

5.0 GRID SYSTEM

In addition to determining fuel oil consumption rates at the county level, PES compiled the inventories for the state's three major metropolitan areas (i.e., San Diego, Los Angeles, and San Francisco) on grid systems of 10 km x 10 km grid cells. For this study, the metropolitan areas were defined as congruent to the corresponding air basins (i.e., San Diego Air Basin, South Coast Air Basin, and the Bay Area Air Basin), respectively. Figure 5-1 indicates the geographical location of the subject air basins.

Two separate grid systems were constructed: the San Diego and the South Coast Air Basins (Figures 5-2 and 5-3); and the Bay Area Air Basin (Figure 5-4). Both grids are based on the appropriate U.S. Geological Survey maps that have a 10 km UTM grid system superimposed. In the context of this study, all grid cells are indicated by integral x,y coordinates, starting with 0,0 for the lower left cell and ending in the upper right cell. The southern grid emanates from UTM coordinates 260000 m.E. x 359000 m.N., while the northern grid initiates at UTM coordinates 400000 m.E. x 440000 m.N.

Each of the point sources were manually assigned to the grid cells by either their UTM coordinates, as specified in the EIS file or by their location on a street map as specified in their questionnaire response. In other words, each point source unit that was determined to have used fuel during 1977 has its own grid coordinates in File 4 of the DHS.

In the case of area sources (residential and agricultural sectors), the total county fuel oil consumption rate cannot be allocated directly to the grid cell level. Consequently, surrogate indicators had to be determined whose distribution was known at some subcounty level and which behave similarly to the activity levels of fuel combustion. In this study, only the agricultural sector required consideration since the residential sector in these areas was determined to have no fuel oil usage.



Figure 5-1. California Air Basins

Quite appropriately, the distribution of agricultural land was selected as being the most representative surrogate indicator for both irrigation and frost protection activities.

In this approach, it was necessary to estimate the area within each grid cell which is designated as agricultural area on each county land use map. For this purpose, the grid matrixes were superimposed on available land use maps and area estimates were made to the nearest 1 percent of a grid cell. From these data fuel estimates for each grid were made as follows:

$$F_{x,y} = F_t (A_{x,y}/A_t)$$

where,

$F_{x,y}$ = Fuel oil in grid cell x,y

F_t = Fuel total for county where grid cell x,y is located

$A_{x,y}$ = Percent of grid cell x,y that is agricultural land

A_t = Total agricultural land area in county (sum of all $A_{x,y}$'s county)

Land use maps for the counties covered by the southern grid were secured from the respective county planning agencies. The year of record, as well as the quality, varied significantly from county to county. For example, the San Diego County map was of 1971 vintage while the other four county maps were either for 1978 or 1979. Furthermore none of the maps differentiated between agricultural land use (e.g., orchards, truck crops, etc.). From conversations with the issuing agencies, it was determined that these are the best available at the present time.

In the case of the Bay Area Air Basin, it was determined through contact with the Associated Bay Area Governments that at the present time there are no reliable hard copy land use maps. However, they were able to provide a computer listing that specified the percentage of each cell that is classified as agricultural land. The source of these data was the Jet Propulsion Laboratory's Landsat data for September 1976.

Considering the impact of this sector, it was felt that the discrepancies between the base years of the maps and this study are within the error of this analysis.

The grid systems for the Los Angeles, San Diego and San Francisco Air Basins, shaded by four levels of fuel consumption, are illustrated in Figures 5-2, 5-3 and 5-4, respectively. To enhance the detail of the visual presentation of the fuel oil consumed in the grids, the aforementioned figures are enlargements of the air basins, with non-fuel oil consumption areas deleted (i.e., ocean areas).

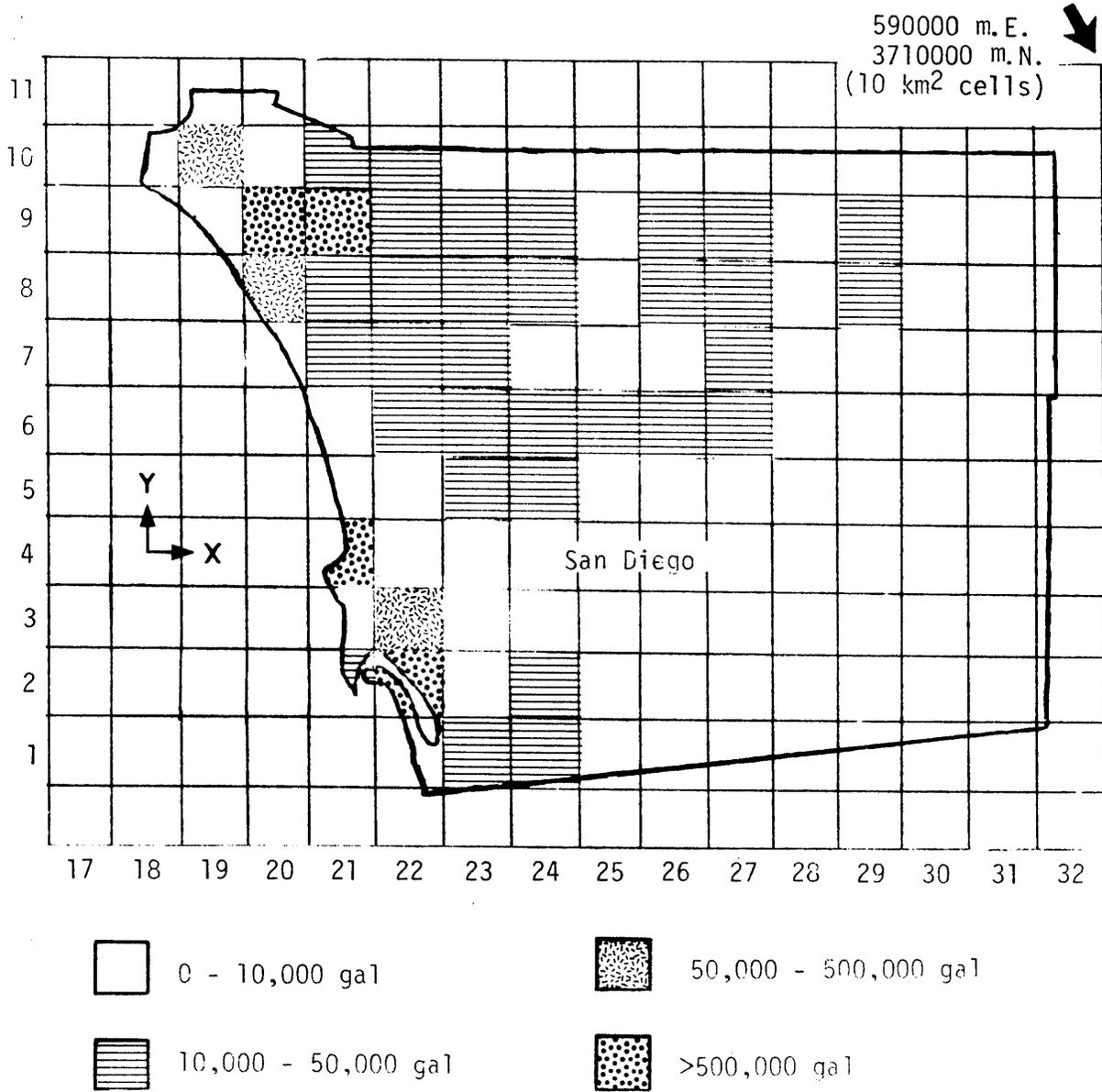


Figure 5-2. Gridded Fuel Oil Consumption in the San Diego Air Basin, 1977

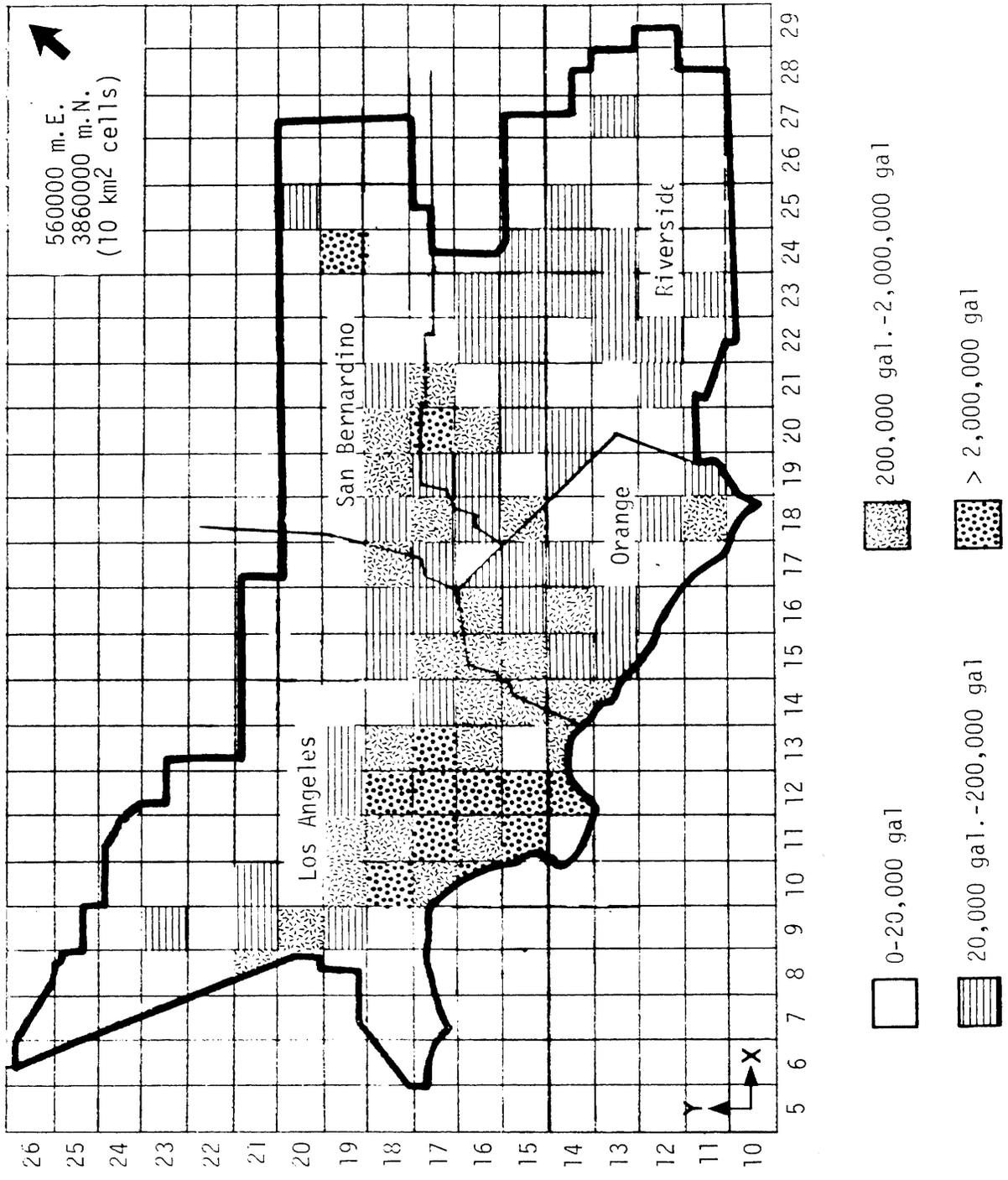


Figure 5-3. Gridded Fuel Oil Consumption in the Los Angeles Air Basin, 1977

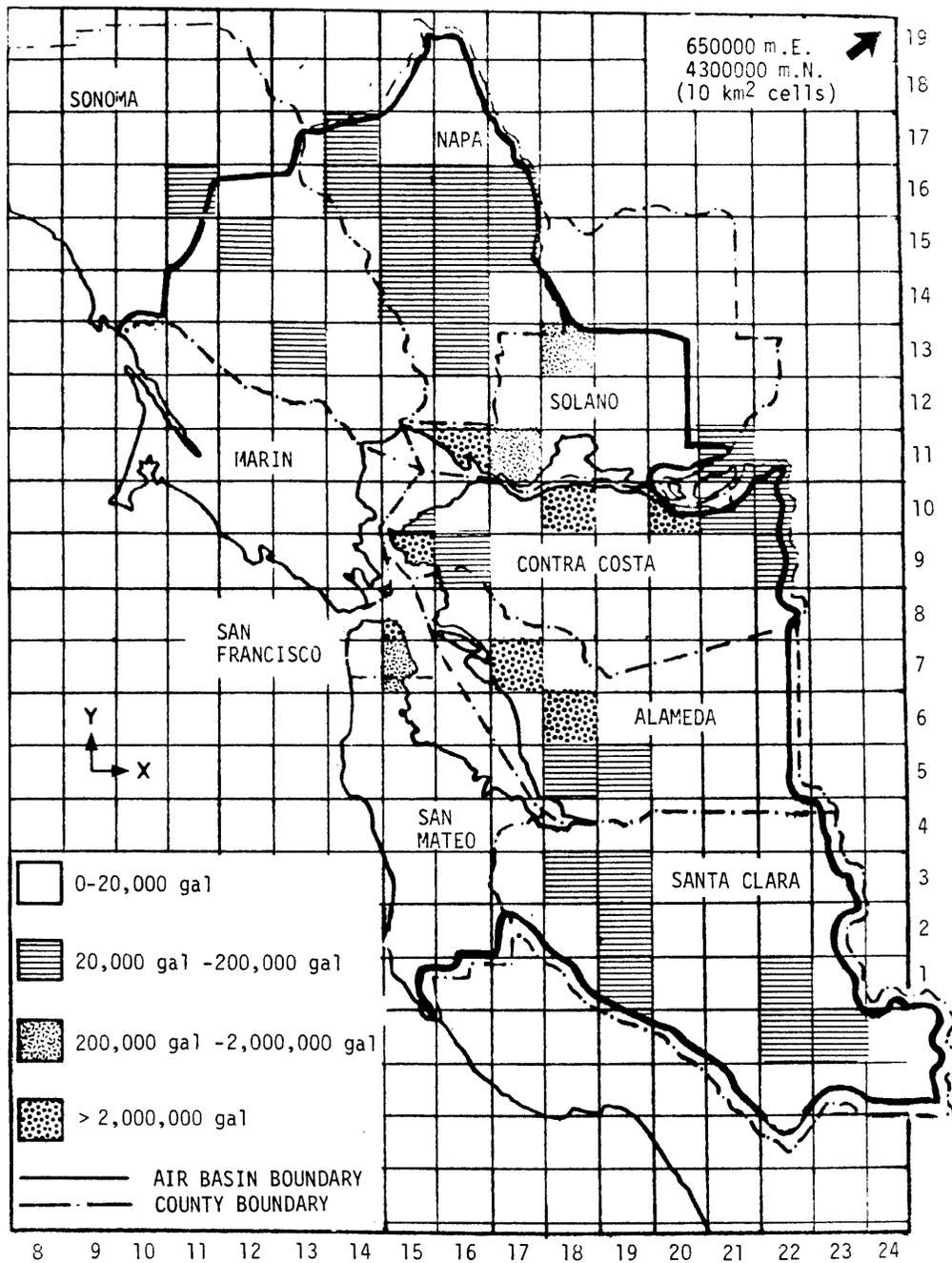


Figure 5-4. Gridded Fuel Oil Consumption in the San Francisco Air Basin, 1977

APPENDIX A
SUPPORT DATA FOR THE RESIDENTIAL SECTOR

The purpose of this appendix is to document the methodology that was used in generating county data for variables S and W of equation 1 in Section 4.2. Variable S is defined as the total number of households in the county using distillate oil for space heating while variable W indicates the total number of households using fuel oil for water heating. Utilizing the best available secondary data, the following equations were constructed to yield 1977 estimates for each variable by county.

Space Heating

$$S_i = A_i \left(\frac{C}{B} \right)_i E_i R$$

Water Heating

$$W_i = A_i \left(\frac{D}{B} \right)_i E_i R$$

where

A = Total 1970 residential housing stock of less than 20 units

B = Total 1970 residential housing stock

C = Total 1970 residential housing stock using distillate oil, kerosene and other petroleum liquids for space heating

D = Total 1970 residential housing stock using distillate oil, kerosene and other petroleum liquids for water heating

E = Forecasting factor to project 1970 estimate to 1977

R = Ratio of distillate oil to total petroleum liquids used as an energy source in the residential sector

i = County i

The data for the variables are presented in Table A-1 along with appropriate citation. The R value, which is the same for

Table A-1. RESIDENTIAL HOUSING DATA

County	VARIABLE				
	A ^a	B ^a	C ^a	D ^a	E ^b
Alpine	350	366	52	0	1.72
Amador	4,940	5,160	295	0	1.49
Butte	34,300	37,700	600	18	1.30
Calaveras	6,620	6,840	158	0	1.35
Colusa	4,420	4,860	88	0	1.08
Del Norte	4,640	5,440	620	21	1.09
El Dorado	21,600	23,200	824	160	1.61
Fresno	128,000	134,000	968	229	1.30
Glenn	5,880	6,100	177	18	1.14
Humboldt	32,100	35,100	1,080	37	1.11
Inyo	4,950	6,250	444	41	1.11
Kings	19,200	19,500	97	58	1.17
Lake	10,500	11,700	872	43	1.17
Lassen	5,420	5,860	1,300	62	1.11
Madera	14,000	14,600	77	0	1.31
Mariposa	2,710	3,050	213	16	1.26
Mendocino	16,900	18,700	2,200	188	1.20
Merced	30,900	32,500	291	22	1.25
Modoc	2,680	2,960	779	59	1.13
Mono	2,050	2,400	171	33	2.28
Nevada	10,600	11,500	1,850	175	1.60
Placer	26,200	28,700	1,190	110	1.50
Plumas	4,600	5,230	1,040	38	1.30
San Joaquin	87,700	96,600	510	0	1.26
Shasta	24,000	27,300	1,039	16	1.33
Sierra	1,290	1,320	341	0	1.16
Siskiyou	11,500	12,700	2,460	57	1.13
Stanislaus	60,900	65,100	333	41	1.35
Tehama	9,200	10,400	520	0	1.21
Trinity	3,200	3,760	227	0	1.21
Tulare	58,700	61,500	507	23	1.24
Tuolumne	10,103	11,000	117	43	1.38
Yuba	12,600	14,100	281	0	1.16

^a Reference 2 of Section 4.0

^b Developed from California Construction Trends (Annual), Security Pacific Bank, Los Angeles, CA, January 1975 and January 1979

each county, was developed by inspection of Table 4-2. As shown in the table, distillate oil and kerosene are the only two petroleum liquids that warrant consideration. Thus, based on these data the R value for this study has been taken to be 8/9, which is the ratio for the Pacific geographic area. Although there is some speculation involved in selecting this value, it is believed to be well within the error bounds of this analysis.

The E values were generated by examining the reported number of new household units authorized by each county from 1971 to 1977. These estimates do not account for possible fuel switching in that they assume a constant distribution of fuel types used in this sector. However, according to the National Petroleum News Factbook Issue (Annual), new homes in the western part of the United States have been averaging about 1 percent per year in the use of fuel oil for heating. This compares favorably with the estimated 2.6 percent for the counties in question during 1970 when considering the nature of the analysis.

APPENDIX B

SUPPORT DATA FOR THE AGRICULTURAL SECTOR

1.0 IRRIGATION

Estimates of the acreage in each of the four major crop groups by county are shown in Table B-1. These figures were compiled by examining the various 1977 county crop reports (e.g., lemons, almonds, grapes, walnuts, etc.) that were issued by the California Crop and Livestock Reporting Service, Sacramento, California.

Tables B-2 through B-17 summarize the data extracted from Reference 12, Section 4.0 for use in Equation 4, Section 4.3.2. This data indicates the pumping energy per acre by crop in each hydrologic basin.

2.0 FROST PROTECTION

The purpose of this section is to provide support for the analysis of fuel oil usage during frost protection activities. In sum, the following briefly describes for each county the important information that was distilled from visits to county APCDs and from follow-up phone calls to county U.C. Agricultural Cooperative Extension Service (Farm advisory) and County Agricultural Commissioners.

1. Alameda County: Farm Advisory. No orchard heaters or wind machines are used in the county.
2. Alpine, Inyo, and Mono Counties: No orchard heaters or wind machines.
3. Amador, Calaveras, El Dorado, Nevada, Placer, Plumas, Sierra, and Tuolumne Counties: Mr. Earl Withycombe, MCAB Administrative Assistant. No orchard heaters are used in these counties. (Taken to be protected by wind machines.)
4. Butte County: Butte County APCD. Data for 1978 indicated 4,376 protected acres of almonds using 5 orchard heaters per acre without wind machines. Heaters burn an average of 6.9 lbs (0.97 gal) per hour per heater. No other protected crops.

Table B-1. CROP ACREAGE BY MAJOR CROP GROUP

County	Group I Field Crops	Group II Fruit & Nut Crops	Group III Vegetable Crops	Group IV Pastureland
Alameda	3,810	2,800	3,410	1,200
Alpine	0	0	0	0
Amador	1,160	1,980	0	1,670
Butte	116,000	64,900	0	19,800
Calaveras	0	1,430	0	1,500
Colusa	214,000	26,200	10,100	12,000
Contra Costa	18,800	13,300	8,740	9,280
Del Norte	0	0	0	4,610
El Dorado	0	3,950	0	4,900
Fresno	752,000	294,000	74,400	40,000
Glenn	114,000	29,300	1,230	18,000
Humboldt	307	49	690	20,000
Imperial	449,000	6,180	77,600	185,000
Inyo	3,300	20	0	10,000
Kern	573,000	207,000	71,250	15,000
Kings	525,000	24,700	1,540	9,800
Lake	1,090	21,900	0	3,000
Lassen	26,100	0	0	20,000
Los Angeles	46,100	3,500	5,360	1,420
Madera	163,000	103,000	630	42,000
Marin	0	93	0	530
Mariposa	0	43	0	0
Mendocino	3,550	15,400	0	4,400
Merced	164,000	95,200	31,400	100,000
Modoc	66,200	0	4,700	53,500
Mono	5,030	0	0	9,000
Monterey	54,700	35,900	176,000	1,500
Napa	0	25,600	0	400
Nevada	0	205	0	8,600
Orange	0	8,880	9,560	0
Placer	20,100	3,860	0	19,500
Plumas	2,800	3	0	30,900
Riverside	113,000	69,600	38,000	16,600
Sacramento	107,000	11,100	10,620	54,000
San Benito	11,200	14,300	13,200	500
San Bernardino	25,500	21,900	640	7,500
San Diego	8,240	38,600	8,890	2,190
San Francisco	0	0	0	0
San Joaquin	227,000	132,000	67,700	60,800
San Luis Obispo	107,000	15,900	14,800	3,300
San Mateo	900	140	2,410	300
Santa Barbara	29,400	15,200	33,500	10,300
Santa Clara	3,130	15,200	13,200	1,500
Santa Cruz	1,510	8,140	10,500	2,800
Shasta	23,800	2,500	0	34,000
Sierra	2,800	0	0	10,600
Siskiyou	106,000	0	6,700	102,000
Solano	101,000	18,700	22,200	24,600
Sonoma	100	41,800	0	6,800
Stanislaus	71,800	123,000	29,300	71,000
Sutter	156,000	51,300	31,700	24,000
Tehama	32,100	34,900	0	33,000
Trinity	175	0	0	303
Tulare	329,000	254,000	2,900	11,000
Tuolumne	0	215	0	2,000
Ventura	1,440	60,600	37,300	0
Yolo	234,000	25,700	79,300	16,000
Yuba	38,100	24,500	0	21,000

Table B-2. HYDROLOGIC BASIN 1A

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (9.4% of Acreage)		+Surface Water (90.6% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	403	1248	207	1091
Irrigated Pasture	---	1653	---	1446
Small Grain & Hay	192	594	99	519
Other Field Crops	212	656	109	573
FRUIT & NUT CROPS				
Other Orchard Crops	338	1045	174	914
VEGETABLE CROPS				
Beans	174	---	90	---
Potatoes	302	933	155	816
Other Vegetables	214	---	110	---

Table B-3. HYDROLOGIC BASIN 1B

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (58.8% of Acreage)		+Surface Water (41.2% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	267	916	136	811
Irrigated Pasture	354	1216	180	1077
Small Hay & Grain	139	478	71	423
Grain Sorghum	172	---	88	---
Corn	---	740	---	655
Other Fld Crops	184	634	94	562
FRUIT & NUT CROPS				
Grapes	172	591	87	523
Citrus & Avocadoes	167	574	85	508
Peaches & Nectarines	---	592	---	524
Prunes	210	722	107	639
Walnuts	210	722	107	639
Other Orchard	212	729	108	646
VEGETABLE CROPS				
Tomatoes	227	---	116	---
Potatoes	---	947	---	838
Other Vegetable	186	---	95	---

Table B-4. HYDROLOGIC BASIN 2

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (75.5% of Acreage)		+Surface Water (24.5% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alalfa	---	1275	---	3282
Irrigated Pasture	602	1221	3016	3152
Sugar Beets	492	1003	2477	2589
Grain Sorghum	355	----	1779	----
Other Fld Crops	359	728	1798	1879
FRUIT & NUT CROPS				
Grapes	276	560	1384	1446
Peaches & Nectarines	387	784	1937	2024
Prunes	422	856	2114	2209
Almonds	263	533	1318	1377
Walnuts	413	837	2068	2162
Other Orchard	380	770	1902	1988
VEGETABLE CROPS				
Beans	312	632	1560	1630
Tomatoes	321	651	1609	1681
Potatoes	---	1238	----	3195
Lettuce	302	621	1511	1579
Other Vegetable	---	750	----	1936

Table B-5. HYDROLOGIC BASIN 3

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (97.6% of Acreage)		+Surface Water (2.4% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	---	1779	---	1153
Irrigated Pasture	847	1545	167	1001
Small Grain & Hay	201	368	40	238
Sugar Beets	---	1334	---	865
Grain Sorghum	426	777	84	504
Corn	---	970	---	629
Other Fld Crops	528	963	104	624
FRUIT & NUT CROPS				
Grapes	---	445	---	288
Citrus & Avocadoes	436	796	86	516
Peaches & Nectarines	675	1231	133	798
Prunes	465	849	92	550
Almonds	394	719	78	466
Walnuts	495	903	98	585
Other Orchard	540	986	107	639
VEGETABLE CROPS				
Beans	892	715	77	463
Tomatoes	424	773	84	501
Potatoes	373	681	74	441
Lettuce	252	459	50	298
Other Vegetables	403	736	80	477

Table B-6. HYDROLOGIC BASIN 4A

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (89.7% of Acreage)		+Surface Water (10.3% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	720	1307	1297	1769
Irrigated Pasture	766	1390	1379	1881
Small Grain & Hay	203	369	366	499
Sugar Beets	---	1340	---	1812
Grain Sorghum	447	---	806	---
Other Fld Crops	446	846	840	1145
FRUIT & NUT CROPS				
Grapes	---	487	---	659
Citrus & Avocadoes	441	801	794	1083
Walnuts	460	834	828	1128
Other Orchard	479	869	862	1176
VEGETABLE CROPS				
Beans	376	---	677	---
Tomatoes	402	729	723	986
Lettuce	363	659	654	891
Other Vegetables	465	844	838	1142

Table B-7. HYDROLOGIC BASIN 4B

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (76.7% of Acreage)		+Surface Water (23.3% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	830	1394	7227	6511
Irrigated Pasture	898	1508	7820	7046
Small Hay & Grain	235	394	2043	1841
Corn	---	1040	---	4861
Other Fld Crops	---	910	---	4254
FRUIT & NUT CROPS				
Citrus & Avocados	439	738	3826	3447
Peaches & Nectarines	367	617	3198	2881
Walnuts	434	---	3777	---
Other Orchard	682	1144	5935	5348
VEGETABLE CROPS				
Beans	434	---	3777	---
Tomatoes	632	1062	5506	4961
Lettuce	399	671	3478	3133
Other Vegetables	537	---	4676	---

Table B-8. HYDROLOGIC BASIN 5A

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (26% of Acreage)		Surface Water (74% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	353	985	69	758
Irrigated Pasture	470	1313	92	1010
Small Grain & Hay	92	258	18	199
Rice	748	---	146	---
Sugar Beets	285	794	56	611
Grain Sorghum	183	510	36	393
Corn	228	---	45	---
Other Fld Crops	186	518	36	399
FRUIT & NUT CROPS				
Grapes	276	771	54	593
Citrus & Avocadoes	281	784	55	603
Peaches & Nectarines	268	749	52	576
Prunes	272	759	53	584
Almonds	326	909	64	699
Walnuts	295	822	58	633
Other Orchard	307	858	60	660
VEGETABLE CROPS				
Beans	185	516	36	397
Tomatoes	248	693	48	533
Other Vegetables	192	---	37	---

Table B-9. HYDROLOGIC BASIN 5B

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (37.3% of Acreage)		Surface Water (62.7% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	539	1070	153	761
Irrigated Pasture	665	1321	189	940
Small Grain & Hay	153	304	43	216
Rice	1256	---	356	---
Sugar Beets	465	924	132	657
Grain Sorghum	337	670	96	476
Corn	337	---	96	---
Other Fld Crops	339	673	96	479
FRUIT & NUT CROPS				
Grapes	387	768	110	546
Peaches & Nectarines	454	901	129	641
Prunes	505	1002	143	713
Almonds	472	936	134	666
Walnuts	498	989	141	703
Other Orchard	491	975	139	693
VEGETABLE CROPS				
Beans	337	---	95	---
Tomatoes	419	833	119	592
Potatoes	638	1267	181	901
Lettuce	306	---	87	---
Other Vegetables	352	---	100	---

Table B-10. HYDROLOGIC BASIN 5C

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (31.8% of Acreage)		Surface Water (68.2% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	1094	1814	1053	1781
Irrigated Pasture	1172	1942	1128	1907
Small Hay & Grain	214	355	206	348
Cotton	856	1419	824	1393
Rice	1418	---	1365	---
Surgar Beets	773	1282	744	1259
Grain Sorghum	529	---	510	---
Corn	677	---	652	---
Other Fld Crops	663	1099	638	1079
FRUIT & NUT CROPS				
Grapes	754	1250	726	1227
Citrus & Avocados	536	888	516	872
Peaches & Nectarines	892	1479	859	1452
Prunes	889	---	856	---
Almonds	748	1240	720	1217
Walnuts	927	1536	892	1509
Other Orchard	889	---	856	---
VEGETABLE CROPS				
Beans	529	---	510	---
Tomatoes	487	807	469	793
Potatoes	932	1546	898	1518
Lettuce	529	---	510	---
Other Vegetables	593	---	571	---

Table B-11. HYDROLOGIC BASIN 5D

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (57.4% of Acreage)		Surface Water (42.6% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	1748	2417	1448	2177
Irrigated Pasture	2143	2964	1775	2670
Small Grain & Hay	378	522	313	470
Cotton	1299	1796	1076	1618
Rice	2087	---	1729	---
Sugar Beets	1186	1641	983	1478
Grain Sorghum	883	1221	731	1100
Corn	1059	1465	877	1319
Other Fld Crops	1002	1385	830	1247
FRUIT & NUT CROPS				
Grapes	1232	1704	1020	1535
Citrus & Avocadoes	788	1090	653	982
Peaches & Nectarines	1262	1745	1045	1571
Prunes	1246	---	1032	---
Almonds	1155	1597	956	1438
Walnuts	1259	1741	1042	1568
Other Orchard	1301	1799	1077	1620
VEGETABLE CROPS				
Beans	716	991	593	892
Tomatoes	686	948	568	854
Potatoes	1372	1898	1136	1709
Other Vegetables	945	1307	783	1177

Table B-12. HYDROLOGIC BASIN 6A

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (10.8% of Acreage)		+Surface Water (89.2% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	379	1044	143	855
Irrigated Pasture	280	770	105	631
Small Grain & Hay	150	414	57	339
Other Fld Crops	381	---	144	---
VEGETABLE CROPS				
Potatoes	421	1159	158	949
Other Vegetables	242	---	91	---

Table B-13. HYDROLOGIC BASIN 6B

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (85.6% of Acreage)		+Surface Water (14.4% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	1397	1932	330	1055
Irrigated Pasture	1595	2206	343	1204
Small Hay & Grain	527	729	113	398
Cotton	1558	---	335	---
Sugar Beets	1526	---	328	---
Grain Sorghum	935	---	201	---
Corn	1246	---	268	---
Other Fld Crops	1246	---	268	---
FRUIT & NUT CROPS				
Grapes	1308	1809	281	988
Citrus & Avocadoes	935	1292	201	706
Peaches & Nectarines	1387	1919	298	1048
Almonds	1216	1681	261	918
Other Orchard	1354	1872	291	1022
VEGETABLE CROPS				
Other Vegetables	910	1258	196	687

Table B-14. HYDROLOGIC BASIN 7A

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (2.4% of Acreage)		Surface Water (97.6% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	1280	---	15	---
Irrigated Pasture	1323	---	16	---
Small Hay & Grain	576	---	7	---
Cotton	1046	---	12	---
Sugar Beets	1046	---	12	---
Grain Sorghum	619	---	7	---
Corn	854	---	10	---
Other Fld Crops	854	---	10	---
FRUIT & NUT CROPS				
Grapes	1408	---	17	---
Citrus & Avocadoes	1477	2438	17	1271
Other Orchard	1086	1793	13	934
VEGETABLE CROPS				
Beans	469	---	6	---
Tomatoes	1067	---	13	---
Lettuce	640	1057	8	551
Other Vegetables	1068	1763	13	919

Table B-15. HYDROLOGIC BASIN 7B

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (2.1% of Acreage)		Surface Water (97.9% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	1323	---	16	---
Irrigated Pasture	1323	---	16	---
Small Hay & Grain	640	---	8	---
Cotton	1046	---	12	---
Grain Sorghum	619	---	7	---
Corn	854	---	10	---
Other Fld Crops	875	---	10	---
FRUIT & NUT CROPS				
Grapes	1366	---	16	---
Citrus & Avocadoes	1430	---	17	---
Other Orchard	1387	---	16	---
VEGETABLE CROPS				
Tomatoes	1067	---	13	---
Lettuce	480	793	6	413
Other Vegetables	1078	1779	13	927

Table B-16. HYDROLOGIC BASIN 8

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (67.2% of Acreage)		+Surface Water (32.8% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	1027	1618	6260	5805
Irrigated Pasture	827	1304	5044	4677
Small Hay & Grain	266	419	1621	1503
Sugar Beets	---	1614	---	5788
Grain Sorghum	585	---	3567	---
Corn	562	---	3424	---
Other Fld Crops	564	890	3443	3192
FRUIT & NUT CROPS				
Grapes	---	692	---	2481
Citrus & Avocadoes	616	970	3754	3481
Peaches & Nectarines	611	963	3727	3456
Almonds	891	1404	5433	5038
Walnuts	600	945	3657	3391
Other Orchard	625	984	3808	3531
VEGETABLE CROPS				
Beans	515	---	3139	---
Tomatoes	609	---	3710	---
Potatoes	---	1614	---	5788
Lettuce	484	763	2953	2738
Other Vegetables	615	969	3747	3475

Table B-17. HYDROLOGIC BASIN 9

	ENERGY/ACRE (KWH/ACRE)			
	On Farm Well (22.5% of Acreage)		+Surface Water (77.5% of Acreage)	
	Surface Irrigation	Sprinkler Irrigation	Surface Irrigation	Sprinkler Irrigation
FIELD CROPS				
Alfalfa	452	1156	8900	7915
Irrigated Pasture	---	1156	---	7915
Small Grain & Hay	117	300	2312	2056
Grain Sorghum	258	---	5086	---
Corn	258	---	5086	---
Other Fld Crops	217	---	4272	---
FRUIT & NUT CROPS				
Grapes	---	495	---	3392
Citrus & Avocadoes	268	685	5272	4688
Peaches & Nectarines	235	600	4624	4112
Walnuts	260	665	5118	4551
Other Orchard	274	700	5393	4796
VEGETABLE CROPS				
Beans	227	---	4476	---
Tomatoes	269	688	5301	4714
Potatoes	---	1156	---	7915
Lettuce	224	574	4420	3830
Other Vegetables	268	---	5290	---

5. Colusa County: County Agricultural Commissioners Office. The use of orchard heaters and wind machines are very limited in the County. Almonds is the crop that requires frost protection. (Assumed to have negligible consumption of fuel oil for frost protection during 1977).
6. Contra Costa County: County Agricultural Commissioners Office. No orchard heaters or wind machines are used.
7. Del Norte, Humboldt, and Trinity Counties: Humboldt County APCD. No orchard heaters are used. (Taken to be protected by wind machines.)
8. Fresno County: Farm Advisory and the County Agricultural Commissioner's Office (1977 data).
 - Almonds: ~3,000 acres protected by orchard heaters at 45 heaters per acre
 - Plums: ~200 acres protected by orchard heaters at 33 heaters per acre
 - Citrus: ~21,000 acres protected by orchard heaters and wind machines. Acreage distribution not known. There are ~50 heaters per acre with wind machine and ~75 without.
 - Avocados: ~270 acres are protected with the same densities as citrus crops.

(For purposes of this study, the equipment ratios from item 42 were used to determine the population of heaters without wind machines and with wind machines).

9. Glenn County: Glenn County APCD (1977 data). Total protected acreage in the county is 400 acres of almonds and 150 acres of oranges. Use around 50 orchard heaters per acre. Use of wind machines is very limited.
10. Imperial County: County Agricultural Commissioners Office and the Farm Advisory. Orchard heater use is limited to about 10 percent of the citrus crops. Most crop protection is by sprinklers and helicopters.
11. Kern County: Farm Advisory. Frost protection by orchard heaters and wind machines is mainly limited to citrus crops. There are about 20,000 acres with wind machines and about 10,000 acres with orchard heaters. Use about 15 heaters per acre.

12. Kings County: Farm Advisory. There is very little use of fuel oil in frost protection. Airplanes and sprinkler methods are mainly used. Crops that could require protection include lemons, avocados, and grapes. Based on this information, it was assumed that no orchard heaters were used in 1977.
13. Lake County: County Agricultural Commissioner's Office. Protected acreage equals 3,200 acres of grapes, 8,600 acres of pears, and 9,400 acres of walnuts. There is a total of 100 wind machines (35-40% diesel) in the entire county. Orchard heater densities are 8 - 10 per acre with wind machines and 15 - 20 per acre without wind machines. Most crop protection is by sprinklers. Walnuts rarely require orchard heaters. (Assuming 10 acres per wind machine this equals about 1,000 acres. Furthermore, from this contact and the 1972 study, deciduous fruits and nuts are presumably the only crops that use fuel oil as part of protection).
14. Lassen County: Lassen County APCD. No orchard heaters or wind machines are used.
15. Los Angeles County: (Analysis based on items 25 and 27).
16. Madera County: Farm Advisory (1977 data). About 3,940 acres of citrus crops required frost protection during the year of 1977. No other protection requirements. (Assumed some equipment pattern as in item 41).
17. Marin County: Marin County APCD. No orchard heaters are used. (Taken to be protected by wind machines.)
18. Mariposa County: Farm Advisory. No orchard heaters are used. (Taken to be protected by wind machines.)
19. Mendocino County: Mendocino County APCD and Farm Advisory (1977 data). Approximately 46,000 orchard heaters were operated for a total of 20 hours per heater during the year.
20. Merced County: Farm Advisory. The primary method of protection is overhead sprinklers, which is followed by air circulation (i.e., wind machines and helicopters). Less than 5 percent of the acreage of the following crops is protected by orchard heaters: almonds, peaches, plums and prunes. The heater density for most counties is 20/acre.
21. Modoc County: Siskiyou County APCD. No orchard heaters are used. (Taken to be protected by wind machines.)

22. Monterey County: County Agricultural Commissioners Office Orchard heaters, for the most part, are not used. Apples, strawberries, and apricots are protected by wind machines. Grapes are protected by overhead sprinklers. In 1977 about 100 acres of apples and 300 acres of strawberries were protected by wind machines.
23. Napa County: County Agricultural Commissioners Office. Grapes are the only crop requiring frost protection. The primary method is by wind machines, with some support from orchard heaters. About one-third of frost protection is done by sprinklers. In some instances, orchard heaters are not required. (Assumed to have required orchard heaters 0.25 of the time during 1977).
24. Orange County: County Agricultural Commissioners Office. The crops that require frost protection are grapes and deciduous fruits and nuts.
25. Riverside County: County Agricultural Commissioners Office (1977 data). There are about 700 wind machines in the County's citrus crops of which about 50 percent are with orchard heaters (10 per acre). (Assuming 10 acres per wind machine, this equals about 7,000 acres.) About 95 percent of the citrus crops west of the Santa Susana Mountains use heaters without wind machines (40-50 heaters per acre). (Estimated to be 200 acres.) Heater fuel rate is about 1 gal/hr/heater.
26. Sacramento County: Sacramento County APCD. No orchard heaters are used.
27. San Benito County: County Agricultural Commissioners Office. Apricots and walnuts are protected by orchard heaters.
28. San Bernardino County. Farm Advisory. Citrus crops are the only ones requiring frost protection. Use wind machines, orchard heaters, and sprinklers. Distribution is not known. (Estimates were based on information for Riverside and ARB's estimate of the number of orchard heaters in the county during 1977).
29. San Diego County: Farm Advisory. The primary method of frost protection is overhead sprinklers. There may be a few orchard heaters, but they are just not used due to pollution and high fuel costs. Based on this information, it was assumed that no orchard heaters were used in 1977.
30. San Francisco County: No agricultural activity exists in the county.

31. San Joaquin County: County Agricultural Commissioners Office (1977 data). The only crops requiring frost protection were 1000 acres of almonds and 200 acres of walnuts. The walnuts are protected by orchard heaters (40/acre), while the almonds are protected by a combination of heaters and wind machines (20 heaters/acre). (The ratio of acres protected by only heaters to those protected by heaters and wind machines was based on item 42.)
32. San Luis Obispo County: San Luis Obispo County APCD. No orchard heaters are used in the county. (Taken to be protected by wind machines.)
33. San Mateo County: County Agricultural Commissioners Office. No orchard heaters are used in the county. (Taken to be protected by wind machines.)
34. Santa Barbara County. County Agricultural Commissioner's Office. Wind machines are the primary frost protection method. Avocados, lemons, and grapes may have some protection by orchard heaters. However, heaters are too expensive to operate and cause air pollution. (Based on this information, it was assumed that during 1977 all frost protection was provided by wind machines.)
35. Santa Clara County: Farm Advisory. Overhead sprinklers are the primary method of frost protection. No orchard heaters have been used in the last 15 years due to pollution control requirements and high fuel costs.
36. Santa Cruz County: County Agricultural Commissioners Office and Farm Advisory. Unable to resolve frost protection practices in this county. (Based on items 22, 32, and 34, grapes are assumed to be protected by sprinklers, while fruits, nuts, and citrus crops are assumed to be protected by wind machines).
37. Shasta and Siskiyou Counties: County Agricultural Commissioners Office and County APCD, respectively. No orchard heaters used in these counties. (Taken to be protected by wind machines.)
37. Solano County: County Agricultural Commissioners Office. Very few orchard heaters in the county and those that exist are limited to apricots. Orchard heaters were not used during 1977. (Taken to be protected by wind machines.)
38. Sonoma County: County Agricultural Commissioners Office. Grapes are the only crop requiring frost protection which is primarily performed by sprinklers.

40. Stanislaus County: County Agricultural Commissioners Office. Almonds are the only crop with orchard heater. Sprinklers are the primary method of protection in the county. All the wind machines are electric. (Since the actual number of protected acres was not reported, the ratio from the 1972 study was used. It was also assumed that the orchard heaters are used with wind machines.)
41. Sutter and Tehama Counties: County APCDs. No orchard heaters exist in the counties. In Sutter County none have been used since 1971. (Taken to be protected by wind machines.)
42. Tulare County: Farm Advisory (1977 data).
- Citrus: 55% of the total acreage is protected (~50,800 acres) by wind machines and orchard heaters. About 76% is by wind machines and 9% is by wind machines with orchard heaters. This averages about 12 heaters per acre. The rest is protected by sprinklers. Of the wind machines, about 29 percent are electric powered, about 43 percent are gasoline powered, and about 28 percent are diesel. The distribution data is reported to be reflective of the entire San Joaquin Valley.
 - Avocado: ~100 acres are protected by wind machines and ~20 acres are protected by orchard heaters. The heater density is 30 heaters per acre.
43. Ventura County: County APCD. Orchard heaters were used once on January 9-10 for two hours using a total of 97,360 heaters at a density of 18 heaters per acre. (It was assumed that 18 percent were for fruit crops and 82 percent were for citrus crops. It was also assumed that wind machines were operated on the potential freeze days.)
44. Yolo County: Farm Advisory. Orchard heaters are not used. Overhead sprinklers are the primary means of frost protection.
55. Yuba County: Agricultural Commissioners Office. No orchard heater from 1976 to present have been used. (Taken to be protected by wind machines.)

APPENDIX C

SUPPORT DATA FOR THE INDUSTRIAL, COMMERCIAL
AND INSTITUTIONAL SECTORS

1.0 INTRODUCTION

The purpose of this appendix is to provide support information for Section 4.4 "Industrial, Commercial and Institutional Sectors."

2.0 SECRECY AGREEMENTS

A copy of the secrecy agreements signed by PES and its staff having access to confidential data are provided in Figures C-1 and C-2 of this appendix.

3.0 SAMPLE QUESTIONNAIRE PACKET

An example of the questionnaire packet used in the fuel oil survey is presented in Figures C-3 and C-4 of this appendix. The sample packet contains a cover letter, set of instructions and the actual questionnaire.

4.0 QUESTIONNAIRE ANALYSIS AND DATA HANDLING SYSTEM

A detailed description of the questionnaire analysis process as related to the DHS is provided in this section.

There are five distinct files in the Data Handling System (DHS) developed for this study. Every facility that was mailed a questionnaire has at least two files. File 1 contains information on the plant name and address, plant contact and a response code described in the section below. File 2 contains the facility's EIS number if applicable, and information on the nature of business. Facilities that practiced the combustion of fuel oil in 1977 received one, two or three more files. File 3 contains information on each type of fuel oil burned and the name of the oil supplier, if given. File 4 contains information on the type of equipment used, the amount of fuel oil consumed and the temporal pattern of fuel oil use. File 5 is for describing the type of combustion unit. For every file 4 there is a corresponding file 5.

COPY

SECRECY AGREEMENT

In consideration of the granting to Pacific Environmental Services, Inc. (hereafter "PES") of ARB Contract No. A8-123-21 (hereafter "the Contract"), PES agrees as follows:

1. In connection with PES's activities under the Contract, PES may obtain information directly from business entities, from the Air Resources Board (hereafter the "ARB"), or from local Air Pollution Control Districts which has been designated "trade secret" by a business entity.
2. PES agrees to preserve in strict confidence all such information, and agrees that it will not use, disclose, or in any other manner use this information, except as directed by duly authorized representatives of the ARB.
3. PES agrees to obtain from each of its employees who has access to such information ^a on Secrecy Agreement in the form attached hereto as Exhibit A.
4. PES agrees that upon completion of the Contract, it will promptly deliver to the ARB all such information,

Figure C-1. PES Secrecy Agreement

except as related to gross totals of categories of business entities developed from such information.

5. PES agrees that it shall include with all such information supplied to the ARB having designation of "trade secret," the justification of trade secret, if any was supplied with such information.

Dated 3-31-80

Pacific Environmental Service, Inc.
By Allan Fokun, Vice-Pres.

Figure C-1. PES Secrecy Agreement (Concluded)

DRAFT:TJ/sjl
March 5, 1980

EMPLOYEE SECRECY AGREEMENT

In consideration of my employment and the compensation paid to me by Pacific Environmental Services, Inc. (hereafter "PES"), I agree as follows:

1. In connection with PES's activities under ARB Contract No. A8-123-21, PES may obtain information directly from business entities, from the Air Resources Board, or from local Air Pollution Districts, which has been designated "trade secret" by a business entity.
2. I will regard and preserve as confidential all such information that has been or may be obtained by me by reason of employment. I will not use for my own benefit or purposes, nor disclose to others, either during my employment or thereafter, except as required in the line of my employment with PES, any such information; and I will not take or retain a copy of any such information.

Date April 11, 1980

Employee *Jack T. [Signature]*

EXHIBIT A

Figure C-2. PES Employee Secrecy Agreement

AIR RESOURCES BOARD

1102 G STREET
P.O. BOX 2815
SACRAMENTO, CA 95812



Subject: Fuel Oil Inventory

Dear Sir:

The California Air Resources Board (ARB) has contracted with Pacific Environmental Services, Inc. (PES), of Santa Monica, California to examine fuel oil usage patterns in the state during the calendar year 1977.

Your cooperation in providing the information described in the attached questionnaire would be appreciated. The data you provide will be evaluated along with information being gathered from other fuel oil users throughout the state. Please be aware of the fact that the more complete and accurate the response to the questionnaire, the more valid the conclusions of the study will be.

This request for data is a formal one made by the ARB pursuant to Section 41511 of the California Health and Safety Code and Section 91100, Title 17 of the California Administrative Code, which authorize ARB, or its duly appointed representative, to require the submission of air pollution related information from owners and operators of air pollution emission sources.

Be advised that the information provided in the questionnaire can be released to the public upon request unless you request trade secret classification in writing, (in accordance with the California Public Records Act, Government Code Section 6250 et seq.). All such requests must be accompanied by an adequate justification for the trade secret designation, which should be as detailed as possible without disclosing the trade secret. Actual air pollution emission data cannot be classified as trade secrets, but other data such as privileged processes, costs, formulas, etc., may be eligible for such treatment. Information supplied to ARB which is designated as a trade secret will be kept confidential, although such information may be forwarded to the U.S. Environmental Protection Agency, which protects trade secrets in accordance with Federal law. Please note that the contractor, PES, has formally agreed with the ARB to protect the disclosures of trade secrets to others.

Further information regarding ARB procedures for protecting trade secrets may be found in Section 91010, Title 17 of the California Administrative Code or by contacting ARB's Legal Affairs and Enforcement Division.

In order to expedite the completion of this study, please return the completed questionnaire within twenty (20) working days after receipt of this correspondence to:

Pacific Environmental Service, Inc.
Attention: J.A. Trapasso
1930 14th Street
Santa Monica, CA 90404

For your convenience, a self-addressed envelope has been enclosed.

Should you require assistance in the completion of this questionnaire, please contact Mr. Joseph A. Trapasso, Project Manager, or Mr. Arthur L. Shrope, Project Scientist, at PES. They may be reached at the above address or at (213) 450-1800. In addition, they will be happy to answer any questions you may have concerning this project.

Your prompt response to this matter will be greatly appreciated.

Sincerely,

CALIFORNIA AIR RESOURCES BOARD

A handwritten signature in cursive script that reads "John R. Holmes".

Mr. John R. Holmes
Chief, Research Division

Enclosure

Figure C-3. Fuel Oil Questionnaire Cover Letter

Official Use

ID _____

CODED _____

FUEL OIL SURVEY QUESTIONNAIRE FOR
CALENDAR YEAR 1977

- Please read the following before completing the questionnaire.
- Everyone receiving this questionnaire should respond to Section I (General Information). Section II (Combustion Information) should be completed only if it is relevant.
- Your cooperation in filling out this questionnaire is greatly appreciated. Please supply as much information as possible to allow accurate calculations to be made and a representative 1977 fuel oil inventory to be conducted. If you have any questions concerning this questionnaire, please contact the individual(s) listed on the enclosed cover letter.

I. GENERAL INFORMATION

1. Plant Name: _____
Plant Address: _____
City: _____ Zip _____
Nearest Cross Street: _____
2. Mailing Address: _____
City: _____ Zip _____
3. Plant Contact: _____
Telephone: () _____ Title: _____
4. Nature of Business (and SIC code if known): _____

5. Is the combustion of fuel oil (dedicated or standby) practiced at this plant: ___ Yes ___ No
If NO, sign form and return only this page.
If YES, sign form and complete the remainder of the questionnaire. (If combustion of fuel oil (including diesel) is on a standby basis and no fuel oil was consumed in the calendar year 1977, please check the following box and return only this page.)
6. Name and title of the person completing form:

Signature: _____
Date: _____

Figure C-4. Fuel Oil Questionnaire

2. COMBUSTION UNITS

Please provide information for the calendar year 1977, as indicated in Table 2, for all combustion units firing fuel oil at the plant. The general comments outlined in the previous section for Table 1 apply equally to this table.

INSTRUCTIONS FOR TABLE 2

In the columns under the heading "COMBUSTION UNIT ID" designate each combustion unit data set by sequential numbers starting with "01". If the combustion unit is situated at a different location than that indicated by the plant address, then provide on the back of the table geographic information that will allow locating the unit on a street map.

- a. FUEL OIL CODE: Record the "FUEL OIL CODE" number from Table 1 that corresponds to the fuel oil fired in the combustion unit. If more than one "FUEL OIL CODE" fuel is fired, then record a set of combustion unit data (one complete column in Table 2) for each fuel type. For example, the "COMBUSTION UNIT ID" for combustion unit "01" firing more than one fuel would read "01a", "01b", "01c", etc., with corresponding sets of combustion unit data (columns).
- b. DESIGN CAPACITY: Record the design capacity of the unit in millions of BTU's of heat input per hour (10^6 BTU/hr). If less than one million BTU's per hr, then indicate the decimal fraction of a million BTU's.
- c. PERCENT OF DESIGN CAPACITY: Record the average and maximum percent of "DESIGN CAPACITY" at which the unit operates.
- d. ANNUAL FUEL CONSUMPTION DATA
ANNUAL FUEL CONSUMPTION: Record the total gallons of fuel consumed by the unit during calendar year 1977. Keep in mind that the total refers only to that fuel oil coded in "FUEL OIL CODE". If more than one type of fuel oil is fired, then a separate set of combustion unit data should be filled out for each fuel.
PERCENT SPACE HEAT: Record the percentage of the "ANNUAL FUEL CONSUMPTION" figure that was used for space heating rather than process heat.
- e. UNIT DESCRIPTION: Enter a brief description of the unit (e.g., boiler (type), rotary kiln, tunnel kiln, incinerator, dryer (type), etc.).

Figure C-4. Fuel Oil Questionnaire (Continued)

II. COMBUSTION INFORMATION

1. FUEL OILS

Please provide the information indicated in Table 1 for all fuel oil types (i.e., No. 2, No. 6, etc.) consumed at the plant during the calendar year 1977. In addition to each fuel oil type, provide information for stocks of the same fuel oil types that have different sulfur contents. For example, if low sulfur (e.g., 0.0%) and high sulfur (e.g., 4.0%) No. 6 fuel oils were fired in combustion units, then two sets of data should be generated.

Since more than one copy of Table 1 may be needed, please copy a sufficient number of these blank tables before responding. Before returning the complete tables, please remove this instructional sheet.

INSTRUCTIONS FOR TABLE 1

In the columns under the heading "FUEL OIL CODE" designate each data set by sequential numbers starting with "01". In those cases where "no data available" or "unknown", leave the answer blank. If needed, enter comments on the back of the table.

- a. FUEL OIL TYPE: Record the number of the fuel oil type. For example, No. 6 fuel oil would read "6". If known by some other system, please indicate.
- b. A.P.I.: Record the average degree A.P.I.
- c., d., and e. ASH, SULFUR, AND NITROGEN CONTENT: For each of the three elements, record the average content in units of percent by weight (wt. %) of fuel oil burned.
- f. METAL CONTENT: Record the average metal content in units of parts per million (ppm) by weight. If known, record the metals present in the analysis in the space provided on the bottom of the table.
- g. TOTAL HEAT CONTENT: Record the average heat content in units of BTU's per gallon fuel oil.

Finally, provide the names and addresses of all fuel oil suppliers. Remember to indicate which supplier corresponds to which fuel oil code.

Figure C-4. Fuel Oil Questionnaire (Continued)

Table 1. FUEL OILS

DATA ELEMENT	FUEL OIL CODE		
a. FUEL OIL TYPE			
b. A.P.I. (avg.)			
c. ASH CONTENT (avg. wt. %)*			
d. SULFUR CONTENT (avg. wt. %)			
e. NITROGEN CONTENT (avg. wt. %)			
f. METAL CONTENT (ppm by wt.)+			
g. TOTAL HEAT CONTENT (avg. BTU/gal)			
Name(s) and address(es) of fuel oil supplier(s) by fuel oil code:			

Metals included in "Metal Content" by fuel oil code (refer to Item f, Instructions for Table 1):			

* avg. wt. % = average weight percent
+ ppm by wt. = parts per million by weight

Figure C-4. Fuel Oil Questionnaire (Continued)

Official Use
ID _____

Table 2. COMBUSTION UNITS

DATA ELEMENTS	COMBUSTION UNIT ID		
a. FUEL OIL CODE			
b. DESIGN CAPACITY (10 ⁶ BTU/hr)			
c. % OF DESIGN CAPACITY			
• AVERAGE			
• MAXIMUM			
d. ANNUAL FUEL CONSUMPTION DATA			
• ANNUAL FUEL CONSUMPTION (gal/yr)			
• % ANNUAL CONSUMPTION			
- January			
- February			
- March			
- April			
- May			
- June			
- July			
- August			
- September			
- October			
- November			
- December			
• % SPACE HEAT			
e. UNIT DESCRIPTION			

Figure C-4. Fuel Oil Questionnaire (Concluded)

File 1

If the respondent listed a mailing address and a plant address, the plant address would always be used. A post office box number would be entered only if the plant address could not be found on the EIS/APCD file or in an available telephone book. Table C-1 presents the data format for file 1 and the tape positions (TP) for the data. Table C-2 illustrates the county codes used in conjunction with the plant identification number. The response codes presented in Table C-3 are based on the information supplied by the facility. Figure C-5 illustrates a File 1 coding sheet.

File 2

All facilities sent a questionnaire were assigned a file 1 and a file 2. If the facility was on the EIS file, its EIS identification number was entered on file 2, otherwise those spaces were left blank. Very few respondents supplied Standard Industrial Classification (SIC) codes. The SIC codes were determined from the nature of business and/or the name of the company. The Standard Industrial Classification Manual was used to assign SIC codes based on the company's primary business. If information was obtained from sources other than the questionnaire (telephone conversations, APCD files or EIS files), the source of information would be indicated in the comments section of file 2. The amount of kerosene or crude oil fired by the respondents who were assigned a "K" response code on file 1 is indicated in the comments section of file 2. A confidential code was entered on file 2 if the source specifically stated that they wished the information supplied to be kept confidential. Table C-4 indicates the data format for file 2. Figure C-6 shows a sample file 2 coding sheet.

Table C-1. DATA FORMAT FOR FILE 1

TAPE POSITION	REMARKS
1-3	Identification number used by PES for survey
4-5	County Code (refer to Table C-2)
6-47	Plant name and plant address
48-52	Zip Code
53-68	Plant contact
69-78	Area code and telephone number
79	Response code (refer to Table C-3)
80	File Code

Table C-2. COUNTY CODES

COUNTY	DHS ID NO.	EIS/AEROS ID NO.
Alameda	01	0060
Alpine	02	0140
Amador	03	0220
Butte	04	0960
Calaveras	05	0980
Colusa	06	1540
Contra Costa	07	1620
Del Norte	08	2000
El Dorado	09	2280
Fresno	10	2820
Glenn	11	2980
Humboldt	12	3300
Imperial	13	3380
Inyo	14	3460
Kern	15	3480
Kings	16	3520
Lake	17	3640
Lassen	18	3800
Los Angeles	19	4200
Madera	20	4320
Marin	21	4400
Mariposa	22	4420
Mendocino	23	4540
Merced	24	4600
Modoc	25	4740
Mono	26	4760
Monterey	27	4860
Napa	28	5020
Nevada	29	5080
Orange ^a	31	5440
Placer	32	5940
Plumas	33	6020
Riverside	34	6420
Sacramento	35	6600
San Benito	36	6660
San Bernardino	37	6700
San Diego	38	6820
San Francisco	39	6880
San Joaquin	40	6960
San Luis Obispo	41	7060
San Mateo	42	7120
Santa Barbara	43	7220
Santa Clara	44	7260
Santa Cruz	45	7300
Shasta	46	7580
Sierra	47	7620
Siskiyou	48	7680
Solano	49	7700
Sonoma	50	7760
Stanislaus	51	8020
Sutter	52	8120
Tehama	53	8200
Trinity	54	8300
Tulare	55	8340
Tuolumne	56	8360
Ventura	57	8500
Yolo	58	8840
Yuba	59	8880

^a DHS ID NO. 30 Not used.

Table C-3. QUESTIONNAIRE RESPONSE CODE (TP 79)

CODE	REMARKS
C	Continual fuel oil use in 1977 (fuel oil used regardless of availability of natural gas).
N	No response to questionnaire, phone calls or data unavailable from other sources (CARB file or local APCD files).
O	Fuel oil burning not practiced at this facility in 1977.
S	Fuel oil standby only, not used in 1977.
T	Standby fuel used for testing purposes only in 1977.
U	Standby fuel used in 1977 due to natural gas service curtailment.
R	Removed from service or not operating in 1977 or unable to find a current telephone number.
D	Source needs to be deleted from file; reasons are found in file 2 (TP 14 to 80)
K	Crude oil or kerosene fired at the facility in 1977 (comments located on file 2 (TP 14 to 80)

Table C-4. DATA FORMAT FOR FILE 2

TAPE POSITION	REMARKS
1-5	Plant ID number and county code (same as file one)
6-9	EIS number
10-13	Standard Industrial code (SIC number)
14-78	Nature of business/comments
79	Confidentiality code, if applicable,(c)
80	File number (2)

File 3

Plants that indicated they used fuel oil in 1977 were asked to complete Table 1 of the questionnaire (refer to Figure C-4).

A file 3 was created for each type of fuel oil the respondent used. No. 1 fuel oil was listed simply as "01". No. 2, however, was based on the degrees API of the fuel. Due to some confusion over names, No. 2 fuel oil includes diesel, No. 2, PS-100 and No. 2 diesel. The code assigned to these fuels is "02".

According to ASTM, there is no No. 3 grade of fuel oil. Thus, this number was not used. A fuel oil code of "04" was assigned for No. 4 fuel oil which also includes PS-200. No. 5 fuel oil also includes PS-300 and crankcase oil which is burned in rotary dryers by some facilities. No. 6 fuel oil also includes PS-400 and the Bunker grades of fuel oil.

Other information in file 3: API, ash, sulfur, nitrogen content by percentage of weight metal content in parts per million and heat content in Btus per gallon were entered only if the respondent included the information in Table 1 of the questionnaire. Any metals listed in Table 1 of the questionnaire as being in the fuel oil are indicated in the comments section of file 3. Table C-6 indicates the data format used in file 3 and Figure C-7 shows a sample file 3 coding sheet. Table C-5 presents the fuel oil suppliers code which was used to indicate the supplier indicated in the questionnaire.

File 4

File 4 contains information pertaining to the firing of fuel oil in each combustion unit responded to in the questionnaire.

The Source Classification Codes (SCCs) were taken directly from the EIS file, or if the facility was not on the EIS, from AP-42 Appendix C. The October 1975 edition of AP-42 was used as the SCCs in that publication correspond to those in the EIS file supplied to PES.

Table C-5. FUEL OIL SUPPLIERS

<u>Supplier Code</u>	<u>Supplier</u>
0000	Not given
0001	Variable
0002	Self supplied
0003	ARCO, 3580 Wilshire Blvd., Los Angeles, CA
0004	ARCO, 515 S. Flower St., Los Angeles, CA
0005	ARCO, 1801 E. Sepulveda, Carson, CA
0006	Aromalene Oil, 2750 E. Spring, Long Beach, CA
0007	ARCO, P.O. Box 750007 Sanford Station, Los Angeles, CA 90005
0008	ARCO, 6451 Rosedale Hwy., Bakersfield, CA
0009	Armour Oil, P.O. Box 81002, San Diego, CA 92138
0010	Ace Oil, 323 "A" St., Galt, CA
0011	Avon Chevron Fuel, 611 Solano Ave., Martinez, CA
0012	Ahlport Oil, 950 Beach Blvd., Watsonville, CA
0013	ARCO, Box 2517, Bell Garlers, CA 90201
0014	Amorient, 30100 Crown Valley Parkway, Laguna Nigel, CA 92677
0015	ARCO, 300 W. Glenoaks, Glendale, CA 91202
0016	ARCO, 2295 E. Harbor, San Diego, CA 92101
0017	Argon Oil, 1605 W. Redlands, Redlands, CA 92373
0301	Bee Petroleum, 4426 W. First St., Santa Ana, CA 92703
0302	Gale Barstow, 14949 S. Garfield, Paramount, CA 90723
0303	Beck Oil, Box 1102, Victorville, CA
0304	Beacon Oil, 525 W. Third St., Hanford, CA 92430
0305	Bay Area Petroleum, 421 23rd Avenue, Oakland, CA 94601
0306	Bineto Oil, 1700 S. River, Sacramento, CA
0307	Bay Cities Oil, P.O. Box 1749, Richmond, CA
0308	Beacon Oil, 940 "I" St. Reedley, CA 93654
0309	Boyett and Sons Oil, 4537 Broadway, Salida, CA 95368
0310	Bear Cat, Klamath Falls, Oregon
0311	Boarda Oil, 17150 Norwalk, Cerritos, CA 90701

0601 Chevron USA, 7700 Edgewater Dr., Oakland, CA 94621
 0602 Chevron USA, P.O. Box 2833, La Habra, CA 90631
 0603 Chevron (No address)
 0604 Crescent Refining, 715 S. Maple, Montebello, CA 90640
 0605 Consumers Oil, 2713 River Avenue, Rosemead, CA 91770
 0606 Chevron, P.O. Box R, Concord, CA 94524
 0607 Crescent Refining, 2460 E. 28th St., Los Angeles, CA
 0608 Crescent Refining, 2404 E. 28th St., Los Angeles, CA
 0609 Chevron USA, Bakersfield, CA
 0610 Coal Oil Co. (No address)
 0611 Car and Car, 45242 Commerce, Indio, CA
 0612 Cunningham Oil, 4526 Commerce, Riverside, CA 92507
 0613 Chevron USA, 2297 S. Riverside Dr., Bloomington, CA
 0614 Chevron USA, P.O. Box 7643, San Francisco, CA
 0615 Curie Bros., 3217 E. Lorena Avenue, Fresno, CA
 0616 Chevron USA, 4073 S. Maple, Fresno, CA 93725
 0617 Chevron USA, 912 26th St., Paso Robles, CA
 0618 Chevron USA, 721 "B" St., Modesto, CA
 0619 Chase Brothers, Sonoma, CA 95370
 0620 Chevron USA, P.O. Box 567, Vacaville, CA 95688
 0621 Chevron Refining, Richmond, CA
 0622 Chevron USA, P.O. Box 755, Bishop, CA 93514
 0623 Chevron USA 220 Commission St., Salinas, CA
 0624 Chevron USA, 2420 Front St., Sacramento, CA 95818
 0625 Chevron USA, Colton, CA
 0626 Cool Fuel, P.O. Box 894, Paramount, CA 90723
 0627 Campbell Oil, 3010 11th Street, Riverside, CA 92507

0901 Diamond Bluff Oil, 1553 Bluff Rd., Montebello, CA 90640
 0902 Derwitt Oil, 1903 N. Durfee, S. El Monte, CA 91753
 0903 Douglas Oil, 3160 Airway, Costa Mesa, CA 92626
 0904 Dion and Sons, 1569 W. 16th St., Long Beach, CA
 0905 Douglas Oil, 14708 Downey Avenue, Paramount, CA
 0906 Dearborn Chemical, 300 Genesee, Lake Zurich, Illinois 60047
 0907 Delta Stations, 3005 Navy Dr., Stockton, CA
 0908 Douglas Oil 900 S. Cherokee, Lodi, CA 95240
 0909 Dewars Oil, 2974 S. Higuera St., San Luis Obispo, CA 93401

1501 Exxon, 1800 Avenue of the Stars, Los Angeles, CA 90067
 1502 Eneeco, P.O. 752, Bakersfield, CA 93302
 1503 Exxon, 1406 W. Broadway, Santa Ana, CA 92802
 1504 El Capitan Oil, 9966 San Diego Mission Rd., San Diego, Ca 92108
 1505 Exxon Refinery, Benicia, CA 94510
 1506 Erickson Shell, P.O. Box 5, Mt. Shasta, CA 96067
 1507 Eureka Oil, 2777 Sunset, Bishop, CA 93514

1801 Fletcher Oil, 24721 S. Main Street, Carson, CA 90744
 1802 Farbest Corp., P.O. Box 80843, Worldway Postal Center, LA, CA 90080

 2101 Gustafson Oil, 1888 Century Park East, Century City, CA 90067
 2102 Golden Eagle Refining, 707 Wilshire, Los Angeles, CA 90017
 2103 Gulf Oil, P.O. Box 2487, Santa Fe Springs, CA 90670
 2104 Gulf Oil, 520 W. 26th Avenue, Los Angeles, CA
 2105 Golden Gate Refining, 465 California St., San Francisco, CA 94104
 2106 Gulf Oil, 1457 Fleet Avenue, Ventura, CA
 2107 Gauilan Petroleum, Hollister, CA
 2108 Gulf Oil, P.O. Box 54064 Terminal Annex, Los Angeles, CA 90067
 2109 Golden Gate Petroleum, 2200 Powell, Suite 750, Emeryville, CA 94608

 2701 Hollandard Son Oil, 799 Fletcher Ave., Hayward, CA 94544
 2702 David Hammer Oil, 8600 Compton Blvd., Paramount, CA 90723
 2703 Hercules Oil, 5630 Cherry Avenue, Long Beach, CA 90805
 2704 Home Oil Co., 1422 W. Broadway, Anaheim, CA 92805
 2705 Hercules Oil, 2771 Kurtz, San Diego, CA
 2706 Holdener Petroleum, P.O. Box 3908, Hayward, CA 94540

 3001 Irwin Petroleum Distributor, P.O. Box 9575, Bakersfield, CA 93389
 3002 Inland Oil, 1726 W. Mission, Escondido, CA 92025

 3301 James Petroleum, 3120 Chester Ave., Bakersfield, CA 93304
 3302 James Petroleum, 1400 W. Laurel, Lompoc, CA 93436

 3601 Keen Oil, 6106 Paramount Blvd., Long Beach, CA 90805
 3602 Kern County Refining, 18882 S. Vermont, Gardena, CA
 3603 Kern County Refinery, Rt. 6 Box 336, Bakersfield, CA 93307
 3604 Kludt Oil, P.O. Box 166, Lodi, CA 95240

 3901 Lakewood Oil, 11020 S. Bloomfield, Santa Fe Springs, CA 90670
 3902 Lubrication Co., 4212 E. Pacific Coast Hwy., Los Angeles, CA 90023
 3903 Little Oil, 44125 N. Yucca, Lancaster, CA 93534
 3904 Lion Oil, P.O. Box 2860, Bakersfield, CA 93303
 3905 Looman Oil, 176 W. Main, Ventura, CA
 3906 LA Solvent Co., 310 N. San Vicente, Los Angeles, CA 90048

 4201 Mobil Oil, P.O. Box 24125, Oakland, CA 94623
 4202 McAuley Oil, P.O. Box 16014, Long Beach, CA
 4203 McVay Oil (860-4711)
 4204 Mobil Oil, 612 S. Flower St., Los Angeles, CA 90051
 4205 Mobil Oil, 2619 E. 37th St., Los Angeles, CA 90058
 4206 McMullen Oil, P.O. Box 1262 Paramount, CA 90723
 4207 Mohawk Oil, P.O. Box 1476, Bakersfield, CA 92302
 4208 Mobil Oil, 3391 Long Beach Blvd., Long Beach, CA 90807

4209 Meek Oil, 180 Newport Center Dr., Newport Beach, C 92660
 4210 Mobil Oil, 6507 Jefferson Blvd., Anaheim, CA 92807
 4211 Mobil Oil, P.O. Box 2309 Hemet, CA 92343
 4212 Mock Petroleum, 16191 W. Construction Circle, Irvine, CA
 4213 Mobil Oil, P.O. Box 60106, Los Angeles, CA
 4214 Merit Oil, 1020 W. Bloomington, Rialto, CA
 4215 Martin Oil, 2874 S. Cherry Avenue, Fresno, CA 93706
 4216 McMillin Oil, Weaverville, CA 96013
 4217 Mclin Oil, 2885 Mosquito Road, Placerville, CA 95667
 4218 Mobil Oil, 504 Sherman, Corcoran, CA 93213
 4219 Myers Oil, Madera, CA 93637
 4220 J.P. Morgan Oil, 1450 Atlantic, Roseville, CA 95678
 4221 McCormic, 22 N. Salsipuedes, Santa Barbara, CA
 4222 Mobil Oil, 160 N. San Antonio, Pomona, CA 91767
 4223 Mand Carpet Mills, 2310 E. 52nd Ave., Vernon, CA
 4224 Mathisen Oil, 10685 Central, Montclair, CA

 4501 Nicky Petroleum, 1335 Santiago, Santa Ana, CA

 4801 Newhall Refining, P.O. Box 938, Newhall, CA 91322

 5101 Owens-Illinois, P.O. Box 3818, Terminal Annex, Los Angeles, CA 90051
 5102 Olen Oil, 11720 Greenstone, Santa Fee Springs, CA 90670

 5401 Petrofina of CA, P.O. Box 889, Paramount, CA
 5402 Powerine Oil, 12354 Lakeland Rd., Santa Fe Springs, CA 90670
 5403 Parton Oil, P.O. Box 4190, Lancaster, CA
 5404 Petrochem Oil World Way Postal Center, Los Angeles, CA 90080
 5405 Parton Oil, Newhall
 5406 Phillips Petroleum, P.O. Box 911, Redlands, CA 92373
 5407 Pepper Oil, 829 Hoover, San Diego, CA
 5408 Point Molate Fuel Depot, Richmond, CA
 5409 PO CM, Ventura 93002
 5410 PAD Oil, 578 "B" St., Hayward, CA 94541
 5411 Peninsula Oil, 1655 Jerrold, San Francisco, CA 94124

 6001 Road Oil Sales, 105 E. Norris Oildale, CA 93308
 6002 Rohrs Oil, P.O. Box 147, Anaheim, CA
 6003 Rutherford Oil, Los Angeles, CA
 6004 Ramos Oil, 653 Bridge St., Yuba City, CA
 6005 Ramco Oil, 1875 S. River Road, W. Sacramento, CA
 6006 Reen, Inc., 698 Stockton Rd., San Jose, CA 95126
 6007 Roardo, Inc., 5 Lake Fanny Rd., Bel Air, MD 21014
 6008 Remarko Int'l, 1771-A Linden Avenue, Glendale, CA 91201

6301 South Bay Petroleum, P.O. Box 90248, LA, CA 90009
6302 Shell Oil, 511 N. Brookhurst, Anaheim, CA 92803
6303 Shell Oil, 12244 E. Front St., Norwalk, CA
6304 Sabre Refining, P.O. Box 2465 Bakersfield, CA 93303
6305 Shell Oil, Wilmington, CA
6306 Soaws Oil, 5800 S. Eastern Ave., City of Commerce, CA 90040
6307 Spark Oil, Box 21277, Los Angeles, CA 90021
6308 Standard Oil of CA (no address)
6309 South Counties Oil Co., P.O. Box 1207, Tustin, CA 92680
6310 San Joaquin Refining, Bakersfield, CA 93302
6311 Stone and Laughlin, 814 First St., Sante Ana, CA
6312 Smith Oil, P.O. Box 238, Lake Elsenore, CA 92330
6313 San Diego Petroleum, P.O. Box 111, San Diego, CA 92112
6314 Shell Neptune, P.O. Box 20537, San Diego, CA 92120
6315 Smith Tank Lines, P.O. Box 1783, Fresno, CA 93717
6316 San Pablo Oil, Vallejo, CA
6317 Sheldon Oil, P.O. Box 278, Susoon, CA 94585
6318 Sierra Energy Mckittrick, CA
6319 Shell Oil, 1660 S. Amphlett, San Mateo, CA 94402
6320 Shell Oil, Alturas, CA 96101
6321 Salinas Valley Oil, Box 240, Salinas, CA 93901
6322 Spoor Oil, P.O. Box 605, Lincoln, CA 95648
6323 SST Oil, P.O. Box 327, Redding, CA 96009
6324 Sierra Butte Petroleum, 188 Crescent, Quincy, CA 95971
6325 Spartan Tank Lines, 1790 S. 10th St., San Jose, CA 95112
6326 Selby Petroleum, P.O. Box 3740, Salinas, CA

6601 Texaco, 3350 Wilshire, Los Angeles, CA 90010
6602 Thompson Oil, 11512 Anaheim Blvd., Orange, CA
6603 Telfort Oil, 660 Sacramento St., Suite 303, San Francisco, CA 94111
6604 Tosco-Lion Oil Division, Avon Refinery, Martinez, CA 94553
6605 Turner Gas Co., P.O. Box 426, Bishop, CA 93514
6606 Texaco, 366 John St., Salinas, CA
6607 Tropicana Petroleum, P.O. Box 889, Paramount, CA 90723
6608 Taylor Oil, 2495 Huntington Dr., San Marino 91108
6609 Tosco, P.O. Box 2860, Bakersfield, CA 93303

6901 Union Oil, Carson, CA
6902 Union Oil, P.O. Box 7600, Van Nuys, CA 91409
6903 Union Oil, P.O. Box 61143, Los Angeles, CA 90061
6904 Union Oil, P.O. Box 61066, Los Angeles, CA 91006
6905 Union Oil, 13707 S. Broadway, Los Angeles, CA 90061
6906 Union Oil, 1432 N. Main St., Orange, CA 92667
6907 Union Oil, Box 696, Victorville, CA
6908 Union Oil, P.O. Box 1751, San Diego, CA 92112
6909 UCO Oil, 600 Monterey, San Francisco, CA 94111

6910 Union Oil, 1300 Canal, Richmond, CA 94804
6911 Union Oil, Sacramento, CA
6912 Union Oil, 2835 Navy Dr., Stockton, CA
6913 Union Oil, 920 Virginia Ave., Modesto, CA 95356
6914 Union Oil, P.O. Box 388, San Luis Obispo, CA
6915 Union Oil, Vineyard Avenue, Oxnard 93030
6916 Union Oil, Woodland, CA
6917 Union Oil, P.O. Box 1759, Bakersfield, CA
6918 Union Oil, P.O. Box 831, Merced, CA
6919 Union Oil, Greenfield, CA
6920 Union Oil, One California St., San Francisco, CA 94111
6921 Union Oil, P.O. Box T, Quincy, CA 95971
6922 Union Oil, San Jose
6923 Union Oil, 700 W. Churdi, Santa Maria, CA 93454
6924 Union Oil, P.O. Box 469, Ontario, CA 91764
6925 Union Oil, First St., Santa Ana, CA
6926 Union Oil, P.O. Box 756, Pasadena, CA 91102

7201 Vail Oil, 1741 Leslie St., San Mateo, CA

7501 Western Petroleum, 8600 Compton Blvd., Paramount, CA 90723
7502 Wand J. Supply 1005 E. 2nd St., Pomona 91766
7503 Woolsey Oil, P.O. Box 37, Banta, CA 95304
7504 Western Asphalt, 3003 Fairhaven Dr., Bakersfield, CA
7505 WW Oil Co., San Andreas, CA 95249
7506 West Coast Oil, P.O. Box 5475, Oildale, CA
7507 Westwood Mohawk Oil, 3rd & Ash St., Westwood, CA 96137

8401 Zedrick Shell, P.O. Box 407, Santa Rosa, CA 95402

PLANT I.D.	FUEL OIL CODE	API AVERAGE	ASH CONTENT WT. %	SULFUR CONTENT WT.	NITROGEN CONTENT	WT. %	METAL CONTENT PPM	TOTAL HEAT CONTENT	100 BTU/GAL	SUPPLIER CODE	COMMENTS																				CARD NO.																																																
											1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20																																																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

Figure C-7. File 3 Coding Sheet

Universal Transverse Mercator (UTM) coordinates were assigned only if they were listed in the EIS file. The design capacity of the combustion unit was listed if the respondent supplied this information on the questionnaire. The questionnaire asked for the design capacity in millions of Btus per hour. If a respondent indicated that the boiler had a capacity of 500,000 this was interpreted as 0.5×10^6 Btu per hour not $500,000 \times 10^6$ Btu/hr.

The average and maximum percentage of design capacity that the unit operated at were entered on file 4 only if the respondent supplied this information.

The annual gallons throughput of fuel was checked for reasonableness. For example, one chemical plant in San Bernardino County indicated that 18.5×10^9 gallons of No. 6 fuel oil were burned in 1977. The reported capacity of the boilers indicated that this was not possible based on 24 hours per day, 365 day a year use. The energy coordinator of the facility during a telephone conversation insisted the value was correct until PES pointed out that the amount of fuel oil was approximately 7 percent of the oil used in the United States in 1977. Further research by the company found that 18.5×10^6 gallons of No. 6 had been used that year.

The percentage of the combustion unit's heat used for space heating was entered if the information was supplied in the returned questionnaire. For asphalt batch plants and other facilities using rotary dryers, it was assumed that none of the unit's capacity was used for space heat.

The temporal pattern for fuel oil use was either as reported by the user or proportioned by PES. The calculation codes which are presented in Table C-7 indicate how the fuel oil use was proportioned. When possible, PES proportioned fuel oil use based on the operating schedules of similar businesses. For example, the asphalt batch plants that did provide a temporal pattern used

approximately 75 percent of their fuel oil from March to November and the remaining 25 percent from November through February. A laundry tends to use fuel oil on a continual basis and a winery uses most of its fuel oil during the bottling season; September and October.

The X and Y coordinates used in the gridding of the metropolitan areas are based on UTM coordinates. If the UTM coordinates of a facility were not available, the grid numbers were assigned according to the city or approximate location of the facility in the metropolitan area. Table C-8 indicates the format for this file and Figure C-8 shows a sample file 4 coding sheet.

File 5

The type of combustion unit described by the SCC code in file 4 is indicated in this file. In addition, if a respondent listed several identical units with identical fuel use characteristics a divisor code was used in file 5 to indicate how many units were involved. The design capacity (TP 28-31 file 4) and the annual fuel consumption (TP 37-44 file 4) are divided by the divisor to obtain the heat range and annual fuel consumption for each unit.

Table C-9 indicates the file format and Figure C-10 shows a sample coding sheet.

PLANT I. D.	UNIT I. D.	SCC CODE			FUEL OIL CODE		CALCULATION CODE		UTM COORDINATES		DESIGN CAPACITY 10 ⁶ BTU/HR	PERCENT OF DESIGN CAPACITY		ANNUAL THROUGHPUT GAL/YR	SPACE HEAT %	PERCENT OF ANNUAL FUEL CONSUMPTION												KAP NO.	COORD		CARD NO.																																																
		1	2	3	4	5	6	7	8	9		10	11			12	13	14	15	16	17	18	19	20	21	22	23		24	25		26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73
1	7	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
1	7	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80

Figure C-8. File 4 Coding Sheet

Table C-6. DATA FORMAT FOR FILE 3

TAPE POSITION	REMARKS
1-5	Plant ID number and County Code
6-7	Fuel oil code
8-10	Degrees API average to one decimal point (e.g., 33.7)
11-13	Ash content, percentage by weight to two decimal point (e.g., 0.001%)
14-16	Sulfur content percentage by weight to two decimal point (e.g., 0.33%)
17-19	Nitrogen content percentage by weight to two decimal point (e.g., 0.008%)
20-22	Metal content parts per million (ppm)
24-26	Total Heat content 100 Btu's/gallon
27-30	Supplier code (see Table C-6)
31-79	Types of metal in fuel; if stated and any other comments
80	File number (3)

Table C-7. CALCULATION CODES (TP 18)

CODE	REMARKS
A	As reported by user.
B	Aggregated fuel oil total reported by user; PES proportioned by heat range of units.
C	No temporal pattern reported by user; PES proportioned by typical area temporal use.
D	No temporal pattern reported by user; aggregate fuel oil total divided by 12 months by PES.
E	Data from local APCD files; as calculated by PES.
F	Data from NEDS EIS file; as calculated by PES.

Table C-8. DATA FORMAT FOR FILE 4

TAPE POSITION	REMARKS
1-5	Plant ID number and county code (same as file 1)
6-7	Combustion unit ID number
8-15	Source classification code (SCC) number, (e.g., 361.79) based on National Emissions Data System (NEDS) of October 21, 1975 EPA. The SCC number is taken directly from the EIS file referenced on Table C-4 or interpreted from questionnaires.
16-17	Fuel oil code (from file 3)
18	Calculation code (refer to Table A-8)
19-22	Horizontal Universal Transverse Mercator (UTM) coordinates one decimal point (e.g., 485.3)
23-27	Vertical UTM coordinates to two decimal points (e.g., 361.79)
28-31	Design capacity of unit in millions of BTU per hour
32-33	Average percentage of design capacity the unit is fired at (maximum 99)
34-36	Maximum percentage of design capacity the unit is fired at
37-44	Gallons of fuel oil consumed in that unit in 1977
45-46	Percentage of heat produced by unit that is used for space heat (maximum 99 percent)

Table C-8. DATA FORMAT FOR FILE 4 (Concluded)

TAPE POSITION	REMARKS
47-70	Annual fuel consumption pattern, two datums per month, (maximum of 99 percent in any one month)
71	Map number 1 or 2 if source is in a gridded area. 1 = South Coast Air Basin and San Diego County. AQMD 2 = San Francisco Bay Area AQMD
72-73	Horizontal grid coordinates
74-75	Vertical grid coordinates
76-79	Blank
80	File number (4)

Table C-9. DATA FORMAT FOR FILE 5

TAPE POSITION	REMARKS
1-5	Plant ID number and county code (same as other files)
6-7	Unit ID (same as file four)
8-76	Unit Description
77-79	Divisor for combustion units
80	File number (5)

Gridded Area File

The amount of fuel oil used in each grid cell by the industrial institutional/commercial sectors and the agricultural sector for frost protection and irrigation are contained in this file. The total fuel oil use by these sectors by grid is also included. Table C-10 indicates the file format and Figure C-11 shows the necessary file access data.

Table C-10. GRIDDED AREA FILE

TAPE POSITION	REMARKS
4,5 9,10	X coordinate of grid cell Y coordinate of grid cell
16-26	Fuel oil usage by industrial/institutional/ commercial sectors; in grid X, Y (in gallons)
32-42	Fuel oil usage in agricultural sector for irrigation pumping; in grid X, Y (in gallons)
48-58	Fuel oil usage in agricultural sector for frost protection, in grid X, Y (in gallons)
64-74	Total fuel oil use in grid X, Y (in gallons)

UMSI SYSTEMS SUPPORT UTILITIES - AFN-STANDARD LABEL TAPE MAP

SPECIFIED TAPE LENGTH=1200 FEET VOLUME=SER=NI4886 THURSDAY, 8 OCTOBER 1981 10:50:49 AM

REC#	REC#	RECL	BLKSIZE	DEN	LENGTH	FEET	BLKSIZE	DEN	LENGTH	FEET	CUM. BLKSIZE	CUM. FEET
1	REC#M=F	1RECL=780	BLKSIZE 3120	DEN=3	LENGTH= 41.39	FEET	BLKSIZE 3120	DEN=3	LENGTH= 4.85	FEET	BLKSIZE 3.858	FEET
	DATA SET CONTAINS 191 BLOCKS											
2	REC#M=F	1RECL=780	BLKSIZE 3120	DEN=3	LENGTH= 2.79	FEET	BLKSIZE 3120	DEN=3	LENGTH= 41.39	FEET	BLKSIZE 3.458	FEET
	DATA SET CONTAINS 23 BLOCKS											
3	REC#M=F	1RECL=780	BLKSIZE 3120	DEN=3	LENGTH= 4.85	FEET	BLKSIZE 3120	DEN=3	LENGTH= 2.79	FEET	BLKSIZE 4.098	FEET
	DATA SET CONTAINS 13 BLOCKS											
4	REC#M=F	1RECL=780	BLKSIZE 3120	DEN=3	LENGTH= 4.85	FEET	BLKSIZE 3120	DEN=3	LENGTH= 41.39	FEET	BLKSIZE 7.548	FEET
	DATA SET CONTAINS 191 BLOCKS											
5	REC#M=F	1RECL=780	BLKSIZE 3120	DEN=3	LENGTH= 4.85	FEET	BLKSIZE 3120	DEN=3	LENGTH= 2.79	FEET	BLKSIZE 7.948	FEET
	DATA SET CONTAINS 23 BLOCKS											
6	REC#M=F	1RECL=780	BLKSIZE 3120	DEN=3	LENGTH= 2.79	FEET	BLKSIZE 3120	DEN=3	LENGTH= 4.85	FEET	BLKSIZE 8.178	FEET
	DATA SET CONTAINS 13 BLOCKS											

MAP1 (Gridded Emissions Totals) MAP2 (" ")

MASTER FILE COPY

END OF UTILITY - TAPE IS MAPPED

RECORD FORMAT FOR GRIDDED EMISSIONS

X, Y, INDUSTRIAL, IRRIGATION, FROST PROTECTION TOTAL
FUEL OIL

FORMAT = (2I5, 4(SX, E14.5))

Figure C-11. Gridded Area Access Data

SYSTEM SUPPORT UTILITIES ---- IEFMCVE

COPY DSNAME=X.X0438.A8787.QUA.MASTER.	X	14.
TO=TAPE9=(N14886.1).	X	15.
FROM=3330-1=(USER51).	X	16.
TODD=TAPE02		17.
DATA SET X.X0438.A8787.QUA.MASTER HAS BEEN COPIED TO VOLUME(S) UNIT REC OR UNLABLED TAPE		
COPY DSNAME=X.X0438.A8787.MAP1.	X	18.
TO=TAPE9=(N14886.2).	X	19.
FROM=3330-1=(USER51).	X	20.
TODD=TAPE02		21.
DATA SET X.X0438.A8787.MAP1 HAS BEEN COPIED TO VOLUME(S) UNIT REC OR UNLABLED TAPE		
COPY DSNAME=X.X0438.A8787.MAP2.	X	22.
TO=TAPE9=(N14886.3).	X	23.
FROM=3330-1=(USER51).	X	24.
TODD=TAPE02		25.
DATA SET X.X0438.A8787.MAP2 HAS BEEN COPIED TO VOLUME(S) UNIT REC OR UNLABLED TAPE		
COPY DSNAME=X.X0438.A8787.CUA.MASTER.	X	26.
TO=TAPE9=(N14886.4).	X	27.
FROM=3330-1=(USER51).	X	28.
TODD=TAPE02		29.
DATA SET X.X0438.A8787.CUA.MASTER HAS BEEN COPIED TO VOLUME(S) UNIT REC OR UNLABLED TAPE		
COPY DSNAME=X.X0438.A8787.MAP1.	X	30.
TO=TAPE9=(N14886.5).	X	31.
FROM=3330-1=(USER51).	X	32.
TODD=TAPE02		33.
DATA SET X.X0438.A8787.MAP1 HAS BEEN COPIED TO VOLUME(S) UNIT REC OR UNLABLED TAPE		
COPY DSNAME=X.X0438.A8787.MAP2.	X	34.
TO=TAPE9=(N14886.6).	X	35.
FROM=3330-1=(USER51).	X	36.
TODD=TAPE02		37.
DATA SET X.X0438.A8787.MAP2 HAS BEEN COPIED TO VOLUME(S) UNIT REC OR UNLABLED TAPE		

Figure C-11. Gridded Area Access Data (Concluded)

APPENDIX D
ABBREVIATION LIST

ABBREVIATION LIST

AP-42	Emission Factor Publication
APCD	Air Pollution Control District
API	American Petroleum Institute
ARB	California Air Resources Board
ASTM	American Society for Testing and Material
Btu	British Thermal Unit
DHS	Data Handling System
EIS	Emission Inventory Subsystem
EPA	U.S. Environmental Protection Agency
NAAQS	National Ambient Air Quality Standards
NEDS	National Emissions Data System
PES	Pacific Environmental Services, Inc.
SCAB	South Coast Air Basin
SCAQMD	South Coast Air Quality Management District
SCC	Source Classification Codes
SIC	Standard Industrial Classification
UTM	Universal Transverse Mercator

