

DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES DIVISION OF AIR QUALITY, TOXICS PROTECTION BRANCH

AIR TOXICS ANALYTICAL SUPPORT TEAM

WILDFIRES IN EASTERN NORTH CAROLINA DARE COUNTY (PAINS BAY FIRE), NC PENDER COUNTY (JUNIPER RD FIRE), NC

May 12 – July 31, 2011

ATAST Response # 11019

1.0 OVERVIEW

The Pains Bay Fire began on Thursday, May 5, 2011 and was caused by lightning in the Alligator River National Wildlife Refuge in Dare County, NC. On May 11, 2011, the NC Division of Air Quality was requested to provide air monitoring in two urban areas being affected by smoke from the fire. On May 12, members of ATAST and Washington regional office were dispatched to establish two air monitoring sites using the ATAST's two EBAMs (Environmental Beta Attenuation Monitors) to monitor for particles in the 2.5 micron size. These two sites were established in Washington, NC and Greenville, NC at the Washington Regional office and the Pitt County Agricultural Station, respectively. As the fire worsened and conditions necessitated, one monitor was moved from Washington, NC to Manteo, NC on May 26, 2011. The Manteo site was subsequently moved to Jacksonville, NC on June 30, 2011 in response to two fires that began in Pender and Bladen Counties in mid-June. The Juniper Road Fire (Pender County) was started by lightning on June 19, 2011 in the Holly Shelter Game Land, Juniper Road area. The Simmons Road Fire (Bladen County) had begun on June 20, 2011 due to lightning in the Live Oak community. Both fires were affecting air quality in the Jacksonville area and air monitoring was requested.

Monitoring was discontinued in Greenville and Jacksonville as of July 31 due to: 1) the fires being contained, 2) active firefighting had been discontinued, 3) minimal fire observation crews were monitoring fire behavior, 4) the conditions were not favorable to an increase in fire activity from these fires, and 5) the 24 hour running averages for PM_{2.5} concentrations had been below the reference concentration for 10 consecutive days.

2.0 MONITORING

PM_{2.5} monitoring was conducted using EBAMs that were outfitted with meteorological stations and telemetry units. The data were collected as 1 hour averages and datalogged and telemetered to the Interagency Real Time Smoke Monitoring website (<http://www.airsis.com/usfs/>). From this website, data was available in near real time.

The 1 hour data were used to calculate midnight to midnight 24 hour averages and 24 hour running averages of the PM_{2.5} concentrations. These averages were then compared to the

EPA's National Ambient Air Quality Standard (NAAQS) for PM_{2.5}, which is based on a midnight to midnight 24 hour average, of 35µg/m³.

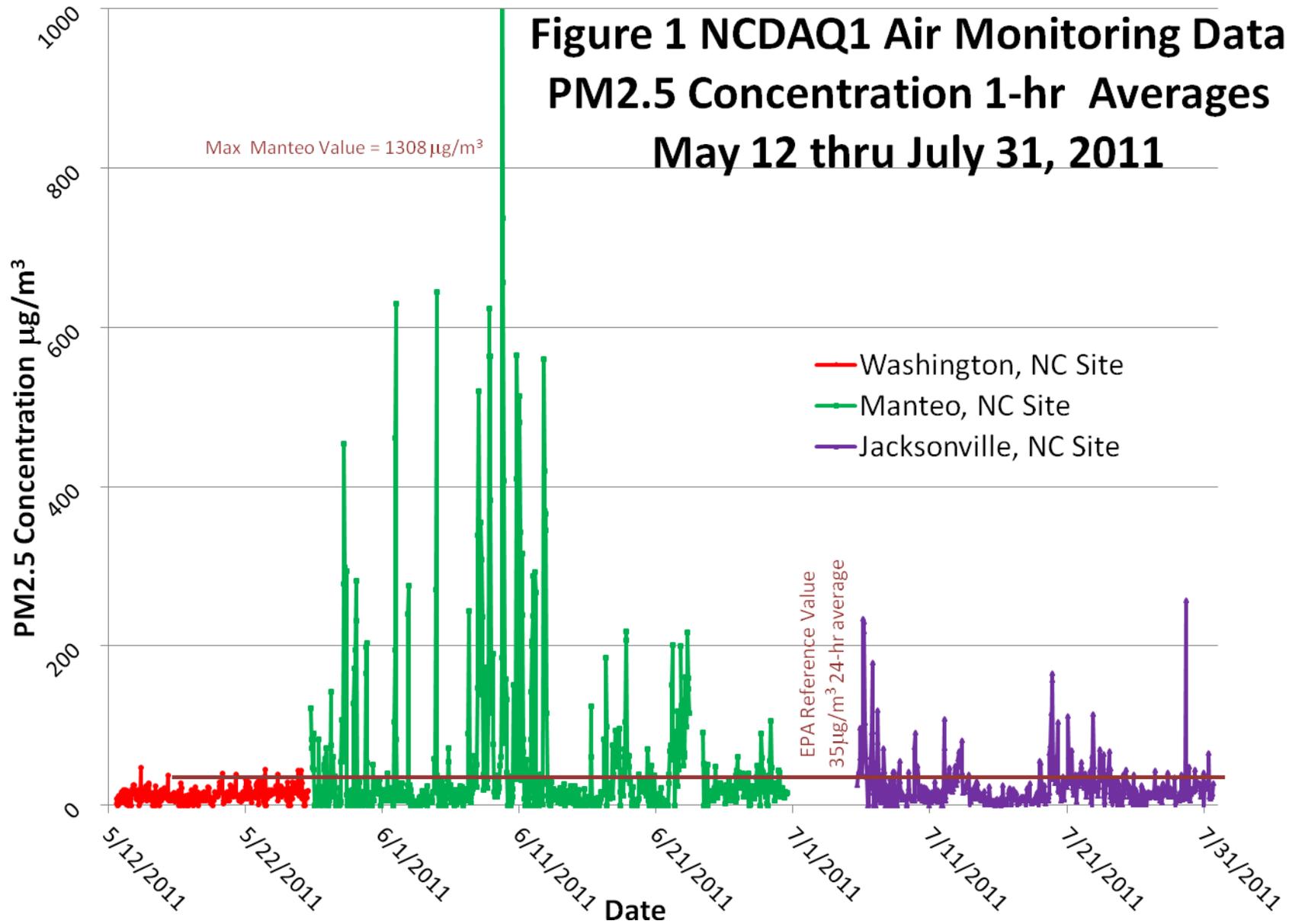
Daily reports were produced every morning, Monday through Friday and disseminated to DAQ management and meteorologists. These reports updated the operational status of the sites and to provide information on the PM_{2.5} concentrations for the previous 24 hours and the preceding 7 days. Additionally, the data from the webpage was used by DAQ meteorologist as part of their data stream to issue air quality forecasts for the next day in the areas affected by the fires.

The data set for the monitoring effort is shown in Figures 1-3 below. Figure 1 shows the PM_{2.5} concentrations for the EBAM designated as NCDAQ1 that was moved from Washington (May 12 – May 26) to Manteo (May 26 – June 30) to Jacksonville (June 31 – July 31). The gap in the data between June 30 and July 5 was due to an instrument malfunction. Figure 2 shows the PM_{2.5} concentrations for the EBAM designated as NCDAQ2 that was located in Greenville for the duration of monitoring. In these figures, the EPA reference value is shown although it should not be used to make direct comparisons in with the one hour values because it is a health based standard based on a midnight to midnight 24 hour concentration average. See Section 3.0 for a brief discussion of health implications. In both of these figures it can be seen that there were significant excursions above the EPA reference value especially in Manteo.

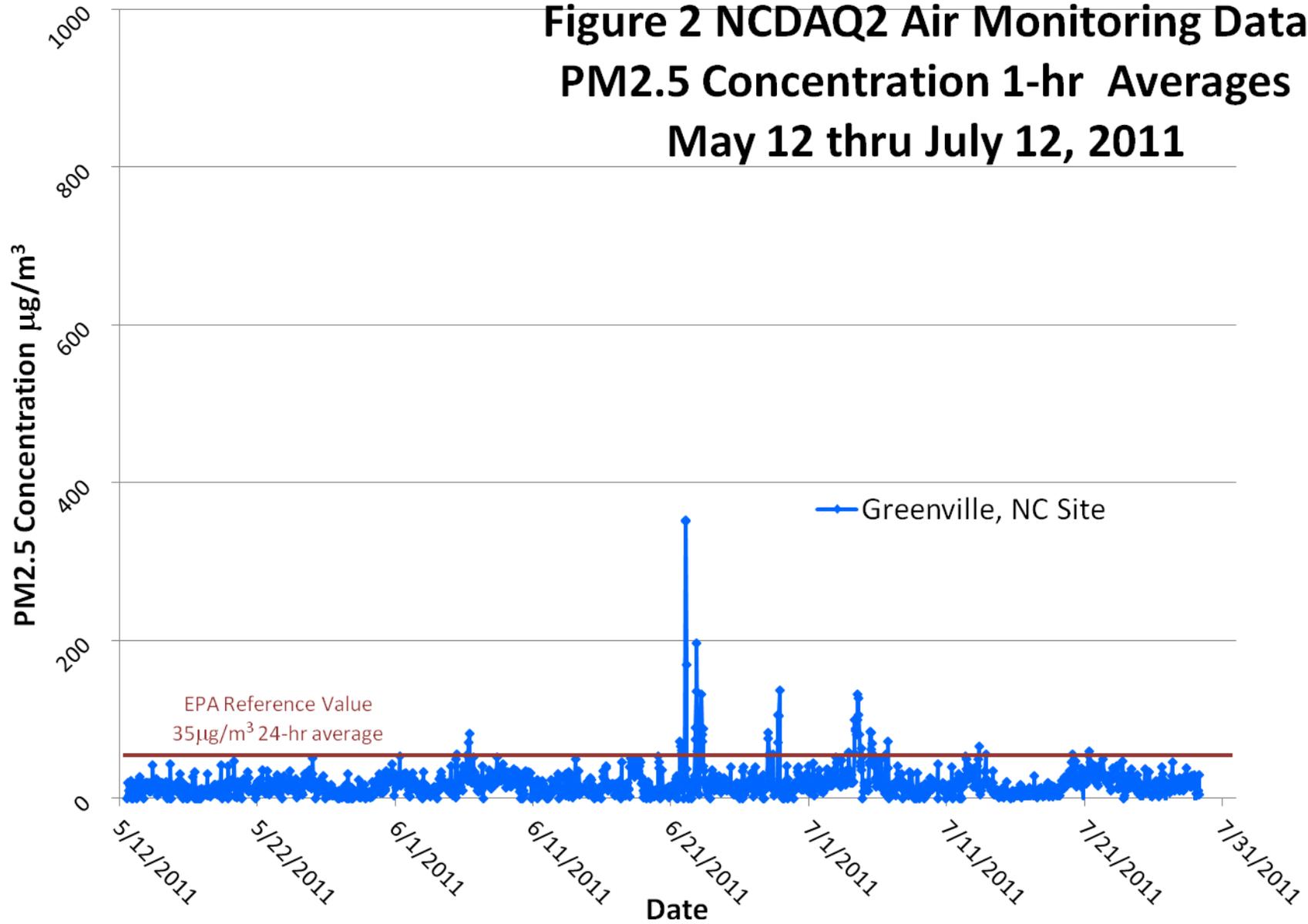
For Figures 1 and 2, it should be noted that the majority of the instances where the values were elevated the winds were predominantly from the direction of the fires or related to circulation of the smoke due to particular weather pattern.

Figure 3 shows the running 24 hour average that can be compared to the EPA NAAQS PM_{2.5}. There are a number of times that the running average as well as the directly comparable midnight to midnight averages (Table 1 Section 3.1 below) was above this value.

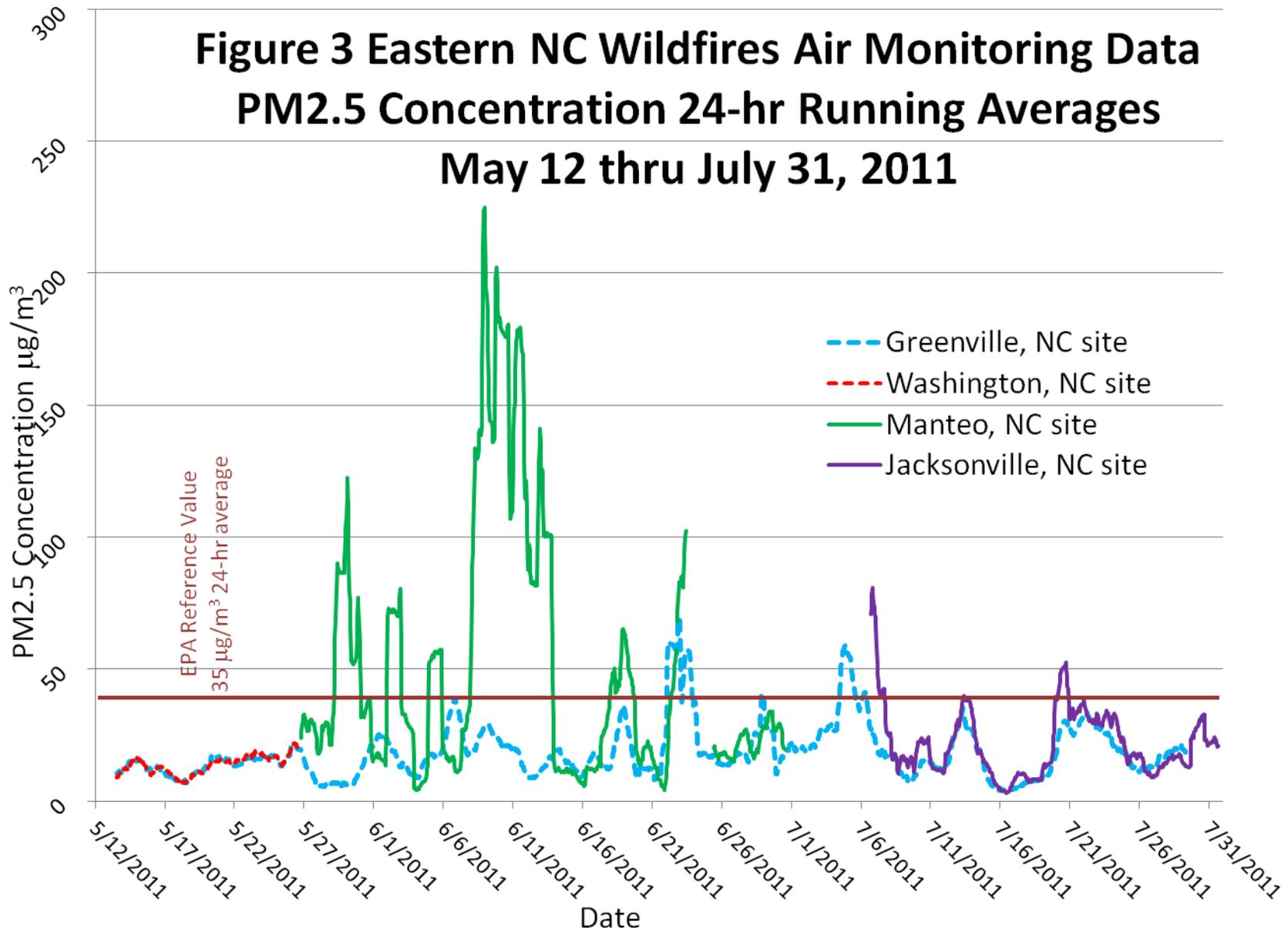
**Figure 1 NCDAQ1 Air Monitoring Data
PM2.5 Concentration 1-hr Averages
May 12 thru July 31, 2011**



**Figure 2 NCDAQ2 Air Monitoring Data
PM2.5 Concentration 1-hr Averages
May 12 thru July 12, 2011**



**Figure 3 Eastern NC Wildfires Air Monitoring Data
PM2.5 Concentration 24-hr Running Averages
May 12 thru July 31, 2011**



3.0 HEALTH IMPLICATIONS

The above section has described the data as it relates to the EPA Reference value for PM2.5 without specific regard to the health implications. This standard is however for the most part health based in nature. As such this section will discuss the particular health implications of this value used for comparison.

3.1 Reference Exposure Limits

As can be seen in Table 1, the NAAQS for PM2.5 was exceeded on several days at three sites during the monitoring effort.

Table 1: 24-hr Midnite to Midnite Averages for PM2.5

Greenville		Manteo		Jacksonville	
Date	Midnite to Midnite 24hr Avg (µg/m3)	Date	Midnite to Midnite 24hr Avg (µg/m3)	Date	Midnite to Midnite 24hr Avg (µg/m3)
6/7/2011	36.0	5/30/2011	103.1	7/7/2011	70.7
6/19/2011	35.8	5/31/2011	60.1	7/20/2011	39.3
6/23/2011	68.8	6/2/2011	69.9	7/22/2011	37.4
6/24/2011	37.0	6/3/2011	36.3		
6/29/2011	40.0	6/5/2011	52.2		
7/5/2011	56.2	6/8/2011	55.7		
7/6/2011	36.1	6/9/2011	216.0		
		6/10/2011	181.4		
		6/11/2011	126.6		
		6/12/2011	109.8		
		6/13/2011	136.1		
		6/18/2011	41.4		
		6/19/2011	63.6		
		6/23/2011	82.2		

One hour air data for PM2.5 collected by the EBAM monitors must be compared with “reference exposure levels” in order to determine the extent to which humans were potentially exposed during the incident. There are no regulations regarding acute PM exposures for time periods less than 24-hours. Reference exposure levels were therefore assessed using 24-hour standards.

EPA has established health impacts of inhalation exposures to PM2.5. Current EPA guidance states that the maximum inhaled health standard for ambient PM2.5 for an adult is 35 µg/m³ over a 24-hour time period. This health standard for PM is based on a 24-hour average (midnight to midnight) of the monitored pollutant.¹

These particles can be inhaled into the respiratory system where they accumulate. PM2.5 can lodge deeply into the lungs, and are believed to pose the largest health risks.² Health studies have shown a significant association between exposure to PM2.5 and premature mortality. Other

important effects include aggravation of respiratory and cardiovascular disease (as indicated by increased hospital admissions, emergency room visits, absences from school or work, and restricted activity days), lung disease, decreased lung function, asthma attacks, and certain cardiovascular problems such as heart attacks and cardiac arrhythmia. Individuals particularly sensitive to fine particle exposure include older adults, people with heart and lung disease, and children.

¹ <http://epa.gov/air/criteria.html>

² http://www.epa.gov/ttn/naaqs/pm/pm25_index.html