Documentation of a Natural Event Due to High Winds, May 02, 2002 Walla Walla, Washington

Addendum Addressing a Natural Event Due to High Winds, May 2, 2002 Wallula, Washington

Publication Number 05-02-004
September 2004


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Prepared by:

Washington State Department of Ecology
Air Quality Program

September 2004

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Summary

This addendum supplies new information and uses information in the Walla Walla natural events documentation for May 2, 2002 to document the May 2, 2002 Wallula PM_{10} concentration as a natural event that should be excluded from any assessment of the attainment status of the Wallula PM_{10} nonattainment area. During the preparation of the PM_{10} maintenance plan for the Wallula nonattainment area, the Washington State Department of Ecology (Ecology) realized that the May 2, 2002 PM_{10} concentration of 134 $\mu g/m^3$ at Wallula, Washington was elevated by the same regional conditions responsible for the exceedance of the PM_{10} standard of 150 $\mu g/m^3$ at Walla Walla on the same day. Ecology had determined that the Walla Walla exceedance was a natural event caused by high winds and thus should be excluded from any assessment of the attainment status for Walla Walla, Washington.

Overview

In April 2003 Ecology submitted documentation to the United States Environmental Protection Agency (EPA) in support of a data flag for the May 2, 2002, particulate matter, 10 microns and smaller, (PM_{10}) concentration at Walla Walla, Washington. The high-volume Federal Reference Method (FRM) monitor at Walla Walla had measured a filter-based PM_{10} concentration of 169 $\mu g/m^3$ on that date. This concentration exceeds the primary 24-hour PM_{10} National Ambient Air Quality Standard (NAAQS) for PM_{10} of 150 $\mu g/m^3$. Ecology determined that this exceedance was a natural event caused by high winds and thus should be excluded from any assessment of the attainment status for Walla Walla, Washington. Ecology flagged the data point for May 2, 2002, in the Air Quality System (AQS) database maintained by EPA to specify the data point as a natural event due to high winds. EPA responded to Ecology's documentation with a letter dated June 24, 2003 that acknowledged the documentation and agreed to place a second, EPA flag on the Walla Walla data point for May 2, 2002 in the AQS database.

During the preparation of the maintenance plan for the Wallula PM_{10} nonattainment area, Ecology realized that the May 2, 2002 concentration of 134 $\mu g/m^3$ measured by the Wallula high-volume FRM monitor was elevated by the same regional conditions responsible for the exceedance at Walla Walla on the same day. The May 2, 2002 Wallula concentration thus qualifies as a natural event due to high winds. When qualified as a natural event due to high winds, the May 2, 2002 concentration is not used for any attainment assessment of the Wallula nonattainment area, including the demonstration of maintenance in a maintenance plan.

This Addendum to *Documentation of a Natural Event Due to High Winds, May 02, 2002, Walla Walla, Washington* (Ecology publication 03-02-006, April 2003) does not stand by itself. The Addendum adds additional information related to PM_{10} concentrations, wind speed and wind direction at Wallula. This information is considered along with information in the April 2003 documentation to determine the May 2, 2002 Wallula concentration is a natural event.

Discussion of the topics EPA's Natural Events Policy, Ecology's response to high wind events on the Columbia Plateau, and Best Available Control Measure (BACM) implementation are not

repeated in this Addendum. The interested reader is referred to the April 2003 documentation of the May 2, 2002, Walla Walla natural event.

Evaluation of the May 2, 2002 Concentration at Wallula, Washington

1. PM_{10} Monitoring

1.1. Wallula PM_{10} Monitoring: The Wallula high-volume FRM monitor measured a filter-based PM_{10} concentration 134 $\mu g/m^3$ on May 2, 2002. The monitor was located in the approximate geographic center of the Wallula PM_{10} nonattainment area (see Appendix A). The Wallula monitor operated on a 1-in-6-day schedule.

The May 2, 2002 concentration of 134 $\mu g/m^3$ was much higher than any other concentration measured in the second quarter of 2002. Monthly maxima for April and June 2002 were 61 and 34 $\mu g/m^3$, respectively. The second highest concentration for May 2002 was 25 $\mu g/m^3$.

The only other PM_{10} concentration over 85 $\mu g/m^3$ measured at Wallula during the year 2002 was the high wind natural event of September 29, 2002. The PM_{10} concentration was 197 $\mu g/m^3$. Ecology developed natural event documentation for the September exceedance. Both Ecology and EPA have flagged the exceedance as a natural event due to high winds in the AQS database. As a result, this data point is excluded from consideration in assessing attainment of the PM_{10} standard in Wallula.

The annual average PM_{10} concentration for the year 2002 at Wallula was 36.8 $\mu g/m^3$ and the average PM_{10} concentration for the second quarter, 35.21 $\mu g/m^3$. Both of these are well below the annual standard of 50 $\mu g/m^3$. Wallula PM_{10} data for the year 2002 are found in Appendix B.

1.2. Other PM_{10} Monitoring: The high-volume FRM PM_{10} monitor in Walla Walla measured a filter-based PM_{10} exceedance of 169 $\mu g/m^3$ on May 2, 2002. The Walla Walla monitor is approximately 27 miles east of the Wallula monitor (see Appendix A).

Ecology prepared natural events documents for the May 2, 2002, exceedance and flagged the data point in the AQS database. EPA Region 10 acknowledged the documentation in a letter dated June 24, 2003 and committed to flagging the data point in the AQS database. As a result, this data point is excluded from consideration in assessing attainment of the PM_{10} standard in Walla Walla.

2. Meteorological Data

2.1. Wallula Meteorological Data: Data from a meteorological station collocated with the Wallula PM_{10} monitor show that winds easily exceeded Ecology's definition for a high wind event. The meteorological station is operated by Boise Paper Solutions—Wallula Mill. Ecology wishes to thank Boise for sharing the data from the station with Ecology.

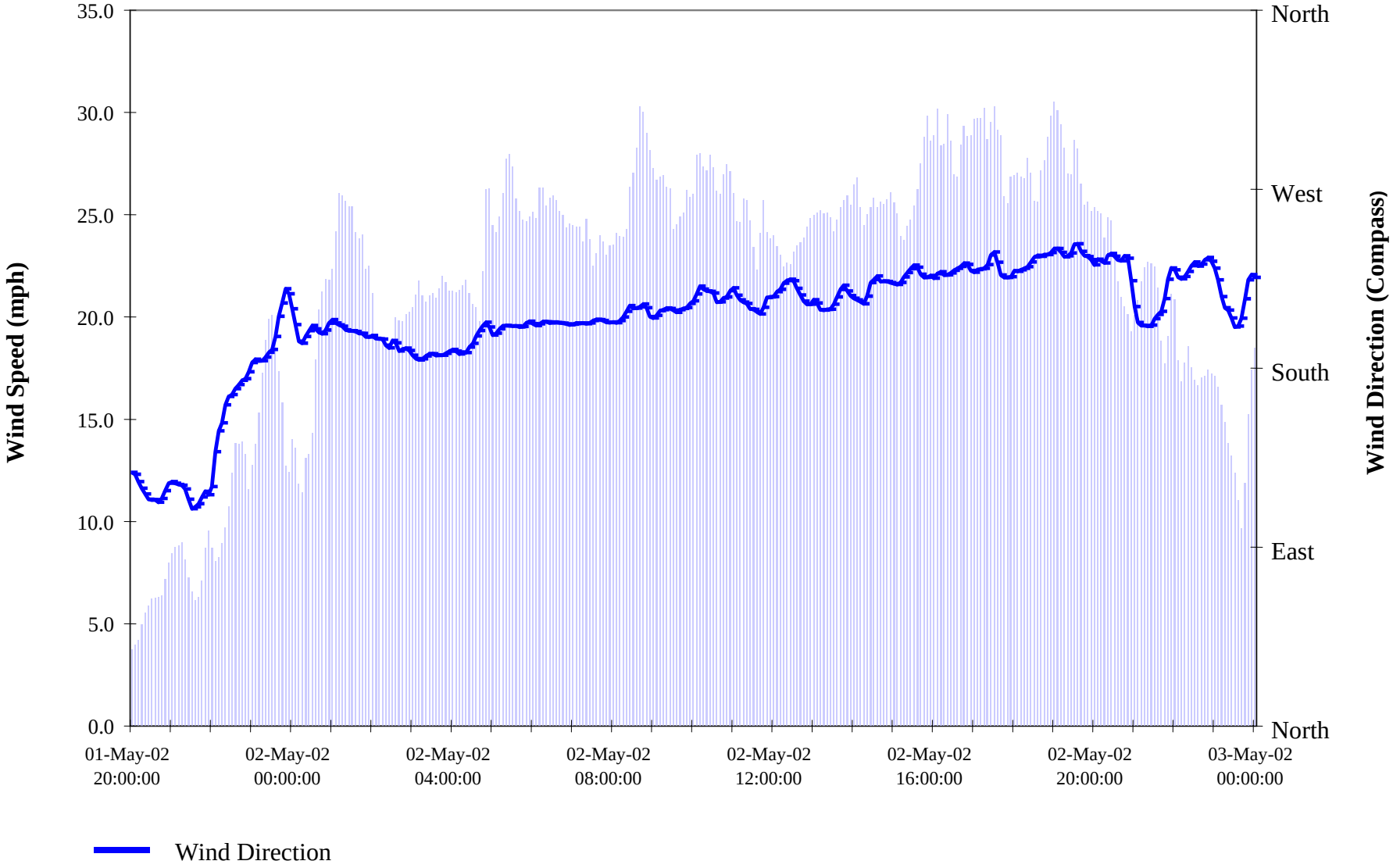
Ecology's definition requires winds of 18 mph or more for a two-hour period. Winds exceeded 20 mph from 1 a.m. through 10 p.m. on May 2, 2002 (see Table 1 and Figure 1). Winds were generally from the southwest and south-southwest during this period. The complete set of meteorological data for May 2, 2002, is found in Appendix C.

Table 1. Hourly Wind Observations for Wallula, Washington, May 2, 2002

Time (Day-Month-Year Hour:Minute:Second)	Speed (MPH)	Wind Direction	
		Degrees	Compass
02-May-2002 00:00:00	14.0	210	SW
02-May-2002 01:00:00	22.4	204	SSW
02-May-2002 02:00:00	21.2	196	SSW
02-May-2002 03:00:00	20.5	186	S
02-May-2002 04:00:00	21.3	189	S
02-May-2002 05:00:00	24.5	197	SSW
02-May-2002 06:00:00	25.1	202	SSW
02-May-2002 07:00:00	24.5	202	SSW
02-May-2002 08:00:00	23.5	203	SSW
02-May-2002 09:00:00	27.3	205	SSW
02-May-2002 10:00:00	26.0	214	SSW
02-May-2002 11:00:00	26.0	220	SW
02-May-2002 12:00:00	24.0	216	SW
02-May-2002 13:00:00	25.0	214	SSW
02-May-2002 14:00:00	26.5	215	SW
02-May-2002 15:00:00	25.6	223	SW
02-May-2002 16:00:00	28.9	225	SW
02-May-2002 17:00:00	29.7	228	SW
02-May-2002 18:00:00	26.9	229	SW
02-May-2002 19:00:00	30.5	240	WSW
02-May-2002 20:00:00	25.4	232	SW
02-May-2002 21:00:00	20.1	211	SW
02-May-2002 22:00:00	20.9	229	SW
02-May-2002 23:00:00	17.1	230	SW
03-May-2002 00:00:00	18.5	226	SW

2.2. Other Meteorological Data: *Documentation of a Natural Event Due to High Winds, May 02, 2002. Wallula, Washington* (April 2003) reported on National Weather Service data for Pendleton, Oregon and Walla Walla, Washington. In Pendleton, winds ranged from 20 to 37 mph between 7 a.m. and midnight on May 2, 2002. West-southwest winds in Walla Walla

Figure 1. Wind Speed & Wind Direction, May 1-2, 2002, Wallula, Washington



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ranged from 22 to 28 mph from 1 p.m. to 5 p.m. on the same date. The interested reader is referred to the documentation for more detail.

2.3. Precipitation Prior to May 2, 2002: The following discussion is adapted from *Documentation of a Natural Event Due to High Winds, May 02, 2002. Wallula, Washington* (April 2003).

Conditions were dry prior to the high winds of May 2, 2002. Table 2 summarizes precipitation data from several meteorological sites in south-central Washington and neighboring Oregon. These sites are operated by the National Weather Service (Walla Walla and Pendleton), Washington State University's (WSU's) Public Agricultural Weather System (PAWS) (McNary, R.Eby, Finley, College Place and Touchet) and the United States Bureau of Reclamation's (USBR's) AGRIMET system (Hermiston and Echo). The sites, which are generally located to the south, southwest and west of Wallula and Walla Walla, were selected on the basis of the west-southwest, southwest, south-southwest and south winds observed on May 2, 2002 in Wallula and Walla Walla. All sites are greater lie within 30 miles of Wallula. A map showing the location of the sites is found in Appendix A.

Eight of the ten stations reported no precipitation 72 hours prior to the natural event. Three stations reported no precipitation four days prior to the natural event. McNary and Echo report no precipitation 17 days prior to the natural event.

Table 2. Precipitation Prior to a Natural Event Due to High Winds, May 2, 2002

STATION	PRECIPITATION 72 hrs. prior to May 2, 2002	DATE	DAYS prior to May 2, 2002, with no precipitation
Pendleton, OR	0.01	4-29-2002	2
Hermiston, OR (HRMO)	0.0	NA	3
Hermiston, OR (HERO)	0.0	NA	10
Echo, OR (ECHO)	0.0	NA	17
Walla Walla	0.0	NA	3
McNary	0.0	NA	17
R.Eby	0.0	NA	4
Finley	0.0	NA	4
College Place	0.0	NA	4
Touchet	0.95	5-02-2002	NA

While Touchet reported precipitation on May 2, 2002, the data show high winds preceded the precipitation. Fifteen-minute wind speed, wind direction and precipitation data show the first measured precipitation occurred at 8 a.m. From midnight to 8 a.m. the average wind speed was 19 mph, with a 15-minute high of 23 mph.

Further, no precipitation was reported at Touchet on April 28, 29, 30 or May 1. The data do show 0.25 inch of precipitation on April 27, 2002. This means that no precipitation was recorded at Touchet for at least 96 hours prior to May 02, 2002.

2.4. Comparison of Average January – April Precipitation for the Area to Precipitation in 2002:
The following discussion is adapted from *Documentation of a Natural Event Due to High Winds, May 02, 2002. Wallula, Washington* (April 2003).

In order to further assess the general dryness of soils in the area prior to the high winds, Table 3 compares average precipitation for January – April with January – April precipitation in 2002. The PAWS network reports both average precipitation and the current year's data. A similar comparison for Hermiston and Echo, Oregon requires first a period of record report from the Western Regional Climate Center and second accumulated precipitation reported by the USBR's Hermiston and Echo AGRIMET stations.

Table 3. Comparison of Average January–April 2002 Precipitation with 2002 Precipitation

STATION	AVERAGE PRECIPITATION January – April (in.)	2002 PRECIPITATION January – April (in.)	PERCENT OF AVERAGE
College Place	5.8	3.41	59
R.Eby	3.6	2.45	68
McNary	4.0	1.65	41
Touchet	3.5	1.82	53
Finley	NA	NA	NA
Hermiston, OR (HRMO)	3.61	2.10	58
Echo, OR (ECHO)	3.97	2.21	56

All sites report below average precipitation for January - April 2002, when compared with the historical record. Conditions for the area generally range from less than 50 percent of average (McNary) to about 70 percent of average (R.Eby).

Findings

The meteorological data from Boise's meteorological station collocated with the Wallula FRM PM_{10} monitor show that May 2, 2002 was characterized by windy conditions. Winds generally from the southwest and south-southwest exceeded 20 mph from 1 a.m. through 10 p.m. on May 2, 2002. Ecology's definition for a high wind event only requires winds of 18 mph or more for a two-hour period. Windy conditions were also present in Pendleton, Oregon and Walla Walla, Washington.

Conditions were dry. Much of the area lying upwind of Wallula with respect to the predominant wind directions on May 2, 2002 had received no precipitation for 96 or more hours prior to that date. Moreover, April through June precipitation in 2002 at weather stations to the south and west of the Wallula PM_{10} monitoring site was generally between 50 and 60 percent of average precipitation for the four-month period.

Ecology found that BACM was implemented on agricultural fields in Benton and Walla Walla counties. BACM implementation is discussed in *Documentation of a Natural Event Due to High Winds, May 02, 2002, Walla Walla, Washington* (Ecology publication 03-02-006, April 2003).

Under the dry conditions so common in this area the windy conditions are likely to have raised the dust that led to the measured elevated PM_{10} concentrations at Wallula. Similar to the previously documented high wind natural event at Walla Walla, Washington on May 2, 2002, the monitored PM_{10} concentration of 134 $\mu g/m^3$ at Wallula, Washington, on May 2, 2002 is reasonably attributed to a natural event due to high winds.

Appendix A

Locations of PM_{10} Monitoring Sites and Meteorological Stations

- Map of Particulate Matter (PM_{10}) monitoring sites and meteorological stations in Benton Franklin and Walla Walla counties, Washington and adjoining Oregon, 2002

- Map of the Wallula PM_{10} Nonattainment Area

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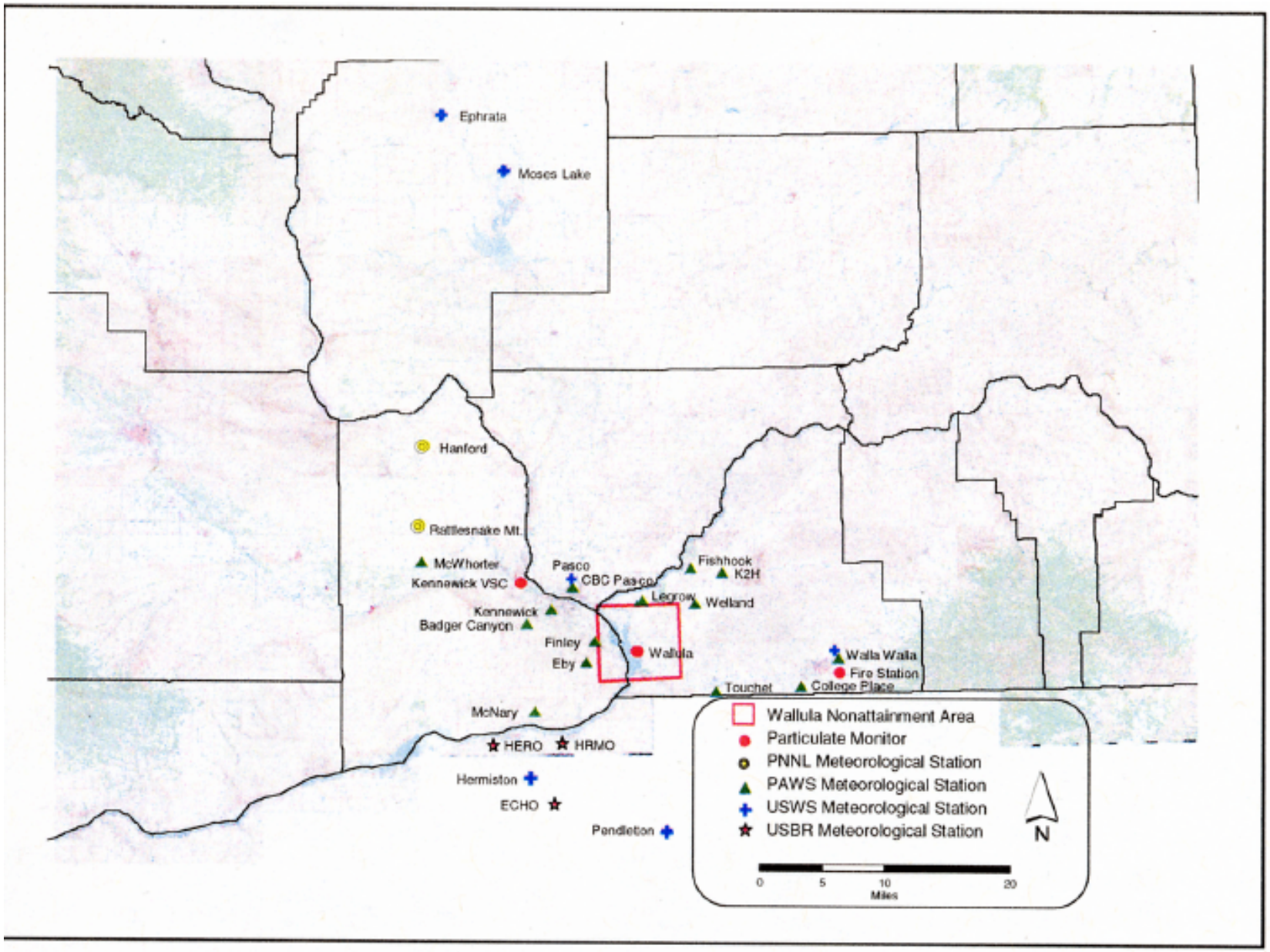

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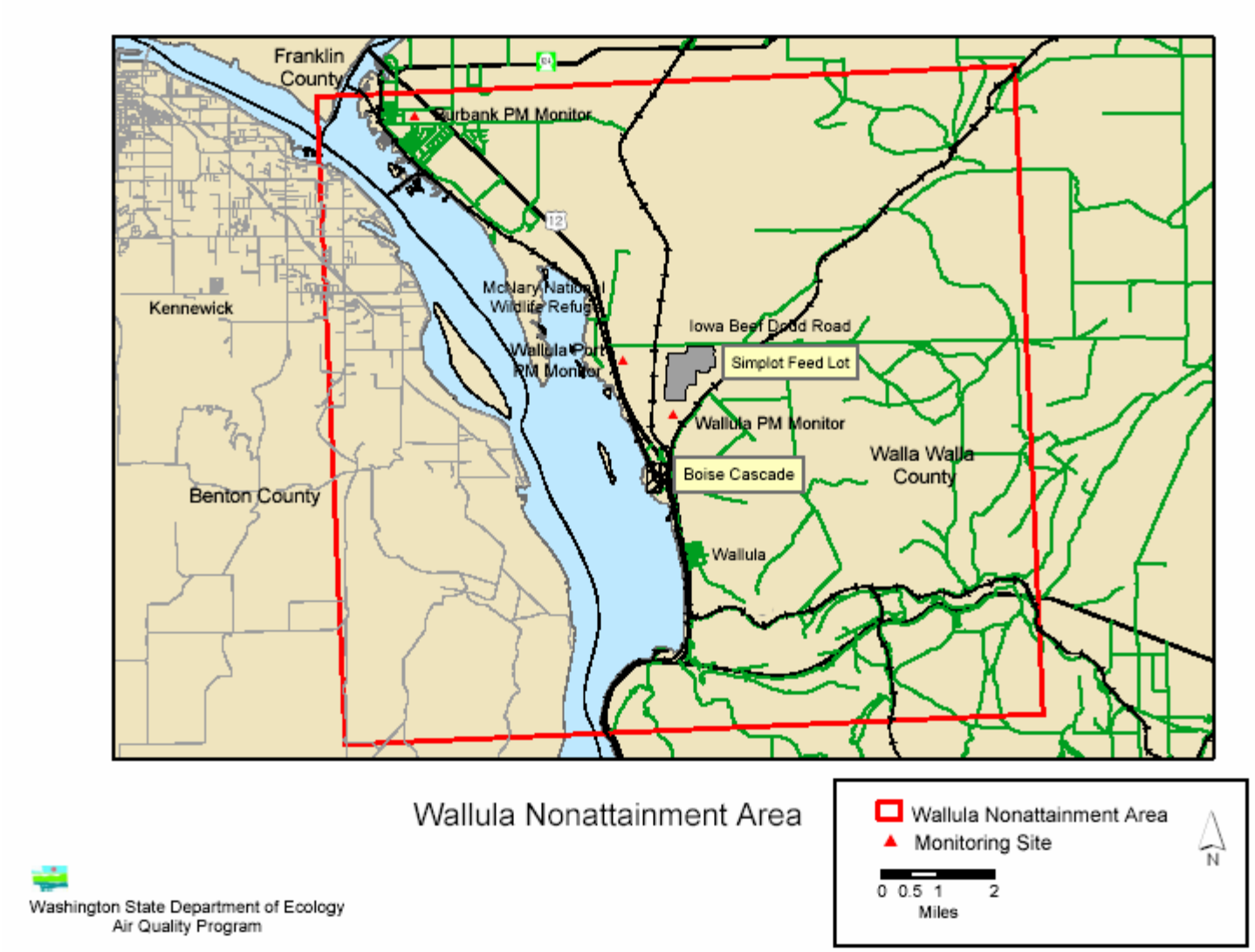

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Appendix B

2002 PM_{10} Monitoring Data
Wallula, Washington

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Natural Event of May 2, 2002

Annual Parameter Report

Reporting Year: 2002

Time of Report: 09/15/04 08:38

STATION: WALLULA

SITE: 0711001 AIRS : Parameter Code: 81102 Method Code: 063 Units Code: 001 Decimal Positioner: 0

Parameter: PM10 SAROAD: Parameter Code: 81102 Method Code: 63 Units Code: 01 Units:

Day	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MAX	MEAN	NO
1		10				21	47	71							
2	8			61	134										
3			11												
4											52	17			
5									33	21					
6															
7		7				15	50	28							
8				49	18										
9	12														
10											10				
11									52	28		12			
12								42							
13						25	63								
14	13			28	16										
15															
16										50	28	8			
17									18						
18								35							
19			51			26	35								
20	19			29	25										
21			17												
22											19	16			
23									83	32					
24								56							
25						34	64								
26	6			12											
27			44												
28											26	9			
29									197	21					
30								43							
31															
AVG	12	8	31	36	48	24	52	46	77	30	27	12		34	
MAX	19	10	51	61	134	34	64	71	197	50	52	17	197		
DAYS	5	2	4	5	4	5	5	6	5	5	5	5			56

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Appendix C

May 1-2, 2002 Meteorological Data Wallula, Washington

Courtesy of Boise Paper Solutions—Wallula Mill

Addendum for Wallula, Washington
Natural Event of May 2, 2002

Time Day-month-year Hour : min. : sec.	Speed MPH	Wind Dir. Degrees	Wind Dir. Compass	Temp Deg. F	Solar Radiation
01-May-02 20:00:00	3.8	**127**	**SE**	**68.7**	5
01-May-02 20:05:00	4.0	**127**	**SE**	**68.5**	3
01-May-02 20:10:00	4.2	**123**	**SE**	**68.2**	2
01-May-02 20:15:00	5.0	**119**	**ESE**	**67.8**	2
01-May-02 20:20:00	5.5	**117**	**ESE**	**67.5**	2
01-May-02 20:25:00	5.9	**114**	**ESE**	**67.1**	1
01-May-02 20:30:00	6.2	**114**	**ESE**	**66.6**	1
01-May-02 20:35:00	6.3	**114**	**ESE**	**65.9**	1
01-May-02 20:40:00	6.3	**112**	**ESE**	**65.5**	1
01-May-02 20:45:00	6.4	**114**	**ESE**	**65.0**	1
01-May-02 20:50:00	7.2	**118**	**ESE**	**64.7**	1
01-May-02 20:55:00	8.0	**122**	**ESE**	**64.7**	1
01-May-02 21:00:00	8.4	**123**	**ESE**	**64.6**	1
01-May-02 21:05:00	8.7	**122**	**ESE**	**64.6**	1
01-May-02 21:10:00	8.8	**121**	**ESE**	**64.5**	1
01-May-02 21:15:00	9.0	**121**	**ESE**	**64.5**	1
01-May-02 21:20:00	8.2	**119**	**ESE**	**64.4**	1
01-May-02 21:25:00	7.3	**114**	**ESE**	**64.1**	1
01-May-02 21:30:00	6.6	**109**	**ESE**	**63.3**	1
01-May-02 21:35:00	6.1	**110**	**ESE**	**62.7**	1
01-May-02 21:40:00	6.3	**112**	**ESE**	**62.6**	1
01-May-02 21:45:00	7.1	**115**	**ESE**	**62.5**	1
01-May-02 21:50:00	8.7	**118**	**ESE**	**62.4**	1
01-May-02 21:55:00	9.5	**116**	**ESE**	**62.6**	1
01-May-02 22:00:00	8.7	**120**	**ESE**	**62.6**	1
01-May-02 22:05:00	8.1	**138**	**ESE**	**62.6**	1
01-May-02 22:10:00	8.3	**148**	**SE**	**63.2**	1
01-May-02 22:15:00	8.9	**152**	**SSE**	**63.5**	1
01-May-02 22:20:00	9.7	**162**	**SSE**	**63.5**	1
01-May-02 22:25:00	10.7	**166**	**SSE**	**63.9**	1
01-May-02 22:30:00	12.4	**167**	**SSE**	**63.8**	1
01-May-02 22:35:00	13.8	**170**	**SSE**	**63.5**	1
01-May-02 22:40:00	13.8	**172**	**S**	**63.3**	1
01-May-02 22:45:00	13.9	**174**	**S**	**62.9**	1
01-May-02 22:50:00	13.3	**175**	**S**	**62.4**	1
01-May-02 22:55:00	11.6	**178**	**S**	**62.0**	1
01-May-02 23:00:00	12.8	**183**	**S**	**61.9**	1
01-May-02 23:05:00	13.8	**184**	**S**	**61.8**	1
01-May-02 23:10:00	15.3	**184**	**S**	**61.5**	1
01-May-02 23:15:00	17.3	**184**	**S**	**61.2**	1
01-May-02 23:20:00	18.9	**185**	**S**	**61.1**	1
01-May-02 23:25:00	19.9	**188**	**S**	**61.1**	1
01-May-02 23:30:00	20.1	**189**	**S**	**61.1**	1
01-May-02 23:35:00	18.7	**196**	**S**	**61.0**	1
01-May-02 23:40:00	17.3	**206**	**SSW**	**61.0**	1
01-May-02 23:45:00	15.8	**213**	**SSW**	**60.7**	1
01-May-02 23:50:00	12.7	**220**	**SW**	**60.0**	1
01-May-02 23:55:00	12.4	**217**	**SW**	**59.5**	1
02-May-02 00:00:00	14.0	**210**	**SW**	**59.4**	1
02-May-02 00:05:00	13.6	**202**	**SSW**	**59.5**	1

Time Day-month-year Hour : min. : sec.	Speed MPH	Wind Dir. Degrees	Wind Dir. Compass	Temp Deg. F	Solar Radiation
02-May-02 00:10:00	11.9	**194**	**SSW**	**59.3**	1
02-May-02 00:15:00	11.4	**193**	**S**	**59.0**	1
02-May-02 00:20:00	13.1	**196**	**SSW**	**58.9**	1
02-May-02 00:25:00	13.3	**199**	**SSW**	**58.7**	1
02-May-02 00:30:00	14.3	**201**	**SSW**	**58.6**	1
02-May-02 00:35:00	17.9	**200**	**SSW**	**58.4**	1
02-May-02 00:40:00	20.4	**198**	**SSW**	**58.3**	1
02-May-02 00:45:00	21.2	**197**	**SSW**	**58.0**	1
02-May-02 00:50:00	21.8	**199**	**SSW**	**57.6**	1
02-May-02 00:55:00	21.8	**202**	**SSW**	**57.2**	1
02-May-02 01:00:00	22.4	**204**	**SSW**	**56.8**	1
02-May-02 01:05:00	24.2	**203**	**SSW**	**56.5**	1
02-May-02 01:10:00	26.0	**202**	**SSW**	**56.4**	1
02-May-02 01:15:00	25.9	**201**	**SSW**	**56.3**	1
02-May-02 01:20:00	25.7	**199**	**SSW**	**56.1**	1
02-May-02 01:25:00	25.4	**199**	**SSW**	**56.0**	1
02-May-02 01:30:00	25.4	**199**	**SSW**	**55.8**	1
02-May-02 01:35:00	24.2	**198**	**SSW**	**55.6**	1
02-May-02 01:40:00	23.9	**197**	**SSW**	**55.5**	1
02-May-02 01:45:00	24.0	**197**	**SSW**	**55.3**	1
02-May-02 01:50:00	22.4	**196**	**SSW**	**55.2**	1
02-May-02 01:55:00	22.5	**196**	**SSW**	**55.1**	1
02-May-02 02:00:00	21.2	**196**	**SSW**	**55.0**	1
02-May-02 02:05:00	19.0	**195**	**SSW**	**54.9**	1
02-May-02 02:10:00	19.0	**195**	**SSW**	**54.8**	1
02-May-02 02:15:00	19.0	**195**	**SSW**	**54.7**	1
02-May-02 02:20:00	19.0	**191**	**SSW**	**54.8**	1
02-May-02 02:25:00	18.7	**190**	**S**	**54.8**	1
02-May-02 02:30:00	18.8	**194**	**S**	**55.0**	1
02-May-02 02:35:00	20.0	**193**	**SSW**	**55.2**	1
02-May-02 02:40:00	19.8	**189**	**S**	**55.2**	1
02-May-02 02:45:00	19.8	**189**	**S**	**55.1**	1
02-May-02 02:50:00	20.1	**190**	**S**	**55.0**	1
02-May-02 02:55:00	20.2	**189**	**S**	**54.8**	1
02-May-02 03:00:00	20.5	**186**	**S**	**54.8**	1
02-May-02 03:05:00	21.1	**185**	**S**	**54.8**	1
02-May-02 03:10:00	21.8	**184**	**S**	**54.8**	1
02-May-02 03:15:00	21.0	**185**	**S**	**54.8**	1
02-May-02 03:20:00	20.8	**186**	**S**	**54.8**	1
02-May-02 03:25:00	21.0	**187**	**S**	**54.8**	1
02-May-02 03:30:00	21.2	**187**	**S**	**54.8**	1
02-May-02 03:35:00	20.9	**186**	**S**	**54.8**	1
02-May-02 03:40:00	21.4	**187**	**S**	**54.8**	1
02-May-02 03:45:00	22.0	**186**	**S**	**54.8**	1
02-May-02 03:50:00	21.7	**187**	**S**	**54.8**	1
02-May-02 03:55:00	21.3	**188**	**S**	**54.8**	1
02-May-02 04:00:00	21.3	**189**	**S**	**54.8**	1
02-May-02 04:05:00	21.2	**188**	**S**	**54.8**	1
02-May-02 04:10:00	21.3	**187**	**S**	**54.8**	1
02-May-02 04:15:00	21.6	**188**	**S**	**54.8**	1
02-May-02 04:20:00	21.8	**188**	**S**	**54.8**	1

Time Day-month-year Hour : min. : sec.	Speed MPH	Wind Dir. Degrees	Wind Dir. Compass	Temp Deg. F	Solar Radiation
02-May-02 04:25:00	21.2	**190**	**S**	**54.8**	1
02-May-02 04:30:00	20.6	**192**	**SSW**	**54.7**	1
02-May-02 04:35:00	20.5	**196**	**SSW**	**54.7**	1
02-May-02 04:40:00	19.8	**199**	**SSW**	**54.7**	1
02-May-02 04:45:00	22.2	**201**	**SSW**	**54.7**	1
02-May-02 04:50:00	26.2	**203**	**SSW**	**54.7**	1
02-May-02 04:55:00	26.3	**201**	**SSW**	**54.7**	1
02-May-02 05:00:00	24.5	**197**	**SSW**	**54.7**	1
02-May-02 05:05:00	24.2	**198**	**SSW**	**54.7**	1
02-May-02 05:10:00	24.9	**200**	**SSW**	**54.7**	1
02-May-02 05:15:00	26.0	**201**	**SSW**	**54.6**	1
02-May-02 05:20:00	27.7	**201**	**SSW**	**54.6**	1
02-May-02 05:25:00	28.0	**201**	**SSW**	**54.6**	1
02-May-02 05:30:00	27.4	**201**	**SSW**	**54.6**	1
02-May-02 05:35:00	25.8	**201**	**SSW**	**54.6**	1
02-May-02 05:40:00	25.1	**201**	**SSW**	**54.6**	2
02-May-02 05:45:00	24.7	**201**	**SSW**	**54.7**	4
02-May-02 05:50:00	24.7	**203**	**SSW**	**54.7**	7
02-May-02 05:55:00	24.9	**203**	**SSW**	**54.7**	11
02-May-02 06:00:00	25.1	**202**	**SSW**	**54.7**	18
02-May-02 06:05:00	24.8	**201**	**SSW**	**54.7**	26
02-May-02 06:10:00	26.3	**202**	**SSW**	**54.7**	35
02-May-02 06:15:00	26.3	**203**	**SSW**	**54.8**	45
02-May-02 06:20:00	25.4	**203**	**SSW**	**54.9**	57
02-May-02 06:25:00	25.8	**203**	**SSW**	**54.9**	70
02-May-02 06:30:00	25.9	**203**	**SSW**	**55.0**	82
02-May-02 06:35:00	25.7	**203**	**SSW**	**55.2**	96
02-May-02 06:40:00	25.2	**203**	**SSW**	**55.3**	110
02-May-02 06:45:00	25.0	**203**	**SSW**	**55.4**	125
02-May-02 06:50:00	24.4	**202**	**SSW**	**55.4**	140
02-May-02 06:55:00	24.6	**202**	**SSW**	**55.4**	155
02-May-02 07:00:00	24.5	**202**	**SSW**	**55.4**	169
02-May-02 07:05:00	24.4	**203**	**SSW**	**55.4**	185
02-May-02 07:10:00	24.4	**202**	**SSW**	**55.5**	201
02-May-02 07:15:00	23.7	**203**	**SSW**	**55.5**	213
02-May-02 07:20:00	24.8	**202**	**SSW**	**55.7**	223
02-May-02 07:25:00	23.8	**203**	**SSW**	**55.9**	240
02-May-02 07:30:00	22.5	**204**	**SSW**	**56.1**	258
02-May-02 07:35:00	23.1	**204**	**SSW**	**56.2**	272
02-May-02 07:40:00	24.0	**204**	**SSW**	**56.3**	285
02-may-02 07:45:00	23.7	**204**	**SSW**	**56.4**	300
02-May-02 07:50:00	23.0	**203**	**SSW**	**56.7**	317
02-May-02 07:55:00	23.5	**203**	**SSW**	**56.9**	333
02-May-02 08:00:00	23.5	**203**	**SSW**	**57.1**	348
02-May-02 08:05:00	24.1	**203**	**SSW**	**57.4**	364
02-May-02 08:10:00	24.0	**204**	**SSW**	**57.8**	379
02-May-02 08:15:00	23.9	**206**	**SSW**	**58.2**	395
02-May-02 08:20:00	24.3	**208**	**SSW**	**58.6**	409
02-May-02 08:25:00	26.4	**211**	**SSW**	**59.1**	424
02-May-02 08:30:00	27.0	**210**	**SSW**	**59.3**	440
02-May-02 08:35:00	28.3	**210**	**SSW**	**59.5**	458

Time Day-month-year Hour : min. : sec.	Speed MPH	Wind Dir. Degrees	Wind Dir. Compass	Temp Deg. F	Solar Radiation
02-May-02 08:40:00	30.3	**211**	**SSW**	**59.6**	474
02-May-02 08:45:00	30.0	**212**	**SSW**	**59.8**	490
02-May-02 08:50:00	29.0	**210**	**SSW**	**59.9**	505
02-May-02 08:55:00	28.1	**206**	**SSW**	**60.1**	518
02-May-02 09:00:00	27.3	**205**	**SSW**	**60.3**	532
02-May-02 09:05:00	26.7	**206**	**SSW**	**60.6**	546
02-May-02 09:10:00	26.9	**209**	**SSW**	**61.0**	556
02-May-02 09:15:00	26.9	**209**	**SSW**	**61.5**	561
02-May-02 09:20:00	26.4	**210**	**SSW**	**62.0**	557
02-May-02 09:25:00	26.3	**210**	**SSW**	**62.2**	554
02-May-02 09:30:00	24.3	**209**	**SSW**	**62.4**	576
02-May-02 09:35:00	24.5	**208**	**SSW**	**62.6**	607
02-May-02 09:40:00	24.9	**209**	**SSW**	**62.9**	629
02-May-02 09:45:00	25.1	**210**	**SSW**	**63.2**	645
02-May-02 09:50:00	26.2	**210**	**SSW**	**63.6**	631
02-May-02 09:55:00	25.9	**212**	**SSW**	**63.7**	592
02-May-02 10:00:00	26.0	**214**	**SSW**	**63.7**	587
02-May-02 10:05:00	27.9	**217**	**SW**	**63.8**	618
02-May-02 10:10:00	28.0	**221**	**SW**	**63.8**	662
02-May-02 10:15:00	27.3	**220**	**SW**	**63.9**	691
02-May-02 10:20:00	27.2	**219**	**SW**	**64.1**	704
02-May-02 10:25:00	27.9	**219**	**SW**	**64.4**	714
02-May-02 10:30:00	27.3	**218**	**SW**	**64.5**	717
02-May-02 10:35:00	26.2	**213**	**SW**	**64.7**	724
02-May-02 10:40:00	26.0	**213**	**SSW**	**64.9**	735
02-May-02 10:45:00	27.0	**215**	**SW**	**65.3**	743
02-May-02 10:50:00	27.5	**216**	**SW**	**65.6**	759
02-May-02 10:55:00	27.1	**219**	**SW**	**65.8**	775
02-May-02 11:00:00	26.0	**220**	**SW**	**65.9**	783
02-May-02 11:05:00	24.7	**217**	**SW**	**65.8**	792
02-May-02 11:10:00	24.7	**214**	**SW**	**66.0**	804
02-May-02 11:15:00	25.8	**213**	**SW**	**66.4**	813
02-May-02 11:20:00	25.7	**212**	**SSW**	**66.6**	820
02-May-02 11:25:00	24.7	**210**	**SSW**	**66.8**	826
02-May-02 11:30:00	23.4	**209**	**SSW**	**67.1**	835
02-May-02 11:35:00	22.3	**208**	**SSW**	**67.3**	841
02-May-02 11:40:00	24.1	**207**	**SSW**	**67.5**	839
02-May-02 11:45:00	25.7	**211**	**SSW**	**67.8**	840
02-May-02 11:50:00	24.1	**215**	**SSW**	**67.9**	813
02-May-02 11:55:00	23.8	**216**	**SW**	**67.9**	800
02-May-02 12:00:00	24.0	**216**	**SW**	**68.0**	835
02-May-02 12:05:00	23.5	**218**	**SW**	**68.1**	858
02-May-02 12:10:00	23.0	**220**	**SW**	**68.3**	864
02-May-02 12:15:00	22.4	**223**	**SW**	**68.4**	869
02-May-02 12:20:00	22.6	**224**	**SW**	**68.7**	875
02-May-02 12:25:00	22.6	**225**	**SW**	**69.0**	875
02-May-02 12:30:00	23.2	**224**	**SW**	**69.3**	876
02-May-02 12:35:00	23.5	**220**	**SW**	**69.5**	876
02-May-02 12:40:00	23.6	**217**	**SW**	**69.7**	870
02-May-02 12:45:00	23.9	**214**	**SW**	**69.9**	869
02-May-02 12:50:00	24.4	**212**	**SSW**	**70.1**	878

Time Day-month-year Hour : min. : sec.	Speed MPH	Wind Dir. Degrees	Wind Dir. Compass	Temp Deg. F	Solar Radiation
02-May-02 12:55:00	24.8	**212**	**SSW**	**70.3**	858
02-May-02 13:00:00	25.0	**214**	**SSW**	**70.4**	834
02-May-02 13:05:00	25.1	**213**	**SW**	**70.4**	796
02-May-02 13:10:00	25.2	**209**	**SSW**	**70.3**	797
02-May-02 13:15:00	25.1	**209**	**SSW**	**70.5**	843
02-May-02 13:20:00	25.1	**209**	**SSW**	**70.7**	885
02-May-02 13:25:00	24.9	**210**	**SSW**	**70.9**	816
02-May-02 13:30:00	24.2	**212**	**SSW**	**70.6**	729
02-May-02 13:35:00	24.8	**216**	**SSW**	**70.4**	655
02-May-02 13:40:00	25.4	**219**	**SW**	**70.3**	657
02-May-02 13:45:00	25.7	**222**	**SW**	**70.2**	634
02-May-02 13:50:00	25.9	**219**	**SW**	**70.1**	580
02-May-02 13:55:00	25.5	**216**	**SW**	**69.8**	597
02-May-02 14:00:00	26.5	**215**	**SW**	**70.1**	731
02-May-02 14:05:00	26.8	**214**	**SW**	**70.6**	801
02-May-02 14:10:00	25.4	**213**	**SW**	**70.8**	801
02-May-02 14:15:00	24.5	**212**	**SSW**	**70.9**	810
02-May-02 14:20:00	25.0	**216**	**SSW**	**71.3**	801
02-May-02 14:25:00	25.4	**223**	**SW**	**71.8**	793
02-May-02 14:30:00	25.8	**225**	**SW**	**72.1**	797
02-May-02 14:35:00	25.4	**226**	**SW**	**72.2**	790
02-May-02 14:40:00	25.6	**224**	**SW**	**72.3**	780
02-May-02 14:45:00	25.5	**224**	**SW**	**72.3**	770
02-May-02 14:50:00	25.8	**223**	**SW**	**72.3**	760
02-May-02 14:55:00	26.1	**223**	**SW**	**72.3**	750
02-May-02 15:00:00	25.6	**223**	**SW**	**72.3**	737
02-May-02 15:05:00	25.1	**222**	**SW**	**72.1**	726
02-May-02 15:10:00	23.9	**223**	**SW**	**71.8**	718
02-May-02 15:15:00	23.8	**226**	**SW**	**71.9**	705
02-May-02 15:20:00	24.5	**228**	**SW**	**72.2**	696
02-May-02 15:25:00	24.7	**230**	**SW**	**72.4**	685
02-May-02 15:30:00	25.4	**232**	**SW**	**72.4**	680
02-May-02 15:35:00	26.3	**231**	**SW**	**72.6**	676
02-May-02 15:40:00	27.5	**227**	**SW**	**72.5**	667
02-May-02 15:45:00	28.8	**226**	**SW**	**72.4**	652
02-May-02 15:50:00	29.9	**226**	**SW**	**72.2**	615
02-May-02 15:55:00	28.6	**227**	**SW**	**72.0**	605
02-May-02 16:00:00	28.9	**225**	**SW**	**71.8**	604
02-May-02 16:05:00	30.2	**228**	**SW**	**71.7**	593
02-May-02 16:10:00	28.4	**228**	**SW**	**71.5**	580
02-May-02 16:15:00	28.4	**227**	**SW**	**71.3**	576
02-May-02 16:20:00	29.9	**227**	**SW**	**71.0**	564
02-May-02 16:25:00	28.6	**228**	**SW**	**70.7**	538
02-May-02 16:30:00	26.9	**229**	**SW**	**70.5**	526
02-May-02 16:35:00	26.9	**230**	**SW**	**70.4**	513
02-May-02 16:40:00	28.4	**231**	**SW**	**70.2**	499
02-May-02 16:45:00	29.4	**233**	**SW**	**70.1**	487
02-May-02 16:50:00	28.8	**232**	**SW**	**69.9**	470
02-May-02 16:55:00	28.9	**229**	**SW**	**69.6**	372
02-May-02 17:00:00	29.7	**228**	**SW**	**69.1**	347
02-May-02 17:05:00	29.7	**230**	**SW**	**68.9**	366

Time Day-month-year Hour : min. : sec.	Speed MPH	Wind Dir. Degrees	Wind Dir. Compass	Temp Deg. F	Solar Radiation
02-May-02 17:10:00	29.7	**230**	**SW**	**68.9**	362
02-May-02 17:15:00	30.2	**230**	**SW**	**68.8**	371
02-May-02 17:20:00	28.7	**232**	**SW**	**68.7**	363
02-May-02 17:25:00	29.5	**237**	**SW**	**68.7**	341
02-May-02 17:30:00	30.3	**238**	**WSW**	**68.5**	332
02-May-02 17:35:00	29.2	**233**	**WSW**	**68.5**	331
02-May-02 17:40:00	28.9	**227**	**SW**	**68.4**	322
02-May-02 17:45:00	25.9	**226**	**SW**	**68.0**	310
02-May-02 17:50:00	25.6	**226**	**SW**	**67.7**	307
02-May-02 17:55:00	26.9	**226**	**SW**	**67.4**	293
02-May-02 18:00:00	26.9	**229**	**SW**	**67.2**	271
02-May-02 18:05:00	27.1	**229**	**SW**	**66.9**	249
02-May-02 18:10:00	26.9	**229**	**SW**	**67.0**	233
02-May-02 18:15:00	26.8	**230**	**SW**	**67.0**	220
02-May-02 18:20:00	27.8	**231**	**SW**	**66.9**	205
02-May-02 18:25:00	27.0	**233**	**SW**	**66.7**	186
02-May-02 18:30:00	25.7	**236**	**SW**	**66.4**	163
02-May-02 18:35:00	25.6	**237**	**WSW**	**66.1**	137
02-May-02 18:40:00	27.2	**236**	**WSW**	**65.6**	111
02-May-02 18:45:00	27.7	**237**	**SW**	**65.0**	94
02-May-02 18:50:00	28.8	**237**	**WSW**	**64.4**	93
02-May-02 18:55:00	29.8	**238**	**WSW**	**63.8**	89
02-May-02 19:00:00	30.5	**240**	**WSW**	**63.4**	87
02-May-02 19:05:00	30.1	**240**	**WSW**	**63.0**	81
02-May-02 19:10:00	29.4	**238**	**WSW**	**62.7**	62
02-May-02 19:15:00	28.3	**236**	**WSW**	**62.3**	45
02-May-02 19:20:00	27.0	**236**	**SW**	**62.0**	36
02-May-02 19:25:00	27.0	**238**	**WSW**	**61.5**	31
02-May-02 19:30:00	28.7	**242**	**WSW**	**61.1**	25
02-May-02 19:35:00	28.2	**242**	**WSW**	**60.8**	18
02-May-02 19:40:00	26.5	**239**	**WSW**	**60.4**	13
02-May-02 19:45:00	25.5	**237**	**WSW**	**60.0**	9
02-May-02 19:50:00	25.6	**236**	**SW**	**59.6**	7
02-May-02 19:55:00	25.2	**234**	**SW**	**59.3**	5
02-May-02 20:00:00	25.4	**232**	**SW**	**59.0**	3
02-May-02 20:05:00	25.2	**235**	**SW**	**58.7**	2
02-May-02 20:10:00	25.0	**234**	**WSW**	**58.4**	1
02-May-02 20:15:00	23.9	**233**	**SW**	**58.1**	1
02-May-02 20:20:00	24.9	**237**	**SW**	**57.8**	1
02-May-02 20:25:00	24.7	**238**	**WSW**	**57.6**	1
02-May-02 20:30:00	23.0	**236**	**WSW**	**57.3**	1
02-May-02 20:35:00	21.7	**234**	**SW**	**56.9**	1
02-May-02 20:40:00	21.0	**234**	**SW**	**56.6**	1
02-May-02 20:45:00	20.5	**236**	**SW**	**56.3**	1
02-May-02 20:50:00	20.1	**235**	**WSW**	**56.2**	1
02-May-02 20:55:00	19.3	**224**	**SW**	**55.9**	1
02-May-02 21:00:00	20.1	**211**	**SW**	**55.6**	1
02-May-02 21:05:00	20.8	**203**	**SSW**	**55.2**	1
02-May-02 21:10:00	21.7	**201**	**SSW**	**55.1**	1
02-May-02 21:15:00	22.4	**201**	**SSW**	**55.0**	1
02-May-02 21:20:00	22.7	**201**	**SSW**	**54.9**	1

Time Day-month-year Hour : min. : sec.	Speed MPH	Wind Dir. Degrees	Wind Dir. Compass	Temp Deg. F	Solar Radiation
02-May-02 21:25:00	22.6	**202**	**SSW**	**54.8**	1
02-May-02 21:30:00	22.5	**205**	**SSW**	**54.7**	1
02-May-02 21:35:00	21.4	**207**	**SSW**	**54.6**	1
02-May-02 21:40:00	18.8	**209**	**SSW**	**54.4**	1
02-May-02 21:45:00	17.7	**215**	**SSW**	**54.2**	1
02-May-02 21:50:00	19.0	**225**	**SW**	**54.0**	1
02-May-02 21:55:00	21.1	**230**	**SW**	**54.2**	1
02-May-02 22:00:00	20.9	**229**	**SW**	**54.3**	1
02-May-02 22:05:00	17.9	**226**	**SW**	**54.1**	1
02-May-02 22:10:00	16.8	**225**	**SW**	**53.7**	1
02-May-02 22:15:00	17.8	**226**	**SW**	**53.6**	1
02-May-02 22:20:00	18.6	**229**	**SW**	**53.6**	1
02-May-02 22:25:00	17.6	**231**	**SW**	**53.6**	1
02-May-02 22:30:00	16.9	**233**	**SW**	**53.5**	1
02-May-02 22:35:00	16.7	**231**	**SW**	**53.4**	1
02-May-02 22:40:00	17.0	**232**	**SW**	**53.3**	1
02-May-02 22:45:00	17.1	**234**	**SW**	**53.1**	1
02-May-02 22:50:00	17.4	**236**	**SW**	**53.0**	1
02-May-02 22:55:00	17.2	**234**	**SW**	**52.9**	1
02-May-02 23:00:00	17.1	**230**	**SW**	**52.8**	1
02-May-02 23:05:00	16.6	**224**	**SW**	**52.6**	1
02-May-02 23:10:00	15.7	**216**	**SW**	**52.4**	1
02-May-02 23:15:00	14.9	**210**	**SSW**	**52.1**	1
02-May-02 23:20:00	13.8	**209**	**SSW**	**52.1**	1
02-May-02 23:25:00	13.2	**205**	**SSW**	**52.3**	1
02-May-02 23:30:00	12.4	**201**	**SSW**	**52.4**	1
02-May-02 23:35:00	11.1	**201**	**SSW**	**52.5**	1
02-May-02 23:40:00	9.7	**205**	**SSW**	**52.3**	1
02-May-02 23:45:00	11.9	**215**	**SSW**	**51.9**	1
02-May-02 23:50:00	15.2	**224**	**SW**	**51.9**	1
02-May-02 23:55:00	17.4	**227**	**SW**	**51.9**	1
03-May-02 00:00:00	18.5	**226**	**SW**	**51.9**	1