

Appendix E

Meteorological Analysis of PM₁₀ Data

Determination of PM₁₀ "Background" Concentration
as a Function of Wind Direction

The PM₁₀ State Implementation Plan (SIP) Development Guideline (EPA-450/2-86-001) defines background as "that portion of (ambient) concentrations due to natural sources, nearby sources other than the one(s) currently under consideration, and unidentified sources." The background may be due to emissions from sources that are within an agency's jurisdiction but are too small or too numerous to inventory, or due to emissions from sources outside the region of jurisdiction and not identifiable. However, in a dispersion modeling study to develop a control strategy, all sources that can impact on the ambient concentration must be included either explicitly or in the background value. For the purposes of the El Paso control strategy, we have established PM₁₀ background concentrations as a function of wind direction since the topographical conditions in the area prohibit establishing one specific background concentration.

Meteorological data collected at CAMS 6 (SAROAD #1700027F01) was used for the wind direction analysis. El Paso was divided into four quadrants with CAMS 6 as the center point. The first quadrant included an arc from 0° to 90° indicating north/northeast wind direction. The second quadrant included an arc from 90° to 120° indicating southeasterly wind direction. The third quadrant included a large arc from 120° to 270° including areas south of the Texas/Mexico border. From 270° to 360° on the northwest side formed the fourth quadrant. Figure B.1 shows the four quadrants.

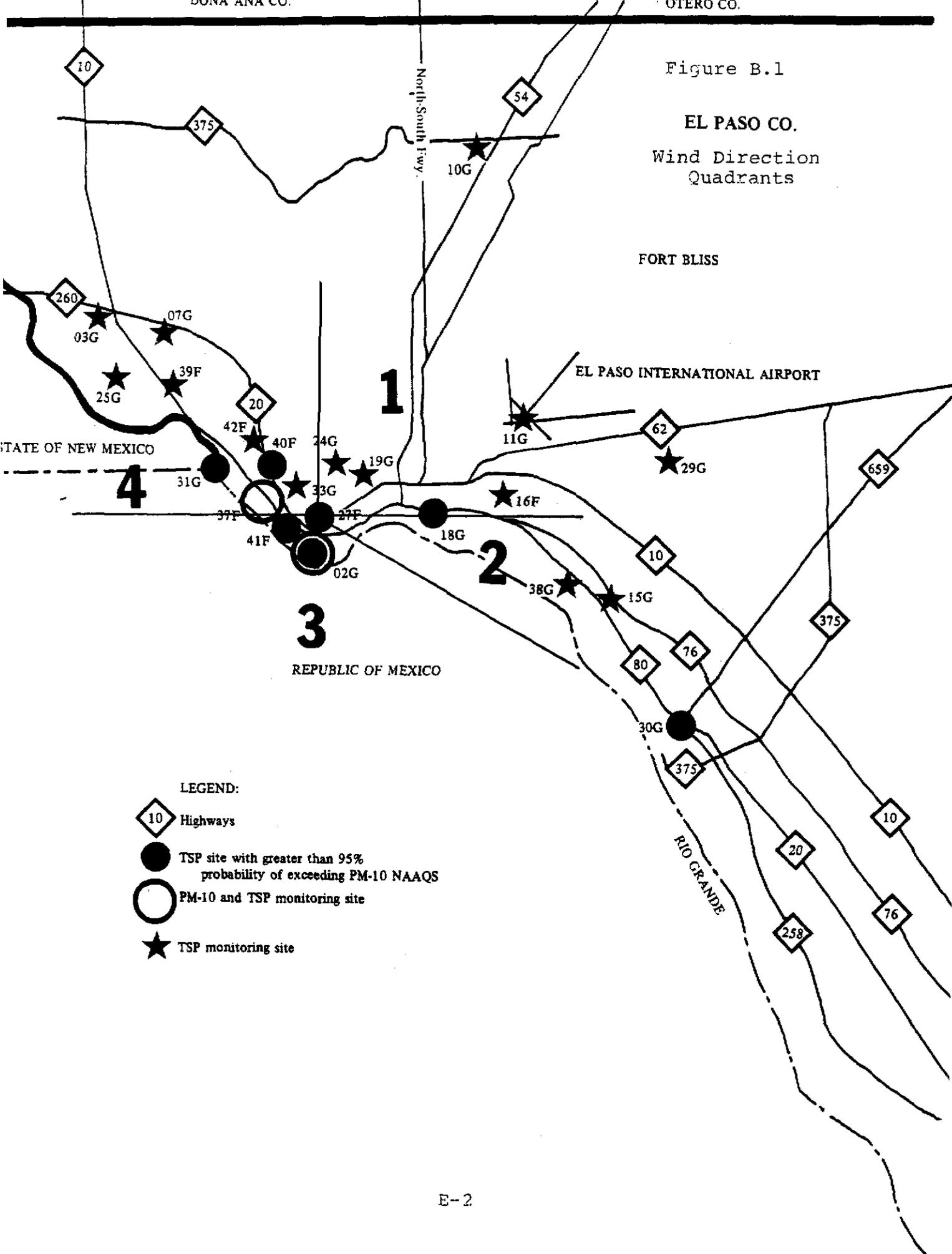
Figure B.1

EL PASO CO.

Wind Direction
Quadrants

FORT BLISS

EL PASO INTERNATIONAL AIRPORT



LEGEND:

-  Highways
-  TSP site with greater than 95% probability of exceeding PM-10 NAAQS
-  PM-10 and TSP monitoring site
-  TSP monitoring site

A background monitor was designated in each quadrant so that when the wind is blowing from a particular direction, the PM_{10} concentration monitored at that site constitutes the background value for that wind direction. For monitors that measured only TSP, a conversion factor, determined at the TSP/ PM_{10} collocated site, was used to calculate a PM_{10} background value. Wind rose graphs for days studied were also generated.

When the prevalent wind direction was from the first quadrant, the TSP monitor at Pershing Fire Station (SAROAD #1700019G01) was considered to be the background monitor. A specific wind direction was considered prevalent when the wind was from the specific direction for 12 or more hours. There were 9 days in 1986 that are classified as prevalent wind days from this quadrant. The average of PM_{10} concentrations for these days was 45 ug/m^3 . The average PM_{10} concentration for the same days at the downtown maximum concentration site (SAROAD #1700002G01) was 54 ug/m^3 . (See Table B.1) Wind rose graphs for the day of most prevalent wind from this quadrant are shown on Figure B.2.

The TSP monitor at Ysleta Clinic (SAROAD #1700030G01) was designated as the background monitor for days when the wind direction was prevalent from the second quadrant. There were only 3 days in 1986 that could be classified as prevalent wind days from this quadrant. The average PM_{10} concentration for these days was 49 ug/m^3 . The average PM_{10} concentration for these days at the downtown maximum concentration site was 70 ug/m^3 . The difference between the two averages should represent the impact of PM_{10} sources between the two monitors. (See Table B.2) The wind rose graph for the day of most prevalent wind from this quadrant is shown in Figure B.3.

TABLE B.1

PM₁₀ Measured at the Background Monitor (1700019G)
 and the El Paso, Health Monitor (1700002G)
 When the Prevailing Wind is Between 0° and 90°

JULIAN DAY	HOURS OF WIND 0° - 90°	PM ₁₀ MEASURED (ug/m ³)		
		BACKGROUND	EL PASO, HEALTH	DIFFERENCE
62	12	51	54	3
86	15	46	49	3
122	15	43	51	8
140	17	64	92	28
164	13	44	44	0
176	13	18	19	1
212	12	48	62	14
278	21	14	11	3
338	12	79	100	21
Average	14	45	54	9

FIGURE B.2

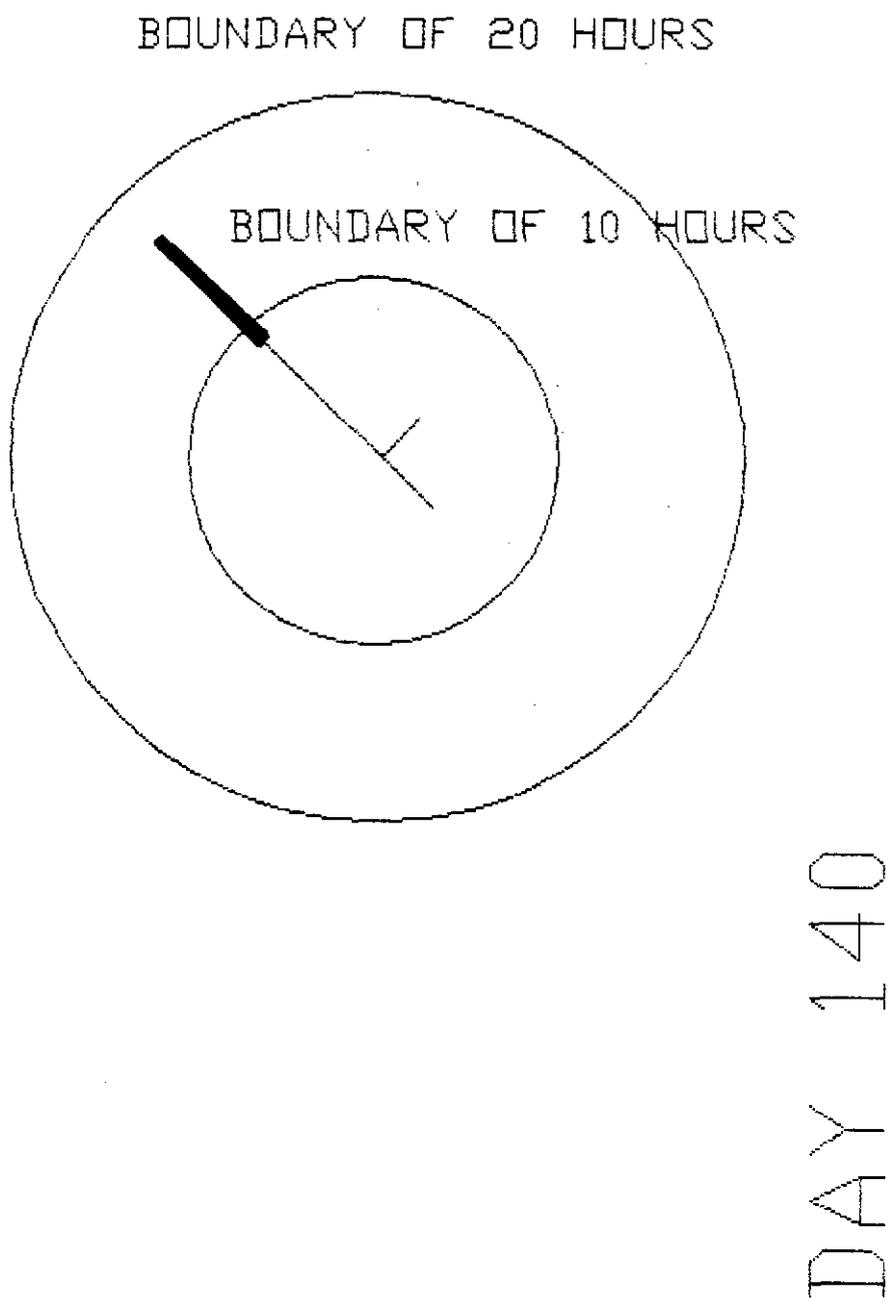


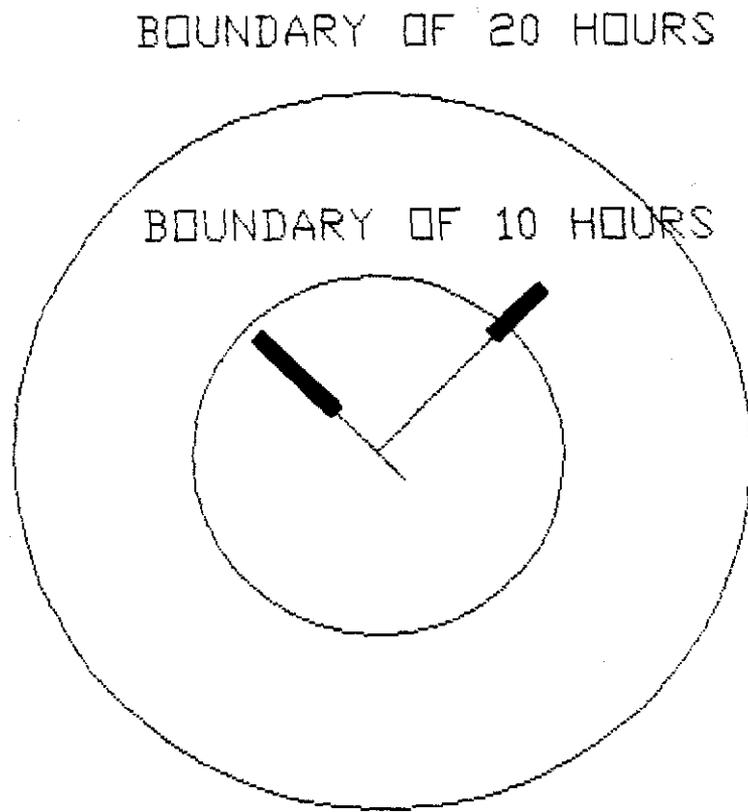
Table B.2

PM₁₀ Measured at the Background Monitor (1700030G)
 and the El Paso, Health Monitor (1700002G)
 When the Prevailing Wind is Between 90° and 120°

JULIAN DAY	HOURS OF WIND		PM ₁₀ MEASURED (ug/m ³)	
	90° - 120°	BACKGROUND	EL PASO, HEALTH	DIFFERENCE
26	13	77	58	19
80	13	43	81	38
236	12	26	*	*
Average	13	49	70	21

* No Data

FIGURE B.3



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The PM_{10} maximum concentration site at the EPCCHD (SAROAD #1700002G01) was designated as the background monitor when the prevalent wind direction was from the third quadrant. This results in Juarez, Mexico being upwind of El Paso. Because the EPCCHD monitor is located very close to the Juarez/El Paso border and because there are no significant PM_{10} sources between the border and the monitor, it was assumed that PM_{10} concentrations recorded at this monitor when the wind was blowing from this quadrant were due to sources in Juarez. Since sources in Juarez are outside the jurisdiction of El Paso, contributions from these sources are considered background. There were 45 days with prevalent wind from this quadrant in 1986. The average PM_{10} concentration recorded at the EPCCHD monitor when wind was blowing from this quadrant was 76 ug/m^3 .

However, the air quality analysis in relation to wind speed has shown that the highest PM_{10} concentrations are recorded at the EPCCHD monitor when low wind speeds and inversion conditions are present. Therefore, additional analysis was performed to determine what the background concentration would be when the wind was blowing from this quadrant and average wind speeds were 4 miles per hour or less. There were 9 days with prevalent wind from this quadrant when the wind speeds were low. Results indicate that the background PM_{10} value changes from 76 ug/m^3 considering all wind speeds to 100 ug/m^3 when only low wind speeds are considered. (See Table B.3 and B.4) Wind rose graphs for days of prevalent wind from this quadrant are shown in Figures B.4 and B.5.

TABLE B.3

PM₁₀ Measured at the El Paso, Health Monitor (1700002G)
When the Prevailing Wind is Between 120° and 270°

JULIAN DAY	HOURS OF WIND 120° - 270°	PM ₁₀ MEASURED (ug/m ³) EL PASO, HEALTH
1	16	24
10	13	161
11	14	163
19	14	105
23	12	135
42	17	55
48	14	32
49	16	50
53	20	53
67	18	70
75	13	44
82	14	109
84	14	86
89	14	47
94	13	106
96	12	70
103	16	123
104	12	99
106	15	96
107	19	136
116	24	109
118	16	75
124	16	48
126	23	87
127	17	100
128	21	51
132	12	63
133	17	53
134	15	53

TABLE B.3
(CONTINUED)

PM₁₀ Measured at the El Paso, Health Monitor (1700002G)
When the Prevailing Wind is Between 120° and 270°

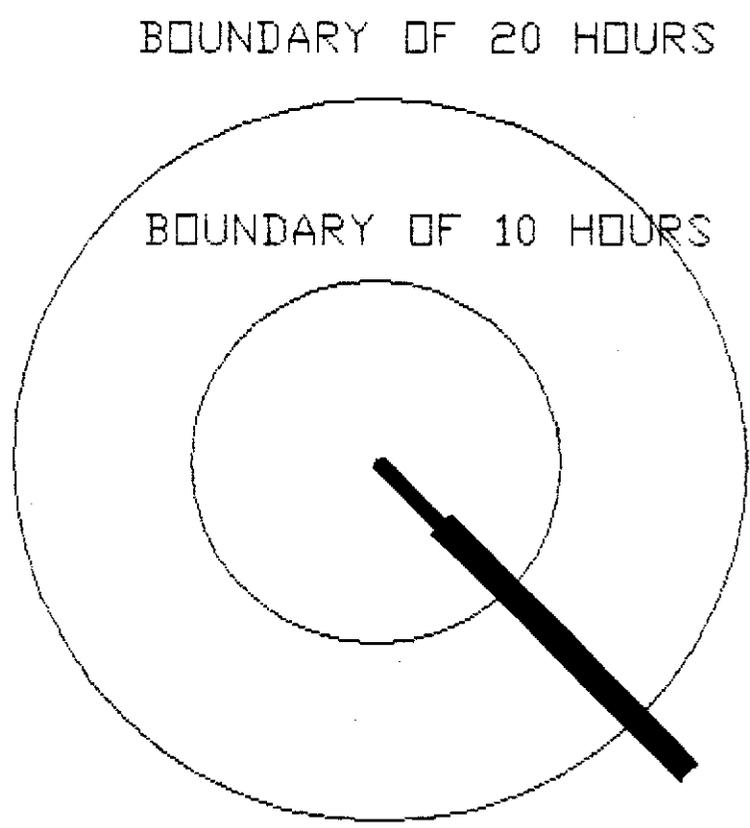
JULIAN DAY	HOURS OF WIND 120° - 270°	PM ₁₀ MEASURED (ug/m ³) EL PASO, HEALTH
135	15	58
136	21	63
141	14	79
142	18	71
160	17	53
161	15	43
165	12	64
270	14	93
271	15	40
272	22	48
273	19	78
287	17	86
294	14	56
296	13	77
329	12	86
364	16	40
Average	17	76

TABLE B.4

PM₁₀ Measured at the Background Monitor (1700002G)
When the Prevailing Wind is Between 120° and 270°
and the Wind Speed is less than 4 mph

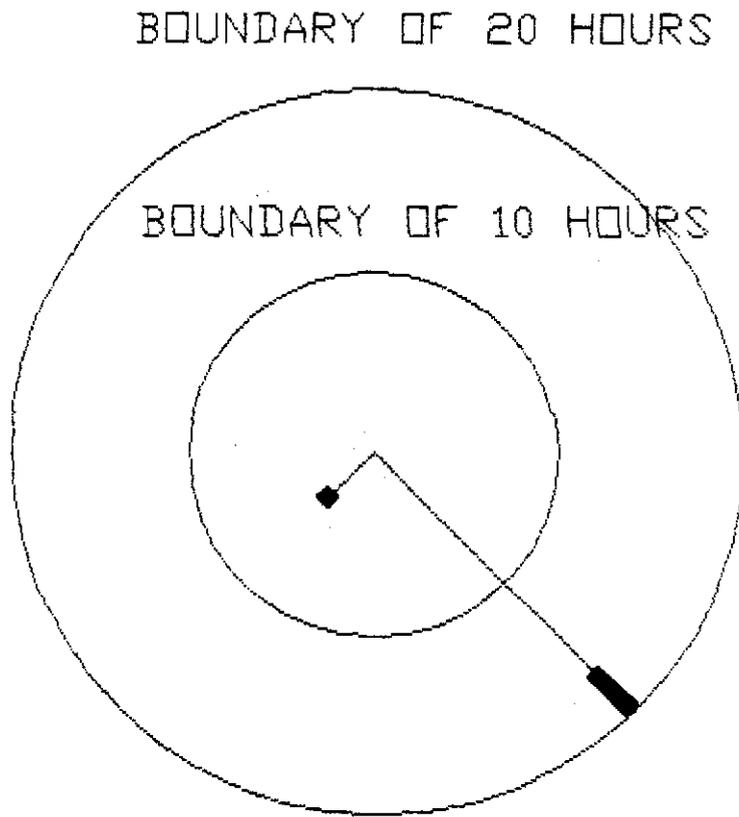
JULIAN DAY	HOURS OF WIND 120° - 270°	PM ₁₀ MEASURED (ug/m ³)
10	13	161
11	14	163
19	13	105
53	17	53
82	14	109
273	14	78
287	17	86
296	13	77
309	13	69
Average	14	100

FIGURE B.4



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FIGURE B.5



DAY 53

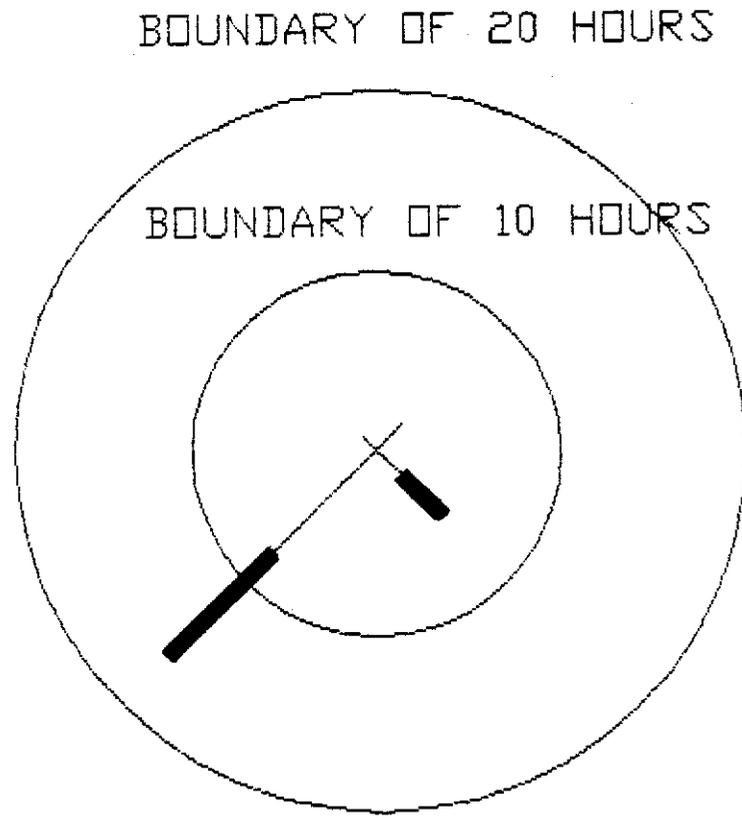
The TSP monitor at Shorty Lane (SAROAD #1700003G01) was designated as the background monitor for wind directions from the fourth quadrant. There were 9 days with prevalent wind from this quadrant. The average PM_{10} concentration for this wind direction was 27 ug/m^3 . The average PM_{10} concentration at the maximum concentration site for the same days was 42 ug/m^3 . The difference between the two averages should represent the impact of PM_{10} sources between the two monitors. (See Table B.5) The wind rose graph for the day of prevalent wind from this quadrant is shown in Figure B.6.

Table B.6 shows a summary of the number of prevalent wind direction days and the average background concentration for each quadrant. From this analysis, the staff concluded that the most prevalent wind direction is from the third quadrant (120° - 270°). This is also the quadrant that represents background concentrations from Juarez. Additionally, the highest background concentrations are observed under the low wind speed conditions from this quadrant.

TABLE B.5

PM₁₀ Measured at the Background Monitor (1700003G)
and the El Paso, Health Monitor (1700002G)
When the Prevailing Wind is Between 270° and 360°

JULIAN DAY	HOURS OF WIND 270° - 360°	PM ₁₀ MEASURED (ug/m ³)		
		BACKGROUND	EL PASO, HEALTH	DIFFERENCE
38	14	18	17	1
44	14	21	35	14
50	15	23	60	37
56	16	35	65	30
74	15	21	49	28
98	12	24	45	21
152	12	40	27	13
158	12	36	47	11
326	13	21	35	14
Average	14	27	42	15



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TABLE B.6

Background Concentration as a Function
of Wind Direction

<u>PREVAILING WIND DIRECTION*</u>	<u>WIND SPEED</u>	<u>NUMBER OF DAYS</u>	<u>BACKGROUND CONCENTRATION (ug/m³)</u>
0° - 90°	all	9	45
90° - 120°	all	3	49
120° - 270°	all	45	76
120° - 270°	low winds	9	100
270° - 360°	all	9	27

* Prevailing wind is defined as when the wind is blowing from that direction for 12 hours or more.