



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

AUG 29 2003

MEMORANDUM

SUBJECT: Variability of PM_{2.5} background concentrations
FROM: John Langstaff, EPA *JL*
TO: PM NAAQS Review Docket (OAR-2001-0017)

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

For the purpose of a sensitivity analysis as part of the PM health risk assessment to look at the impact of using different daily background PM_{2.5} concentrations on estimates of risk, we calculated standard deviations of PM_{2.5} concentrations at locations with relatively small contributions from North American anthropogenic pollution, and provided these to Abt Associates as input to the draft report *Particulate Matter Health Risk Assessment for Selected Urban Areas*¹.

These calculations were based on the daily PM_{2.5} measurements from the Interagency Monitoring of Protected Visual Environments (IMPROVE) program. IMPROVE is a cooperative visibility monitoring effort between the EPA, federal land management agencies, and state air agencies. One of the functions of this program is to monitor visibility and aerosol conditions in Class I areas, and for the most part the IMPROVE monitors are located in rural areas. IMPROVE data from 1988 to 1999 were used in this analysis.

All sites measure some PM_{2.5} from anthropogenic sources, and in most cases this tends to inflate the standard deviation over what it would be if we were able to measure only background concentrations as defined for purposes of these analyses.² Because of this, we selected the smallest standard deviation among all IMPROVE sites in the East (3.8 µg/m³) and in the West (1.5). These were not substantially smaller than the next two smallest standard deviations (3.8 and 4.0 in the East, and 1.6 and 1.6 in the West). The attached tables list the means and standard deviations for IMPROVE sites in the East and West, in order of increasing standard deviation.

These standard deviations were calculated from the IMPROVE data file *Aerosol.asc*, dated 9/29/00, downloaded on 3/20/02 from <http://vista.cira.colostate.edu/improve/Default.htm>.

¹ Abt Associates Inc. 2003b. Particulate Matter Health Risk Assessment for Selected Urban Areas: Draft Report. Prepared for the Office of Air Quality Planning and Standards, U.S. Environmental Protection Agency, Contract No. 68-D-03-002.

² "Background" is defined for purposes of the NAAQS review as the PM concentrations that would be observed in the U.S. in the absence of anthropogenic, or man-made, emissions of primary PM and precursor emissions of volatile organic compounds, nitrogen oxides, sulfur dioxide, and ammonia in North America. Thus, "background" for the purposes of the PM risk analyses includes PM from natural sources and transport of PM from sources outside of North America.

This file has 192,940 records, 64,313 of which are concentration records, and covers the period from March 1988 to August 1999.

Table 1. Eastern Sites ($\mu\text{g}/\text{m}^3$)

	State	Site Id	# Days	Mean	St.Dev.
1	MN	VOYA	771	5.2	3.6
2	MI	ISLE	249	4.5	3.7
3	MN	BOWA	899	5.0	3.8
4	ME	MOOS	713	5.7	3.8
5	MI	ISRO	168	5.6	4.4
6	NC	SWAN	185	8.7	4.5
7	ME	PRIS	119	6.4	4.5
8	MI	SENE	244	5.1	4.5
9	CT	MOMO	50	6.2	4.5
10	LA	BRET	124	8.6	4.7
11	FL	SAMA	125	10.0	4.8
12	FL	CHAS	920	10.6	4.9
13	OK	WIMO	115	7.4	5.0
14	ME	OLTO	62	7.8	5.1
15	VT	PMRF	262	6.9	5.3
16	NH	GRGU	364	6.6	5.4
17	ME	ACAD	1411	6.7	5.4
18	SC	ROMA	731	11.1	5.5
19	VI	VIIS	872	7.5	5.5
20	MO	HEGL	120	9.8	5.6
21	ME	BRMA	114	6.1	5.7
22	GA	OKEF	1025	11.0	5.7
23	AR	CACR	155	10.0	5.9
24	LA	SIKE	102	10.2	5.9
25	MA	QURE	100	7.7	6.1
26	MA	CACO	105	7.6	6.1
27	VT	LYBR	941	6.9	6.1
28	KY	CADI	96	11.4	6.2
29	IL	BOND	113	10.6	6.2
30	ME	CABA	108	7.6	6.3
31	FL	EVER	1076	9.4	6.4
32	AR	UPBU	1031	10.2	6.5
33	NJ	BRIG	1036	11.2	6.7
34	VA	JARI	197	12.0	7.1
35	AL	SIPS	833	13.9	7.2
36	NC	LIGO	209	10.7	7.3
37	VA	JEFF	578	14.7	7.3
38	KY	MACA	1041	13.3	7.4
39	GA	COHU	107	11.7	7.4
40	PA	AREN	102	11.7	7.6
41	NY	COHI	104	8.8	7.8
42	IN	LIVO	117	12.5	7.9
43	NC	SHRO	636	9.8	8.0
44	MO	MING	186	12.8	8.2
45	OH	QUCI	100	11.9	8.3
46	VA	SHEN	1347	11.6	8.4
47	WV	DOSO	1050	11.9	8.4
48	DC	WASH	1310	16.9	8.5
49	TN	GRSM	1399	12.9	8.7
50	NY	ADPI	107	9.8	8.8
51	PA	MKGO	105	12.0	9.4

Table 2. Western Sites ($\mu\text{g}/\text{m}^3$)

	State	Site	# Days	Mean	St.Dev.
52	AK	TRCR	54	1.0	0.6
53	NM	WHPE	118	1.7	1.0
54	HI	MALO	972	1.2	1.1
55	NM	WHIT	14	2.1	1.1
56	WA	OLYM	63	2.1	1.3
57	WY	BRLA	834	2.4	1.6
58	WA	WHPA	223	1.9	1.7
59	CO	WHRI	830	2.3	1.7
60	CO	STPE	62	3.0	1.8
61	CO	WEMI	1336	2.8	1.8
62	UT	CANY	1356	3.3	1.8
63	NM	SAPE	165	2.4	1.8
64	HI	HALE	1060	3.0	1.9
65	AZ	MEAD	62	3.9	1.9
66	NM	BOAP	189	3.9	1.9
67	AZ	GRCA	1423	3.2	1.9
68	NV	GRBA	985	2.9	1.9
69	CO	MOZI	707	2.5	1.9
70	WY	BRID	1362	2.6	1.9
71	UT	BRCA	1350	3.0	1.9
72	AZ	HILL	90	3.3	2.0
73	AZ	PEFO	1304	3.9	2.0
74	CO	ROMO	1151	3.0	2.0
75	AZ	BALD	182	3.4	2.0
76	OR	KALM	229	3.1	2.1
77	AZ	IKBA	209	3.6	2.1
78	OR	MOHO	218	2.3	2.1
79	UT	ZION	215	3.3	2.1
80	CO	MEVE	1356	3.3	2.2
81	AK	TUXE	20	1.7	2.2
82	CO	GRSA	1411	3.4	2.2
83	CA	BLIS	925	3.3	2.2
84	AZ	SIAN	209	4.2	2.2
85	OR	CRLA	1090	2.7	2.4
86	CA	LABE	220	2.9	2.4
87	AK	DENA	1377	1.8	2.4
88	AZ	INGA	1129	4.3	2.4
89	ID	CRMO	964	3.4	2.5
90	AZ	CHIR	1371	4.2	2.5
91	UT	ARCH	393	4.0	2.5
92	SD	WICA	210	3.3	2.5
93	CA	KAIS	99	2.6	2.5
94	UT	CAPI	143	2.8	2.5
95	CO	RMHQ	282	3.7	2.6
96	WY	YELL	1242	3.2	2.6
97	OR	HECA	165	3.7	2.6
98	MT	MELA	231	4.3	2.6
99	AZ	TONT	1309	4.8	2.6
100	CA	SAGA	28	2.2	2.7
101	ND	THRO	223	4.3	2.7
102	CA	DEVA	854	3.9	2.7
103	NM	BAND	1336	3.7	2.7

104	SD	BADL	1411	4.4	2.8
105	WA	SNPA	783	3.8	2.8
106	NV	JARB	1227	3.2	2.8
107	ID	SCOV	782	4.2	2.8
108	WA	NOCA	287	3.2	2.9
109	AK	SIME	29	4.0	2.9
110	ID	SAWT	805	2.9	2.9
111	CA	RAFA	172	5.1	3.0
112	NM	GICL	764	4.0	3.0
113	AZ	SAGU	616	5.8	3.0
114	CA	PINN	1376	5.7	3.0
115	ND	LOST	235	5.0	3.0
116	MT	CABI	186	3.3	3.1
117	AZ	QUVA	95	5.3	3.1
118	WA	COGO	323	5.6	3.2
119	OR	THSI	875	3.3	3.2
120	WY	NOAB	179	2.6	3.2
121	UT	LOPE	675	4.8	3.2
122	CA	LAVO	1335	3.1	3.3
123	CA	TRIN	141	3.2	3.3
124	AZ	SAWE	40	5.9	3.3
125	TX	GUMO	1377	5.4	3.4
126	MT	ULBE	216	3.5	3.5
127	CA	DOME	189	5.4	3.6
128	MT	SULA	769	2.9	3.6
129	ID	SALM	576	2.8	3.6
130	WA	PASA	129	2.6	3.7
131	WA	MORA	1366	4.9	3.7
132	NM	SACR	202	5.7	3.7
133	CA	REDW	1355	4.6	3.7
134	CA	JOSH	210	5.2	3.8
135	TX	BIBE	1341	6.3	3.8
136	WA	CORI	799	6.0	3.8
137	OR	STAR	222	4.7	3.9
138	MT	GAMO	169	2.5	4.0
139	CA	DOLA	129	8.5	4.1
140	CA	YOSE	1346	4.8	4.1
141	MT	GLAC	1419	5.7	4.2
142	CA	AGTI	114	7.7	4.3
143	CA	PORE	1277	7.0	4.3
144	CA	JOTR	73	7.3	4.3
145	HI	HAVO	588	3.8	4.4
146	WA	LYND	61	7.5	4.5
147	AZ	SYCA	267	6.1	4.6
148	NM	SAAN	261	5.2	4.6
149	WA	PUSO	472	8.6	5.0
150	CA	HOOV	66	3.0	5.0
151	CA	SOLA	741	8.9	5.4
152	CA	SAGO	1171	8.0	5.4
153	WA	SPOK	49	7.7	5.8
154	AZ	PHOE	90	11.8	6.0
155	MT	MONT	202	4.7	6.8
156	UT	CARE	24	11.7	7.2
157	CA	SEQU	1012	10.4	7.9