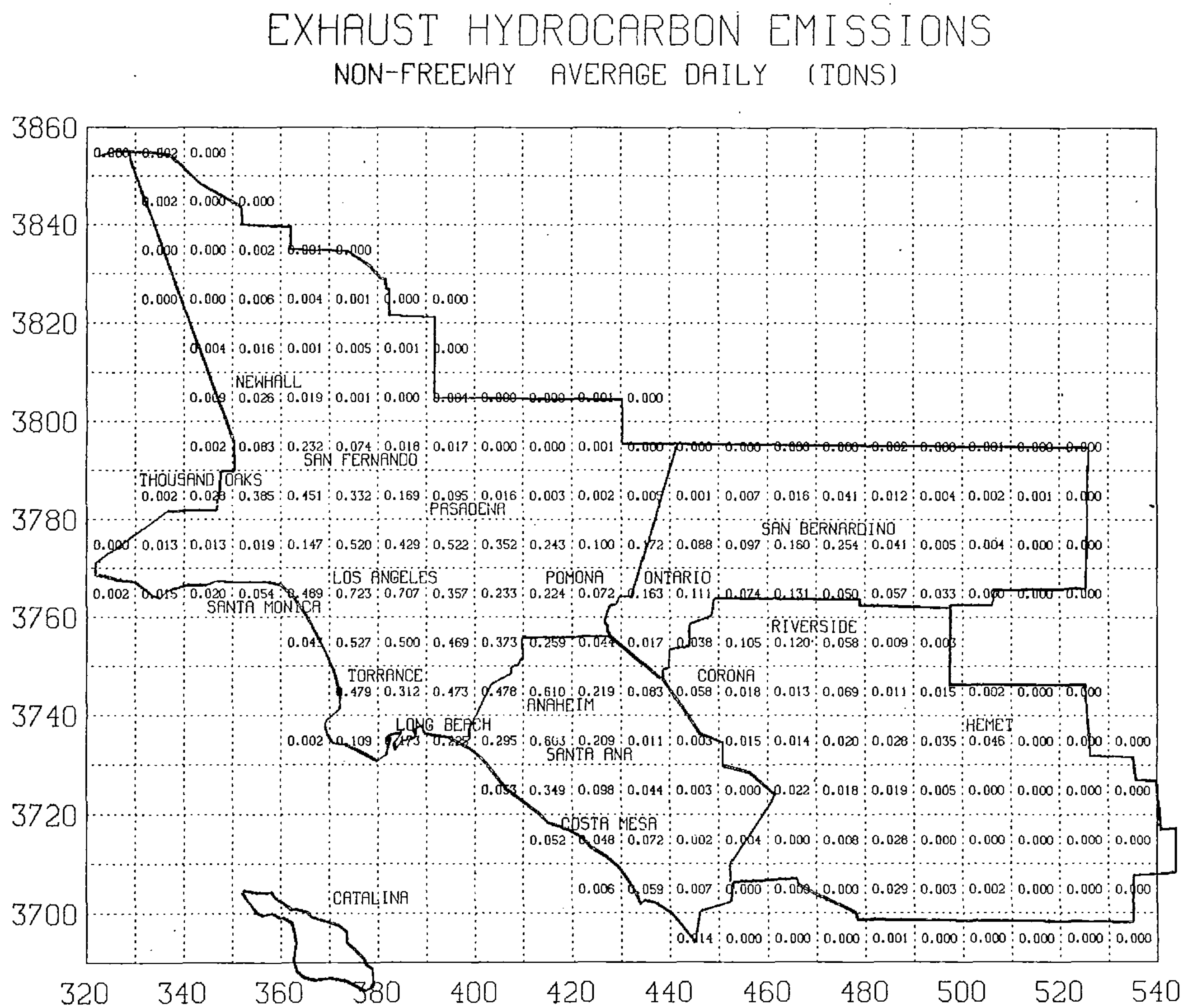

Figure 72. Average Daily Exhaust Organic Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory

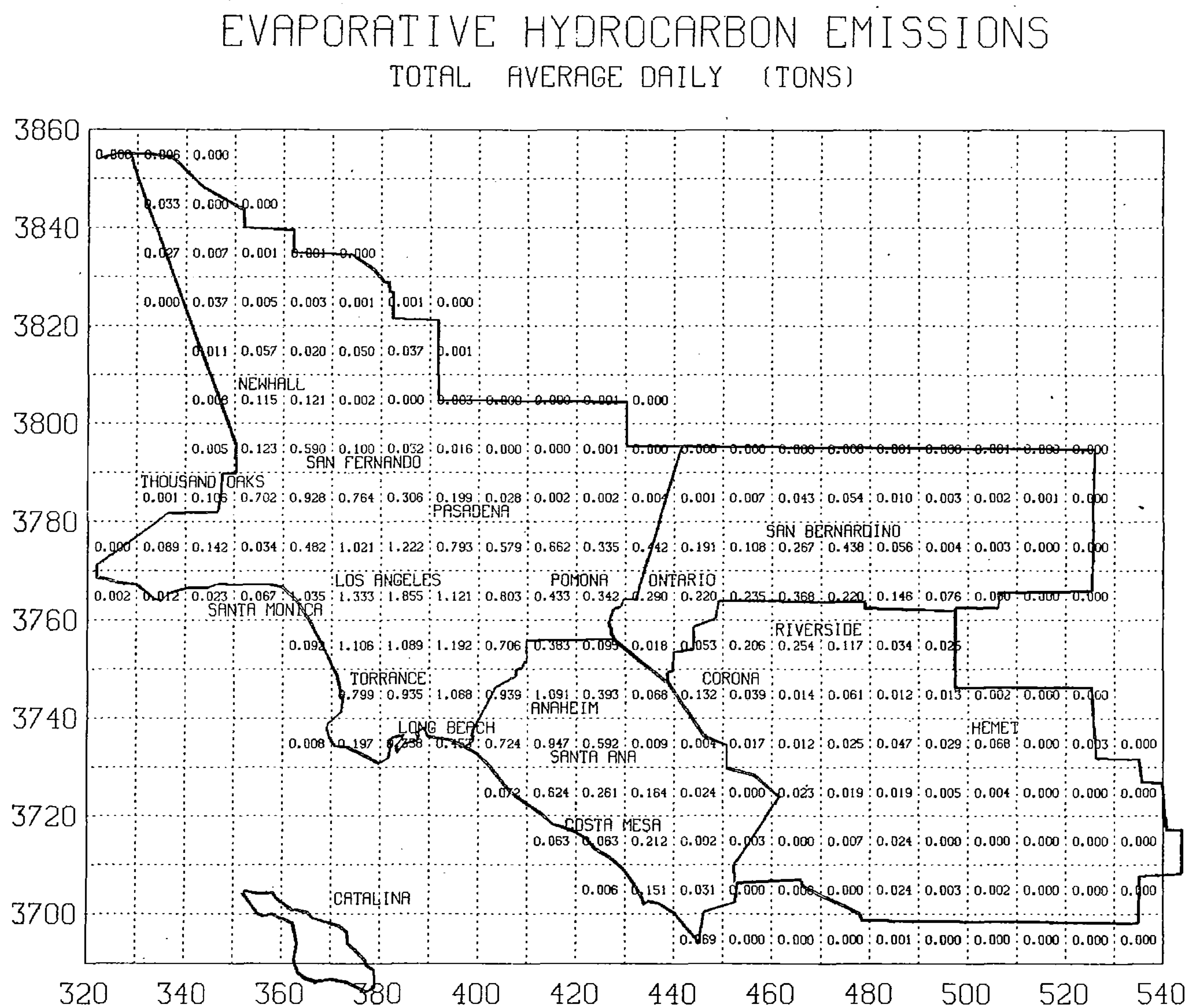

Figure 73. Average Daily Evaporative Organic Emissions - Total (Tons/Day)
Alternate 1975 Inventory

EVAPORATIVE HYDROCARBON EMISSIONS

FREEWAY AVERAGE DAILY (TONS)

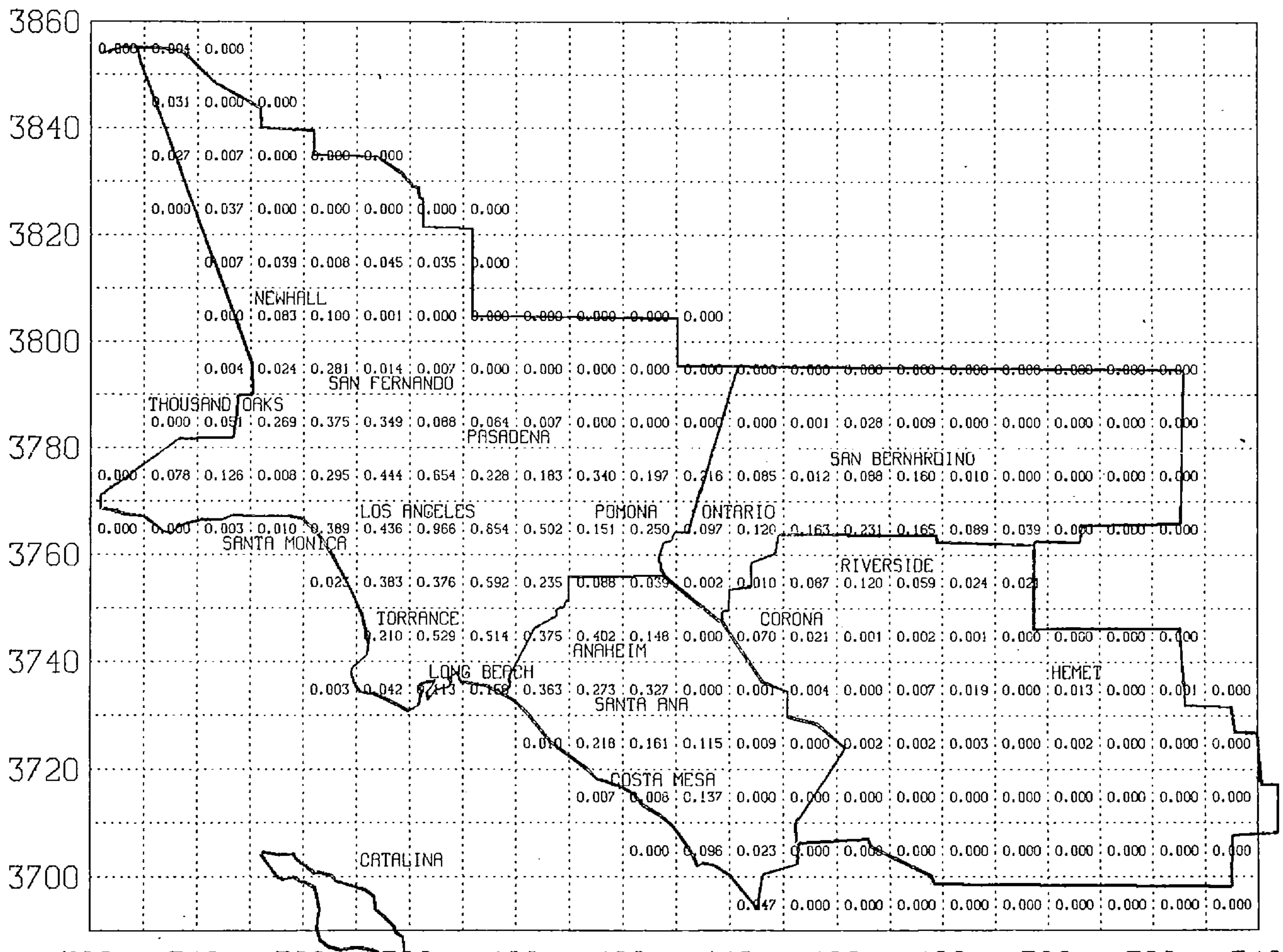

Figure 74. Average Daily Evaporative Organic Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

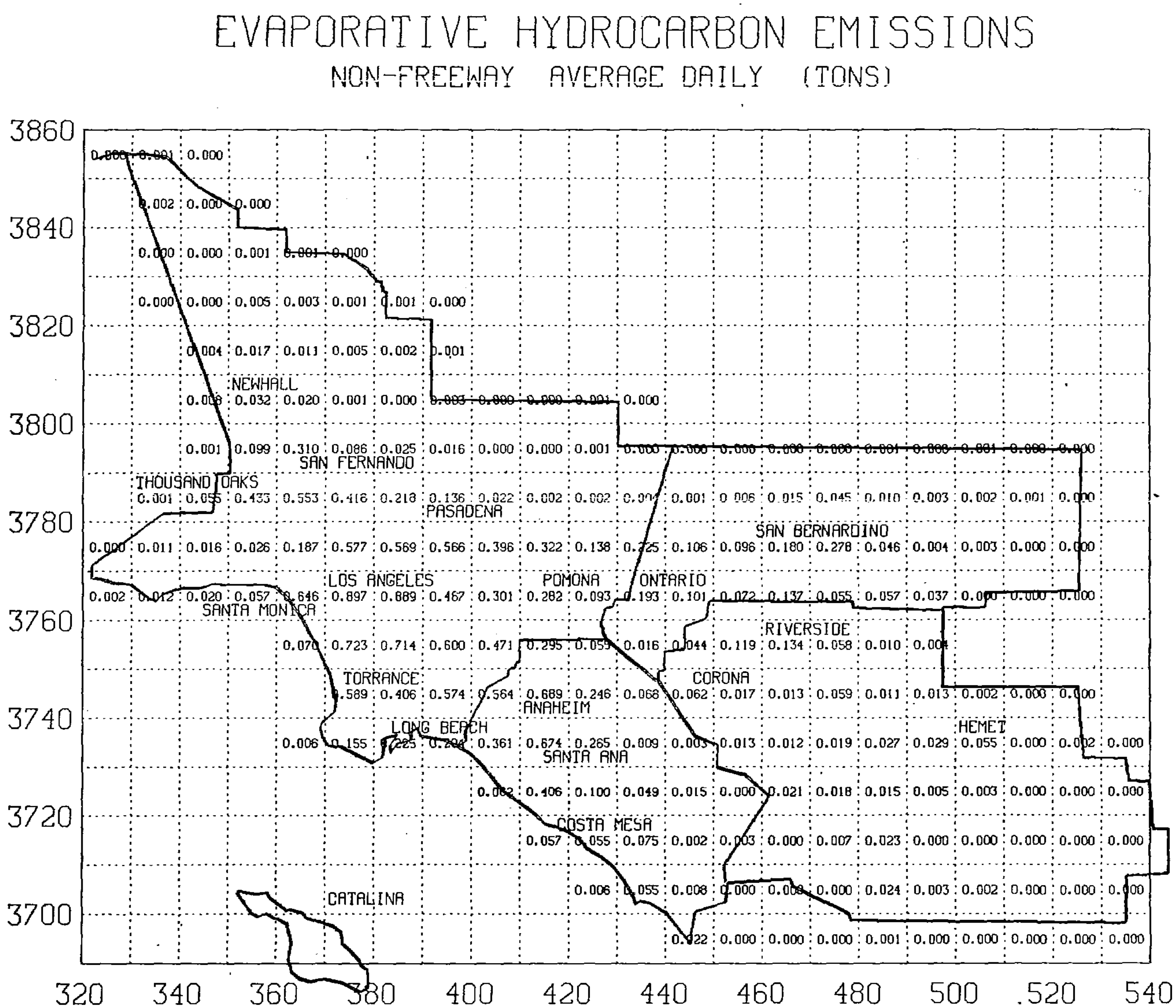

Figure 75. Average Daily Evaporative Organic Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory

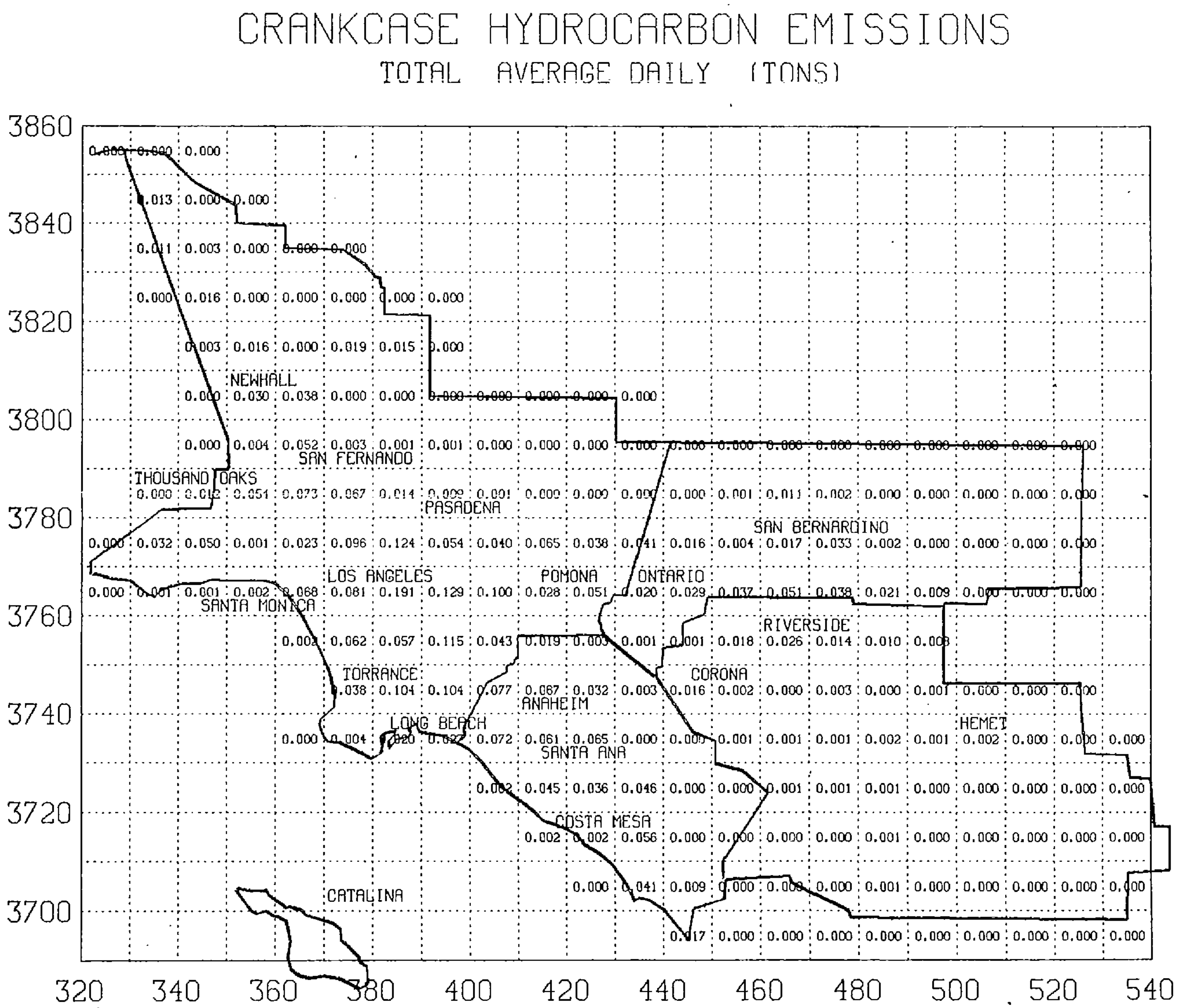

Figure 76. Average Daily Crankcase Organic Emissions - Total (Tons/Day)
Alternate 1975 Inventory

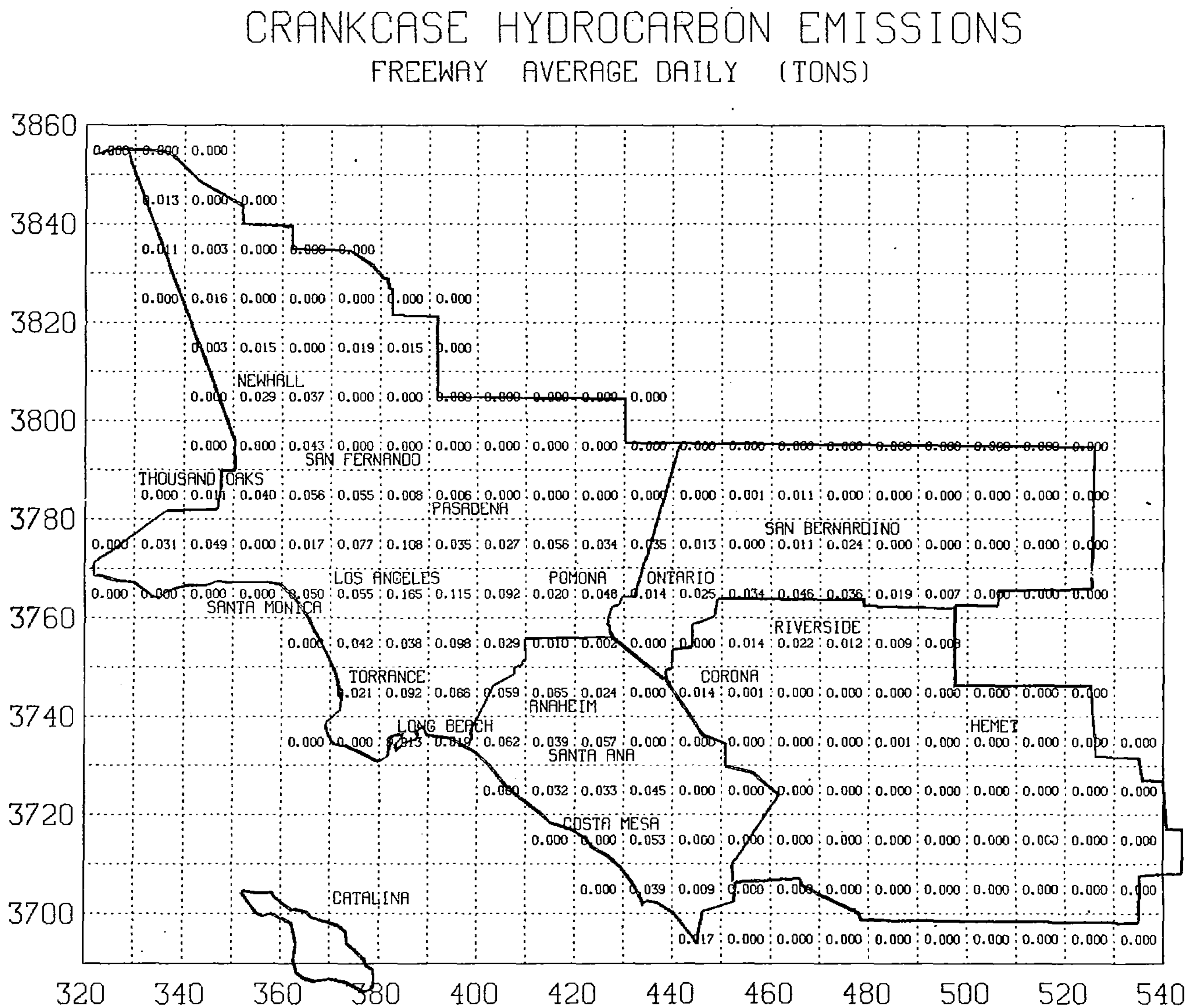

Figure 77. Average Daily Crankcase Organic Emissions - Freeway (Tons/Day)
Alternate 1975 Inventory

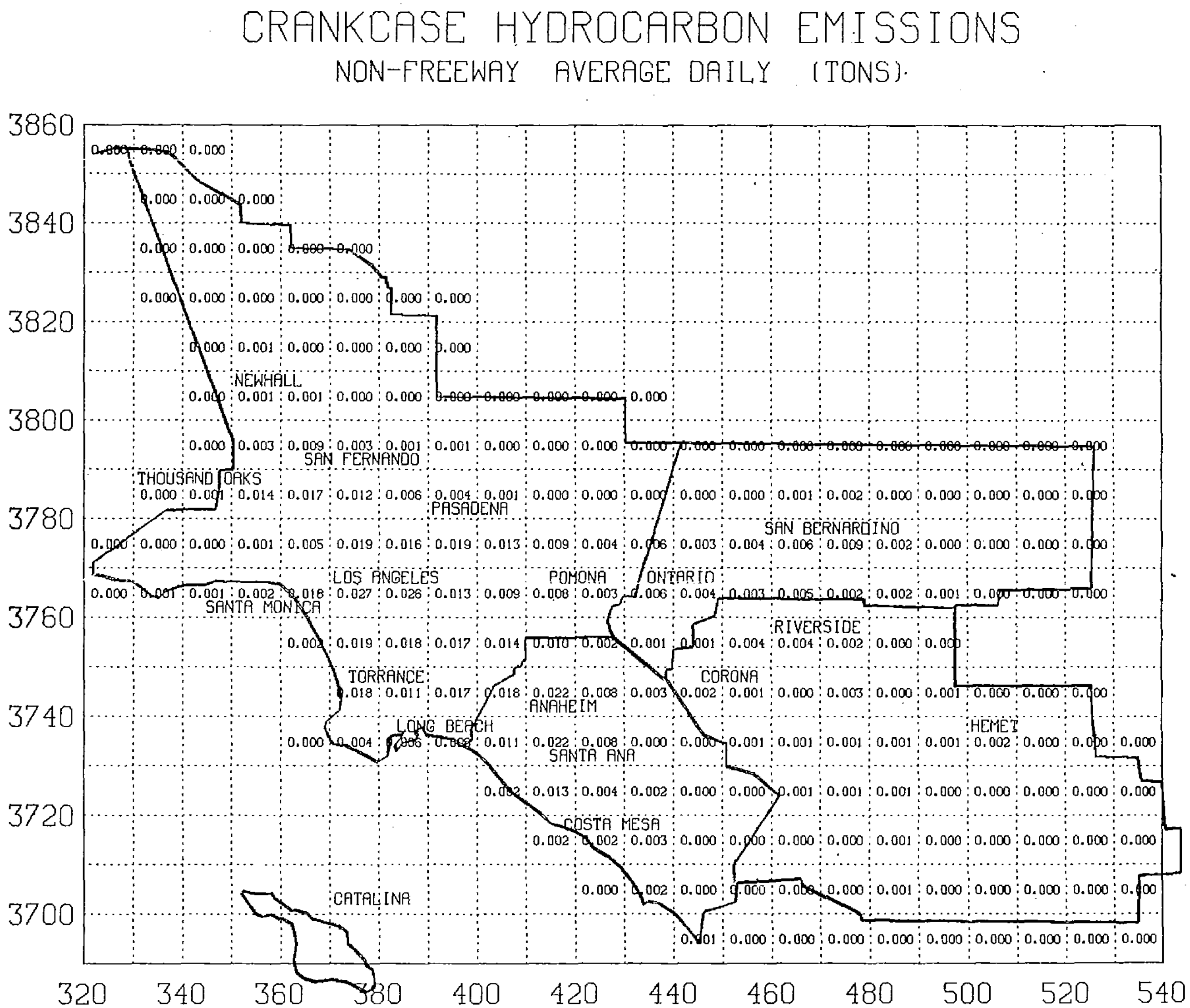

Figure 78. Average Daily Crankcase Organic Emissions - Non-Freeway (Tons/Day)
Alternate 1975 Inventory