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State of New Jersey

DEPARTMENT OF ENVIRONMENTAL PROTECTION
OFFICE OF THE COMMISSIONER
P.O. Box 402
TRENTON, NEW JERSEY 08625-0402

CHRIS CHRISTIE
Governor

KIM GUADAGNO
Lt. Governor

BOB MARTIN
Commissioner

June 23, 2011

The Honorable Judith A. Enck
Regional Administrator
United States Environmental Protection Agency – Region 2
290 Broadway – 26th Floor
New York, New York 10007-1866

Dear Administrator Enck:

The purpose of this letter is to provide you with New Jersey's recommendations for sulfur dioxide (SO_2) designations for the new 1-hour 75 parts per billion (ppb) National Ambient Air Quality Standard.[1] Section 107(d)(1)(A) of the Clean Air Act provides that Governors of each state, or their designee, submit recommendations for areas to be designated attainment, nonattainment, or unclassifiable after the United States Environmental Protection Agency (USEPA) promulgates a new or revised National Ambient Air Quality Standard. On February 28, 2011, you sent Governor Chris Christie a letter advising that New Jersey make such recommendations.

New Jersey recommends the entire state be designated unclassifiable for the 1-hour sulfur dioxide National Ambient Air Quality Standard except for the areas in New Jersey identified in New Jersey's Section 126 petition to the USEPA. See Figure 1 and Table 2 in Attachment 2 of this letter. This includes all of Warren County and portions of Hunterdon, Morris, and Sussex counties. All monitoring locations for sulfur dioxide in New Jersey, with the exception of the Columbia monitor located in Warren County, New Jersey, are measuring levels below the 75 ppb 1-hour sulfur dioxide National Ambient Air Quality Standard (Attachment 1). New Jersey intends to perform the required dispersion modeling analysis as soon as practicable, and perform public outreach on the results of that analysis, to ensure that the National Ambient Air Quality Standard for 1-hour sulfur dioxide is not being exceeded at other locations within the State.

The recommended nonattainment area is identified in the New Jersey's Section 126 petition as being impacted by the emissions from the Portland Generating Station. New Jersey recommends that the New Jersey portion be part of a multi-state non-attainment area with areas in Pennsylvania. New Jersey requests that the USEPA work with Pennsylvania to determine the size of the non-attainment area in Pennsylvania based on the detailed dispersion modeling analyses performed to support New Jersey's Section 126 petition submitted to the USEPA on September

[1] 75 Fed. Reg. 35520 (June 22, 2010)

13, 2010. All modeling results from the detailed modeling analysis performed for the Section 126 petition are available at http://www.state.nj.us/dep/baqp/petition/126petition.htm. The USEPA proposed to grant New Jersey's 126 petition on April 7, 2011(see 76 Fed. Reg. 19,622). The USEPA's proposal included independent modeling analysis of this Pennsylvania power plant that supports New Jersey's 126 petition that the Portland Power Plant is causing exceedances of the 1-hour SO_2 NAAQS monitored in Columbia, New Jersey.

In developing the nonattainment recommendation, New Jersey considered all of the factors required by the USEPA guidance for designating non-attainment areas as shown in Attachment 3.

If you have any questions regarding New Jersey's recommendations, please contact Bill O'Sullivan of the Division of Air Quality, at (609) 984-6721.

Sincerely yours,

Bob Martin
Commissioner

Attachments

c: Ray Werner, USEPA Region 2
Richard Ruvo, USEPA Region 2
John Renella, New Jersey DAG

Attachment 1
Sulfur Dioxide (SO2) Data from New Jersey Monitors

Table 1
The 99th Percentile of the Maximum Daily 1-Hour SO_2 Concentrations from All Monitors in New Jersey

Site	2008	2009	2010	3-year Average
Columbia			183*	183*
Elizabeth Trailer	41	34	30	35
Bayonne	29	33	26	29
Chester	26	29	26	27
Jersey City	28	22	19	23
Elizabeth	20	22	11	18
Hackensack	17	17	9	14
Burlington**	25	26		
Camden***	31			

* Last Quarter of 2010 Data Only
** Site Discontinued
*** Site Not Operational

Attachment 2:
Recommended Non-attainment Area for the SO_2 NAAQS

Figure 1 and Table 2 depict the recommended non-attainment area for the 1-hour sulfur dioxide National Ambient Air Quality Standard in New Jersey.

The entire boundaries of the 61 municipalities listed in Table 2 are recommended to be designated as non-attainment of the 1-hour sulfur dioxide National Ambient Air Quality Standard. This recommendation is based upon 2003 MM-5 4 km grid data used in CALPUFF modeling performed to support New Jersey's September 13, 2010 Section 126 petition (available at http://www.state.nj.us/dep/baqp/petition/126petition.htm). In addition to the 4 km MM-5 data, data from two local 10 meter meteorological towers and four NWS ASOS meteorological stations located in the modeling domain were also used to generate the wind fields used in the 2003 modeling. New Jersey recommends encompassing the entire municipality in New Jersey into the non-attainment area when all or any part of that municipality is predicted by this dispersion modeling to have a violation of the primary SO_2 NAAQS. New Jersey also recommends including the municipalities of Franklin and Union Townships (Hunterdon County), Lafayette Township (Sussex County), and Jefferson Township (Morris County) to the non-attainment area based on USEPA guidance to close up gaps between affected municipalities, as shown on the maps on Figures 1 and 2.

Table 2 Municipalities included in New Jersey's Proposed SO_2 NAAQS Non-attainment Area		
COUNTY	**Municipalities**	**No. of Municipalities**
HUNTERDON	Alexandria Township, Bethlehem Township, Bloomsbury Borough, Califon Borough, Clinton Township, Franklin Township, Glen Gardner Borough, Hampton Borough, High Bridge Borough, Holland Township, Lebanon Borough, Lebanon Township, Milford Borough, Tewksbury Township, Union Township	15
MORRIS	Chester Borough, Chester Township, Jefferson Township, Mount Arlington Borough, Mount Olive Township, Netcong Borough, Roxbury Township, Washington Township	8
SUSSEX	Andover Borough, Andover Township, Branchville Borough, Byram Township, Frankford Township, Fredon Township, Green Township, Hampton Township, Hopatcong Borough, Lafayette Township, Newton Town, Sandyston Township, Sparta Township, Stanhope Borough, Stillwater Township, Walpack Township	16
WARREN	Allamuchy Township, Alpha Borough, Belvidere Town, Blairstown Township, Franklin Township, Frelinghuysen Township, Greenwich Township, Hackettstown Town, Hardwick Township, Harmony Township, Hope Township, Independence Township, Knowlton Township, Liberty Township, Lopatcong Township, Mansfield Township, Oxford Township, Philipsburg Town, Pohatcong Township, Washington Borough, Washington Township, White Township	22
	Total No. of Municipalities	**61**

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Figure 1

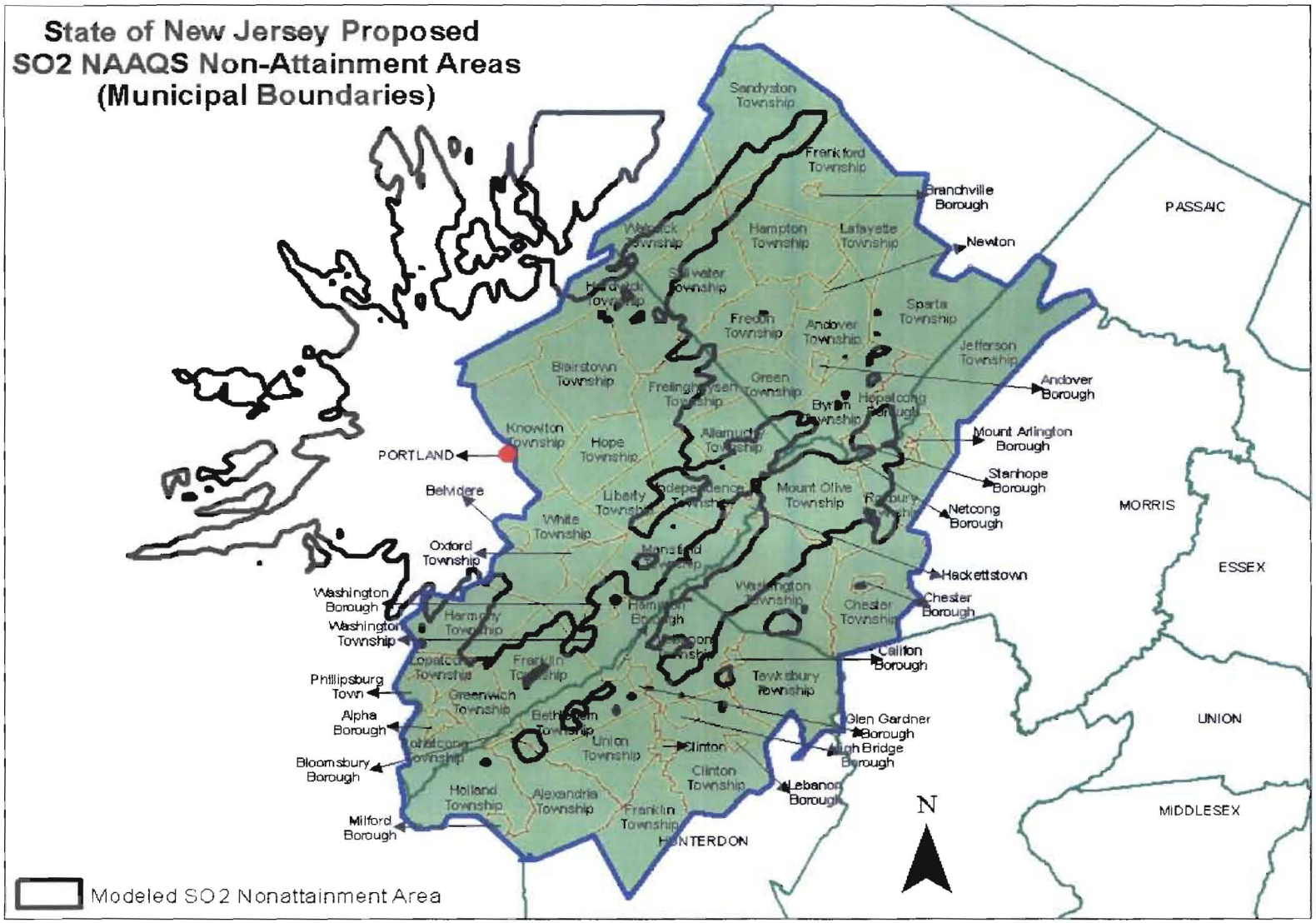

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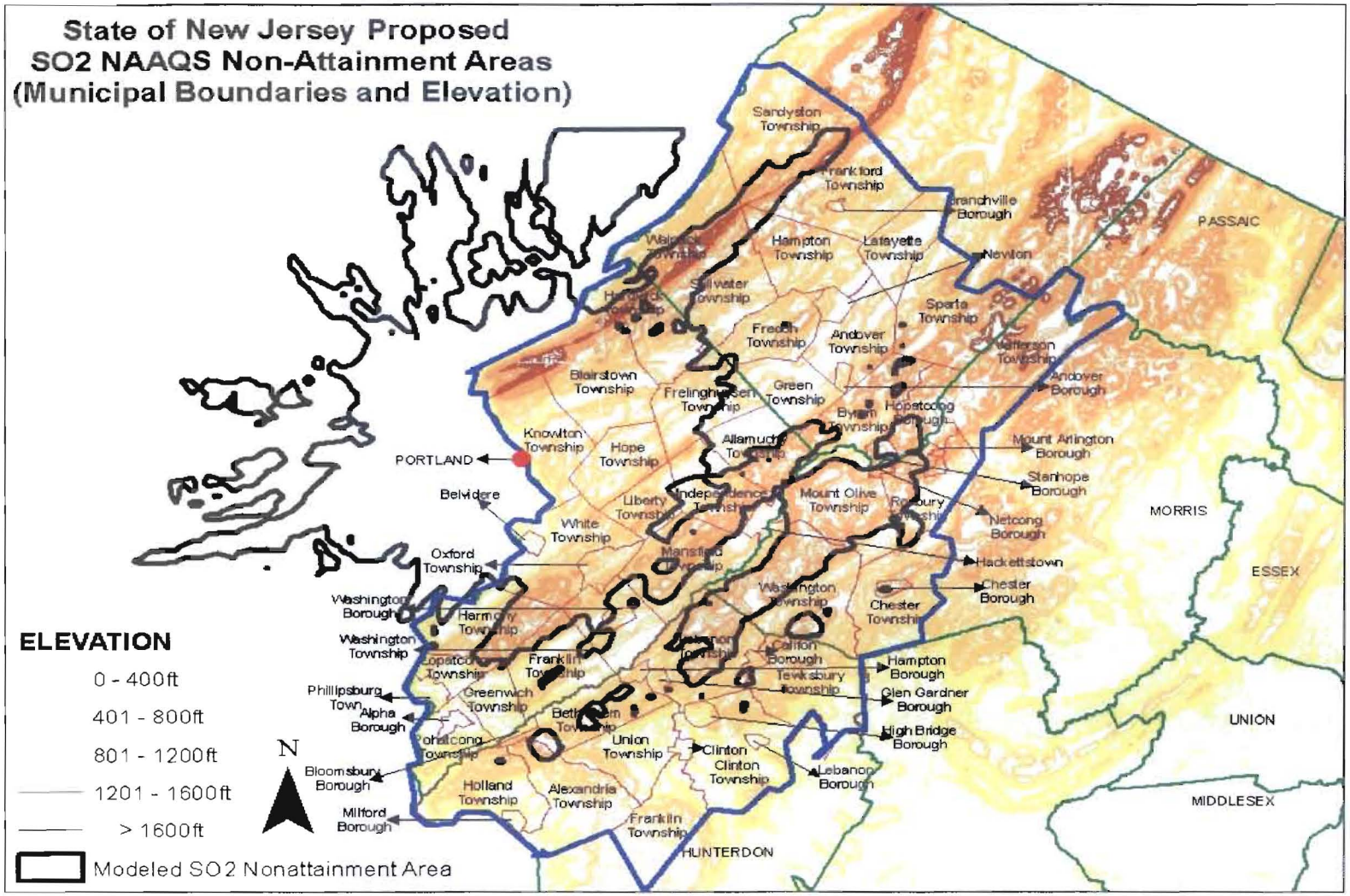
Figure 2



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Attachment 3:
Analysis of the Factors Considered for the Size of New Jersey's Non-Attainment Area Recommendations

The USEPA requires the states to consider five factors to determine the size of an area not meeting the 1-hour sulfur dioxide National Ambient Air Quality Standard[1]. New Jersey is recommending that the municipalities in New Jersey identified by detailed dispersion modeling performed to support New Jersey's September 13, 2010 Section 126 petition, and identified in Attachment 2 of this letter, be included in a multi-state non-attainment area. The factors reviewed pertain to New Jersey's detailed dispersion analysis to support New Jersey's Section 126 petition available at http://www.state.nj.us/dep/baqp/petition/126petition.htm.

The review of the five factors for all remaining New Jersey counties recommended here as "Unclassifiable" will be done when detailed dispersion analysis of major sources within New Jersey is performed.

Factor 1: Air Quality Data – New Jersey reviewed the 1-hour sulfur dioxide concentrations for all monitors within New Jersey. New Jersey determined that the only monitor exceeding the 1-hour sulfur dioxide National Ambient Air Quality Standard is the recently installed monitor in Columbia. (See Attachment 1). The Columbia monitor became operational in September 2010. Existing data obtained to-date show that exceedances of the 1-hour sulfur dioxide National Ambient Air Quality Standard have occurred, and that those exceedances are attributable to the Portland Power Plant located in Northampton County, Pennsylvania. A report entitled "Analysis of the Sulfur Dioxide Measurements from the Columbia Lake, New Jersey Monitor" is attached as Attachment 4, and is available at http://www.state.nj.us/dep/baqp/petition/126petition.htm.

Factor 2: Emissions-related Data – Emissions of sulfur dioxide from the Portland Power Plant in Northampton County, Pennsylvania, have been shown to be the cause of the exceedances occurring at the Columbia, New Jersey, monitor. These emissions are discussed in New Jersey's September 13, 2010 Section 126 petition available at http://www.state.nj.us/dep/baqp/petition/126petition.htm New Jersey intends to perform modeling on the other sources in New Jersey per USEPA guidance[2].

Factor 3: Meteorology – The Columbia, New Jersey monitor experiences elevated sulfur dioxide levels when the wind is blowing from the direction of the Portland Power plant. There are no indications that temperature inversions or other meteorological phenomena are responsible for the elevated levels of sulfur dioxide at the Columbia, New Jersey monitor.

One year of on-site meteorological data was used to perform detailed dispersion modeling. This is discussed in New Jersey's September 13, 2010 Section 126 petition at http://www.state.nj.us/dep/baqp/petition/126petition.htm

Factor 4: Geography / Topography – The Columbia, New Jersey monitor is located in an area of elevated terrain and within the Delaware River Valley. The refined dispersion modeling performed

[1] On, March 24, 2011, Stephen D. Page, Director, USEPA Office of Air Quality Planning and Standards, issued a guidance on how to determine the size of an area not meeting the Sulfur Dioxide National Ambient Air Quality Standard.
[2] Ibid.

used on-site meteorological data and accounted for the topography of the region affected by the Portland Power plant emissions. Violations of the 1-hour sulfur dioxide National Ambient Air Quality Standard were predicted by the refined dispersion modeling to occur in areas of elevated terrain, particularly along portions of the Kittatinny Ridge in Warren and Sussex counties of New Jersey. This is also discussed in New Jersey's September 13, 2010 Section 126 petition at http://www.state.nj.us/dep/baqp/petition/126petition.htm

Factor 5: Jurisdictional Boundaries - New Jersey recommends that all of Warren County, New Jersey and the entire municipality within any other New Jersey county predicted by refined dispersion modeling to have a violation of the sulfur dioxide National Ambient Air Quality Standard be included in a multi-State non-attainment area. See Figure 1 and Table 2.

Including all of Warren County and all of any municipality predicted to have a violation of the sulfur dioxide National Ambient Air Quality Standard by refined dispersion modeling, even when the model predicts that just a portion of the municipality may experience a violation, is adequate to account for any uncertainties within the modeling as to the geographical location of where a violation could occur.

Attachment 4
Analysis of the Sulfur Dioxide Measurements from the Columbia Lake, New Jersey, Monitor

Attachment 4

Analysis of the Sulfur Dioxide Measurements from the Columbia Lake NJ Monitor

March 4, 2011

Bureau of Technical Services
Division of Air Quality
New Jersey Dept. of Environmental Protection

Executive Summary

NJDEP evaluated data from a sulfur dioxide (SO_2) air quality monitor located 1.2 miles northeast of the coal-fired Portland power plant in Knowlton Township, Warren County, New Jersey at the Columbia Lake Wildlife Management Area. Between September 23, 2010 and February 17, 2011, the monitor measured 1-hour SO_2 concentrations that exceeded the 1-hour SO_2 NAAQS threshold on nine days. A trajectory analysis was used to determine the cause of the high monitored concentrations that exceeded the 1-hour SO_2 NAAQS during four episodes when concurrent hourly emissions data was available. The analysis found that Portland Power Plant Units 1 and 2 were the likely cause of each high sulfur dioxide episode at the monitor. The other large source in the area, Martins Creek Power Plant, was either not operating or emitting sulfur dioxide at very low levels during the exceedance hours. In addition, the highest 10 1-hour sulfur dioxide concentrations monitored between September 23, 2010 and February 17, 2011 were compared to an estimate of what AERMOD would predict at that location. A direct comparison is not possible because of the lack of concurrent meteorological data available for use by the model. When run with meteorological data from a different year, AERMOD's predictions when using estimates of the actual emission rates of Portland Power Plant were generally lower than the measured 1-hour concentrations at the monitor.

Purpose of This Analysis

This report examines the elevated 1-hour concentrations being measured at the nearby New Jersey Department of Environmental Protection's (NJDEP) SO_2 monitor located at the Columbia Lake Wildlife Management Area (WMA), New Jersey. Between September 23, 2010 and February 17, 2011, there were nine days where measured 1-hour SO_2 concentrations at the Columbia Lake WMA ambient air monitor exceeded the 1-hour National Ambient Air Quality Standard (NAAQS) of 75 ppb.

A trajectory analysis was done to determine the cause of the elevated 1-hour SO_2 concentrations at this monitor. These air trajectories were calculated during the hours when measured SO_2 concentrations at the monitor were above 75 ppb and the concurrent SO_2 hourly emission rates data was available. Because this necessary hourly emissions data from the Portland and Martins Creek Power Plants is currently only available through December 31, 2010, only four of the nine exceedance days could be evaluated in this report.

Predictions of the impacts from actual and allowable SO_2 emissions from the Portland Power Plant to 1-hour SO_2 concentrations in the vicinity of the Columbia Lake WMA monitor are documented in the NJDEP Bureau of Technical Services reports: *AERMOD Modeling Analysis of the 1-Hour Sulfur Dioxide Impacts Due to Emissions from the Portland Generating Station* (July 30, 2010. This document is an exhibit in NJDEP's supplemental 126 Petition dated September 17, 2010. Using the modeling techniques and assumptions described in this report, AERMOD was run in several different emission scenarios and its predictions of the 10 highest 1-hour concentrations at the monitoring location were compared to the 10 highest measured values.

One-Hour Sulfur Dioxide National Ambient Air Quality Standards

EPA finalized a new 1-hour standard of 196 ug/m^3 (75 ppb) on June 3, 2010. 75 Federal Register 35,581. The new standard was established in the form of the 99th percentile of the annual distribution of the daily maximum 1-hour average concentrations. 75 Federal Register 35,550. When a full year with 365 days of data is available, the 99^{th} percentile will be represented by the fourth-highest daily maximum 1-hour concentration.

Columbia Lake WMA Ambient Air Monitor

The Columbia Lake WMA ambient air monitor is located in Knowlton Township, Warren County NJ. It is approximately 1.9 km (1.2 miles) to the northeast of the Unit 1 and 2 stacks at Portland Power Plant. Figure 1 shows the locations of the monitor and power plant relative to each other. The monitor is 490 ft above mean sea-level (amsl), approximately 200 ft higher than Unit 1 and Unit 2's stack base elevation of 294 ft amsl. NJDEP modeled the impacts of Portland's emissions in the area where the monitor is located. The findings are exhibits to NJDEP's November 17, 2010 126 petition and documented in the following report: *AERMOD Modeling Analysis of the 1-Hour Sulfur Dioxide Impacts Due to Emissions from the Portland Generating Station* (July 30, 2010) This modeling analysis predicts relatively high SO_2 impacts in the area where the monitor is located.

The hourly SO_2 data collected from September 23, 2010 to February 17, 2011 is shown graphically in Figure 2. A listing of the same data in table format is given in Appendix A. The monitoring data from the Columbia Lake WMA indicates there is a relatively low background level of SO_2 in the area. Superimposed on this low background are the occurrences of frequent, very high, short-term SO_2 concentrations. This pattern strongly suggests the existence of a nearby, high emitting point source of SO_2 emissions. The variations in meteorology and, to a lesser extent, source emissions, result in the monitoring pattern seen in Figure 2. There is a low baseline overlaid with frequent spikes as opposed to one of a continual measurement of high SO_2 concentrations with little variation.

The monitoring data indicates that since the monitor began operation on September 23, 2010, there are nine days when there is at least one hour with a measured SO_2 concentration that exceeds the 1-hour SO_2 NAAQS. As listed in Appendix A, these days were September 24, 2010, September 29, 2010, October 30, 2010, December 30, 2010, January 22, 2011, January 24, 2011, February 13, 2011, February 14, 2011, and February 16, 2011. The emissions information needed to conduct the trajectory analysis was available for the episodes on four of these days: September 24, September 29, October 30, 2010 and December 30, 2010.

Figure 1. Location of Columbia WMA Air Monitoring Station in Relation to the Portland Power Plants (Warren County NJ, Northampton County PA)

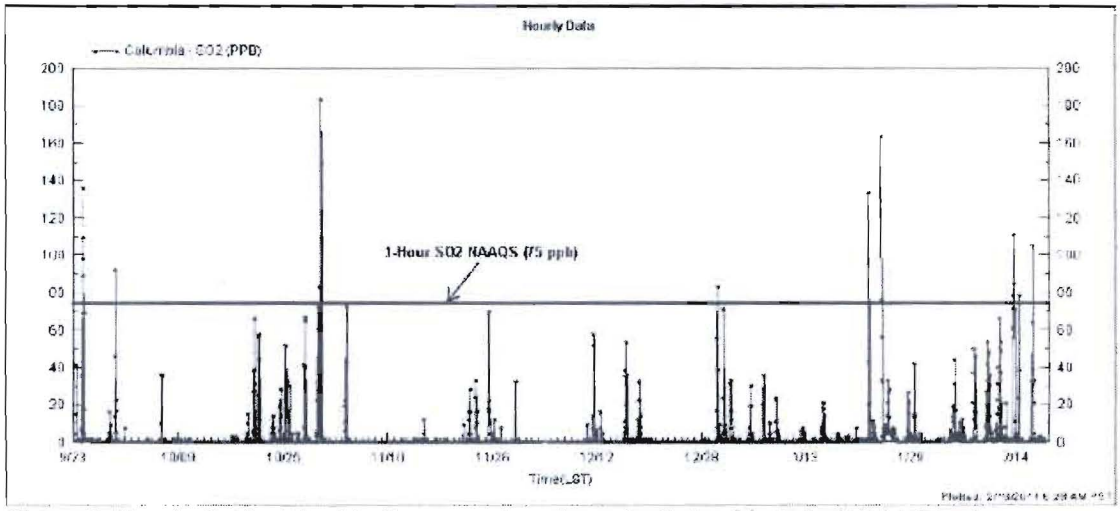

Figure 2. Hourly Sulfur Dioxide Concentrations from the Columbia Lake WMA Monitor

Sources of Sulfur Dioxide Emissions in the Vicinity of the Portland Power Plant and the Columbia Lake WMA Monitor

There are two large sources of SO_2 emissions located within 15 miles of the Columbia Lake WMA monitor, Portland Power Plant Units 1 and 2 located 1.9 km (1.18 miles) to the southwest, and the Martins Creek Power Plant Units 3 and 4, located 14 km (8.7 miles) to the south-southwest. Figure 3 shows the monitor's location relative to the two large power plants. In 2009, the total SO_2 emissions from Portland Power Plant were 30,465 tons. All but 0.4 tons of these emissions were from Units 1 and 2. Unit 5 at Portland Power Plant, a 150 MW simple-cycle turbine, operates infrequently and normally fires natural gas. Between 2007 to 2010, on average Unit 1 operated 6,595 hours per year and Unit 2 operated 7,022 hours per year.

The total 2009 SO_2 emissions from Martins Creek Power Plant were 1,095 tons. These emissions are from the two large 850 MW oil-fired (Units 3 and 4) at the facility. Units 3 and 4 operate much more infrequently than Units 1 and 2 at Portland Power Plant. The average annual operating hours at Martins Creek between 2007 and 2010 was 1,039 hours for Unit 3 and 584 hours for Unit 4.

The hourly emissions of SO_2 from Portland Power Plant Units 1 and 2 and the Martins Creek Power Plant Units 3 and 4 were taken from the EPA Clean Air Markets web site (http://www.epa.gov/airmarkets/emissions/).

Figure 3. Location of Columbia WMA Air Monitoring Station in Relation to Portland and Martins Creek Power Plants (Warren County NJ, Northampton County PA)

The other SO_2 sources in the region are either much smaller and/or more distant from the Columbia Lake WMA monitor than the Portland Power Plant and the Martins Creek Power Plant. In New Jersey, the facilities in Warren, Sussex, Morris and Hunterdon Counties in New Jersey that emitted more than 1 ton/yr of SO_2 in 2009 are listed in Table 1. The emissions from the sources listed in the table are far below the roughly 31,000 tons/year of SO_2 Portland Power Plant has emitted in recent years. The largest, Warren County District Landfill located approximately 11.8 km from the Columbia Lake WMA monitor, emits 25.9 tons/yr, 0.08 percent of the Portland Power Plant's total 2009 emissions.

Table 1. 2009 Sulfur Dioxide Emissions from Facilities in Warren, Sussex, and Hunterdon Counties in New Jersey

FACILITY NAME	COUNTY	MUNICIPALITY	SO_2 (TPY)
Warren County District Landfill	Warren	Oxford	25.9
Covanta Warren Energy Resource Co. L.P.	Warren	Oxford	10.6
Atlantic States Cast Iron Pipe	Warren	Phillipsburg	4.7
Mars Chocolate NA LLC	Warren	Hackettstown	4.3
Warren County Landfill Energy, LLC	Warren	Oxford	3.6
Mallinckrodt Baker Inc.	Warren	Phillipsburg	1.2
Sussex County Municipal Utilities Auth.	Sussex	Lafayette	2.1
Hamms Landfill Energy Recovery Project	Sussex	Lafayette	1.1

In Pennsylvania, besides the Portland and Martins Creek Power Plants, the other sources in the area that emitted more than 20 tons/yr of SO_2 in 2009 are listed in Table 2. 2009 is the latest actual emissions data available in the PADEP eFACTS data base. As can be seen in Table 2, these sources are more distant and emit much less than the Portland Power Plant. The Green Knight/Plainfield Landfill Gas, which emits only 0.15 percent of Portland's annual emissions, is located 12 miles west of the Portland Power Plant. The other four sources in the table are all located to the southwest of the Columbia Lake monitor along a 14 mile east-west line located approximately 4 miles north, and centered on, Bethlehem PA

Table 2. 2009 Sulfur Dioxide Emissions from Facilities in Northampton County PA

Facility Name	Municipality	Distance from Columbia Lake WMA Monitor	SO_2 (TPY)
Hercules Cement Co.	Stockertown	19 mi	1,862
Keystone Portland Cement	East Allen Township	25 mi	685
ESSROC	Nazareth	22 mi	799
Northampton Generating Station	Northampton	28 mi	490
Green Knight/ Plainfield Landfill Gas	Plainfield Township	13 mi	46

Air Trajectory Analysis and HYSPLIT Model

The trajectory analysis was conducted with the NOAA Air Resources Laboratory's (ARL) HYSPLIT Trajectory Model. Access to the interactive trajectory model is available at: http://ready.arl.noaa.gov/. Below is a description of the HYSPLIT model from the web site:

The Air Resources Laboratory's HYbrid Single-Particle Lagrangian Integrated Trajectory (HYSPLIT) model is a complete system for computing both simple air parcel trajectories and complex dispersion and deposition simulations. The model calculation method is a hybrid between the Lagrangian approach, which uses a moving frame of reference as the air parcels move from their initial location, and the Eulerian approach, which uses a fixed three-dimensional grid as a frame of reference. In the model, advection and diffusion calculations are made in a Lagrangian framework following the transport of the air parcel, while pollutant concentrations are calculated on a fixed grid. Through a joint effort between NOAA and Australia's Bureau of Meteorology, the model uses advection algorithms, updated stability and dispersion equations, a graphical user interface, and the option to include modules for chemical transformations. HYSPLIT can be run interactively on ARL's READY (Real-time Environmental Applications and Display sYstem) web site, or it can be installed on a PC and run using a graphical user interface.

The model is designed to support a wide range of simulations related to the atmospheric transport and dispersion of pollutants and hazardous materials, as well as the deposition of these materials (such as mercury) to the Earth's surface. Some of the applications include tracking and forecasting the release of radioactive material, volcanic ash, wildfire smoke, and pollutants from various stationary and mobile emission sources. Operationally, the model is used by NOAA's National Weather Service through the National Centers for Environmental Prediction and at local weather forecast offices.

Several forecast meteorological data sets are available at the web site to use with the HYSPLIT Trajectory Model. Because of its denser grid spacing, the NAM (Eta) 12 km grid forecast meteorological data was selected for use in this analysis. The following start location coordinates were input into HYSPLIT to estimate the forward and backward air trajectories:

Columbia Lake WMA Monitor;	latitude = 40.924607 N, longtitude = 75.067825 W
Portland Power Plant;	latitude = 40.909797 N longitude = 75.07875 W

All times referenced in the trajectory analysis below are based on local time Eastern Daylight Time (EDT) or Eastern Standard Time (EST), not Greenwich Mean Time (GMT) or Coordinated Universal Time (UTC). EDT is - 4 hours different than GMT or UTC. EST is - 5 hours different than GMT or UTC.

Trajectories were calculated at three heights above ground level. One trajectory represents a parcel of air located 221 meters above ground. This is the approximation of the height of the plume emitted from the Portland Power Plant stacks (121 meter stack height and a 100 meter plume rise). A second trajectory was tracked for a parcel of air 10

meters above ground (the lowest height allowed by the HYSPLIT Trajectory Model). This level is used to represent the height of the Columbia Lake WMA monitor. A third trajectory of 100 meters was also used in order to better track the SO_2 transport at a height between the plume height and the monitor's height.

The trajectories at the three different levels were calculated for a one hour period. The large dots on some of the trajectories indicate the distance traveled in a 5 minute increment of time during that hour. The closer the circles are to each other, the lower the wind speed.

The SO_2 emitted from the Portland Power Plant stacks will initially start near the 221 meter level above ground (i.e., plume height). However, as the plume is advected downwind towards the Columbia Lake WMA monitor, it will quickly move to the 100 meter level as the terrain rises and the plume disperses vertically downward. As the plume approaches the monitor it will reach the 10 m level (i.e., ground-level). Therefore, the path of SO_2 emitted from the Portland Power Plant stack plumes traveling and dispersing horizontally and vertically towards the Columbia Lake WMA monitor is best represented by a combination of the 10 meter and 100 meter trajectories.

The NAM (Eta) 12 km forecast meteorological data was selected for use in this analysis because of the data options in HYSPLIT, it provides the finest grid resolution. However, a 12 km grid resolution will sometimes have difficulty giving an exact representation of the wind directions at the scale of this report (1.9 km between Portland Power Plant and the Columbia Lake monitor). In addition, the plume will spread laterally as it is transported downwind due to dispersion. Lack of an exact match of the air trajectory from Portland to the monitor does not imply the source is not impacting the monitor.

Evaluation of the Episodes

Episode 1 (September 24, 2010)

The first episode occurred on September 24, 2010 during the middle of the day. The 1-hour SO_2 concentrations measured during this episode exceeded the new 1-hour SO_2 NAAQS for four hours. The measured values before, during, and after the exceedances are listed in Table 3. The SO_2 values measured during this episode are shown graphically in Figure 4.

The hourly SO_2 emissions from the Portland Power Plant Units 1 and 2 and the Martins Creek Power Plant Units 3 and 4 starting at Hour 10 (10 am) on September 24, 2010 and continuing through 2 pm are also listed in Table 3. As can be seen, the hourly emissions from Portland Units 1 and 2 were significant during this time period. The values range from 50 to 60 percent of each unit's maximum allowable emission rate (Unit 1 allowable emission rate = 5,820 lbs/hr, Unit 2 allowable emission rate = 8,900 lbs/hr). During the period of monitored exceedances of the 1-hour SO_2 NAAQS, the emissions from Martins Creek Units 3 and 4 were negligible.

Table 3. Hourly Measured Sulfur Dioxide Concentrations at the NJDEP Columbia Lake WMA Monitor - Hours 10 thru 15 September 24, 2010 [a]

Hour (EDT)	SO_2 (ppb)	SO_2 ($\mu g/m^3$)	Portland Unit 1 (lbs/hr)	Portland Unit 2 (lbs/hr)	Martins Creek Units 3 & 4 (lbs/hr)
10	35	91	2,985	4,771	40
11	**98**	**256**	3,140	5,447	44
12	**109**	**285**	3,133	5,995	44
13	**136**	**355**	3,005	4,933	77
14	**89**	**233**	3,034	4,858	243
15	69	179	3,231	5,103	1,809

a. Exceedance of 1-Hour SO_2 NAAQS of 75 ppb (196 ug/m^3) in bold.

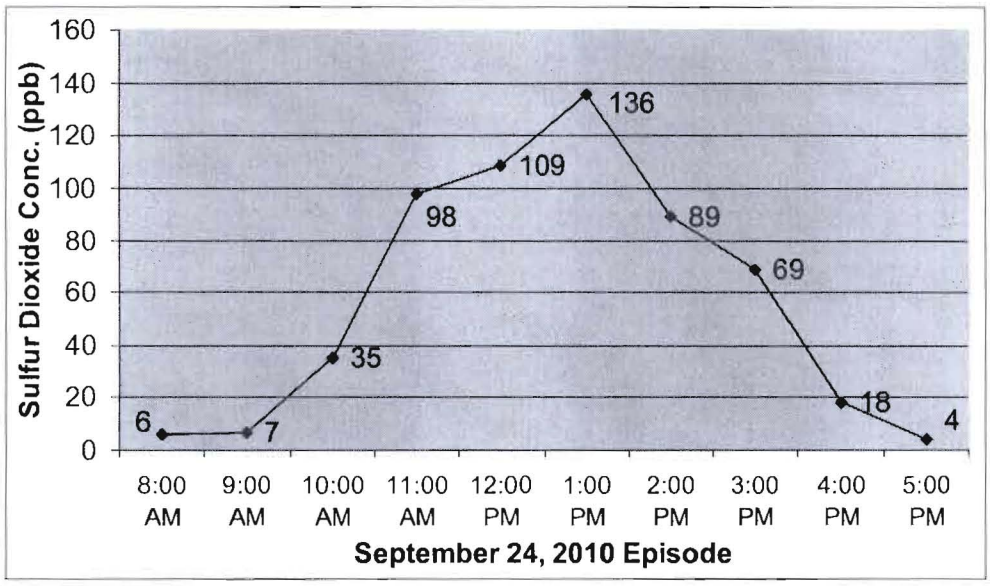

Figure 4. Hourly Sulfur Dioxide Measurements at the Columbia Lake Monitor from 8:00 to 17:00 September 24, 2010.

Figures 5 through 8 show the forward, downwind trajectories of three parcels of air at different heights starting at the Portland Power Plant stacks. The four hours shown are those when the Columbia WMA monitor recorded 1-hour SO_2 above the 75 ppb threshold. The circles on the three trajectories indicate the distance transported downwind every 5 minutes.

Figure 5 shows the first hour of this episode (11 am) when the 1-hour SO_2 NAAQS threshold of 75 ppb was exceeded. While there is some directional wind shear, there is a relatively consistent moderate wind speed at all three levels. The plume starts on a trajectory that would carry the plume to the east of the monitor, but is brought back towards the west at the lower levels. This pattern continues during the next three hours, as shown by the trajectories in Figures 6 through 8.

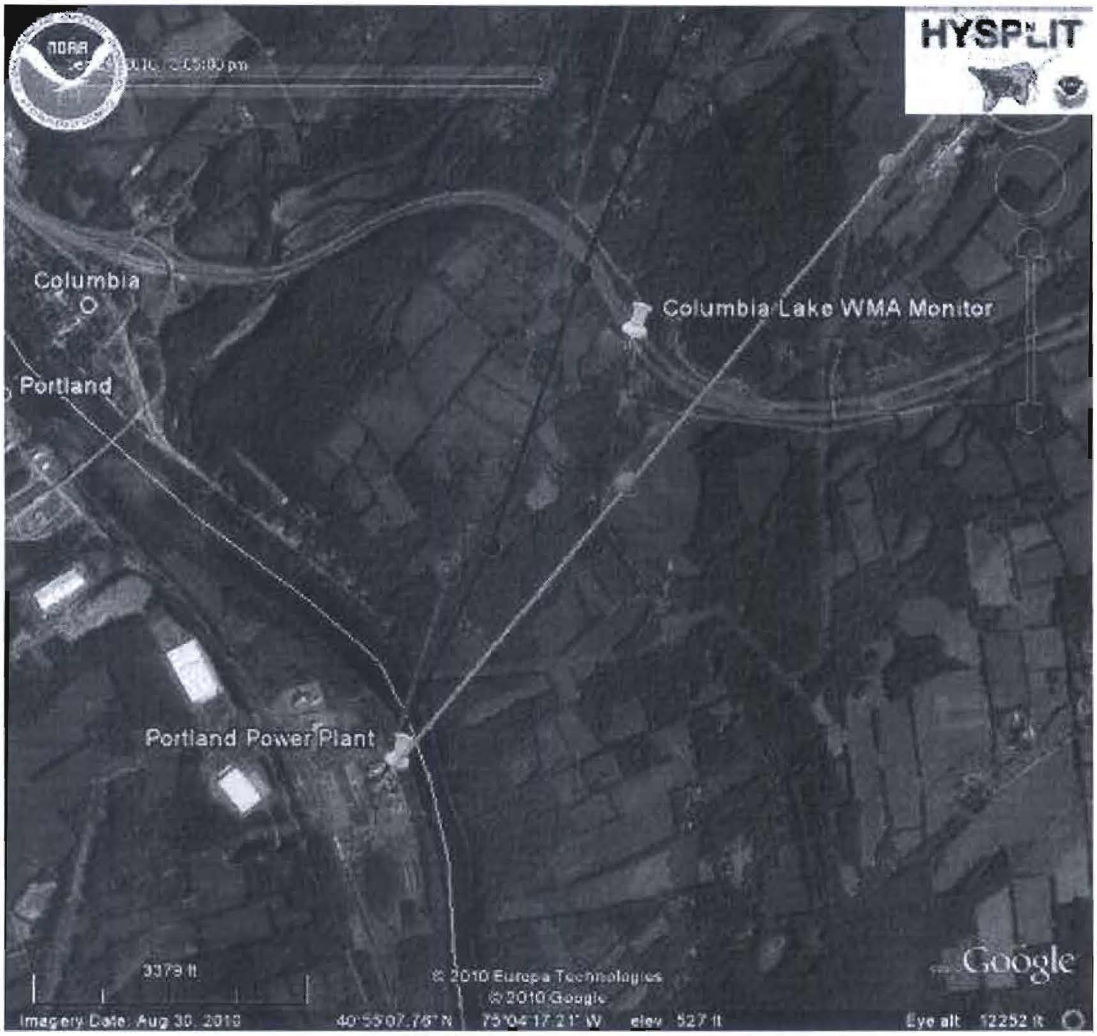

Figure 5. September 24, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 11am EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 98ppb

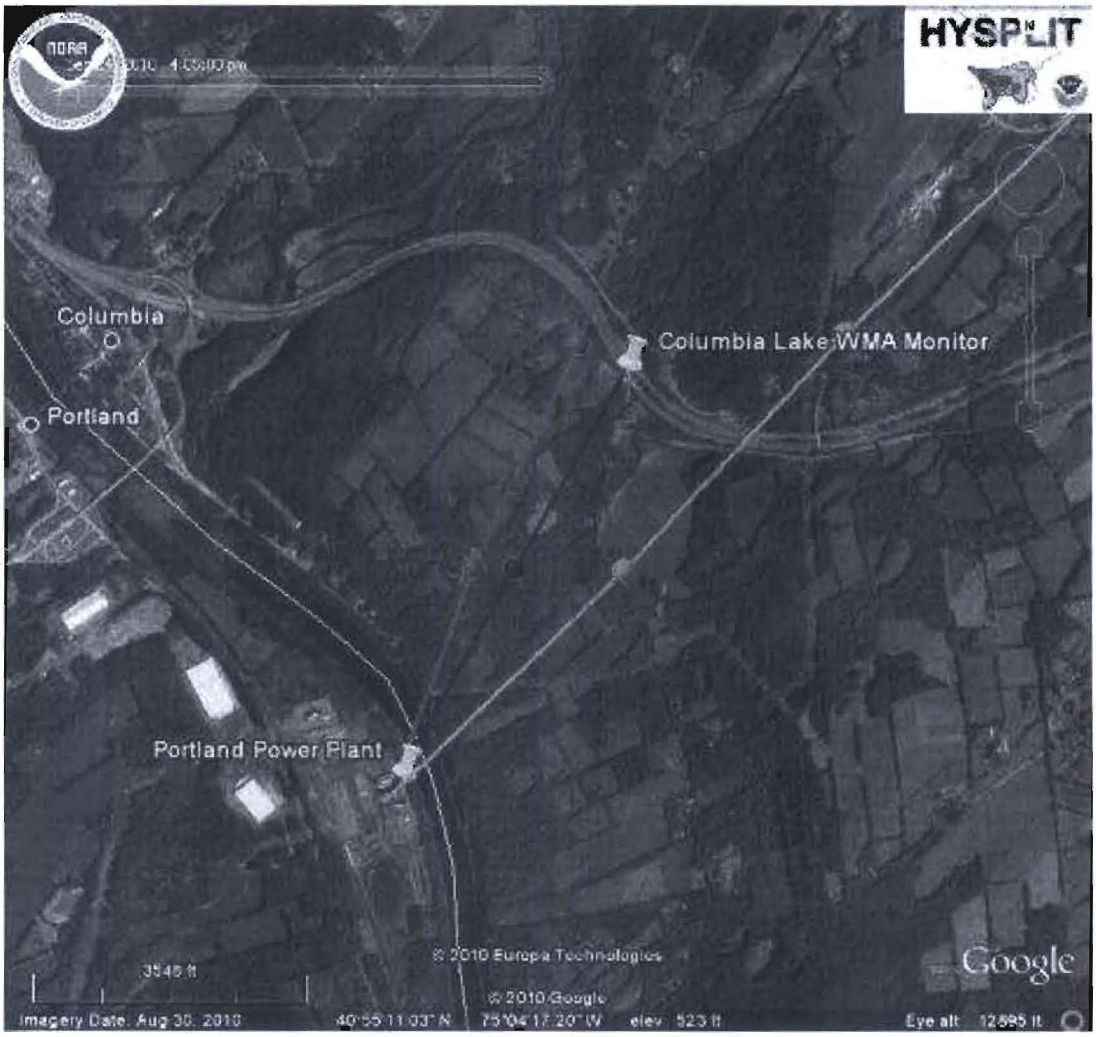

Figure 6. September 24, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 12pm EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 109 ppb

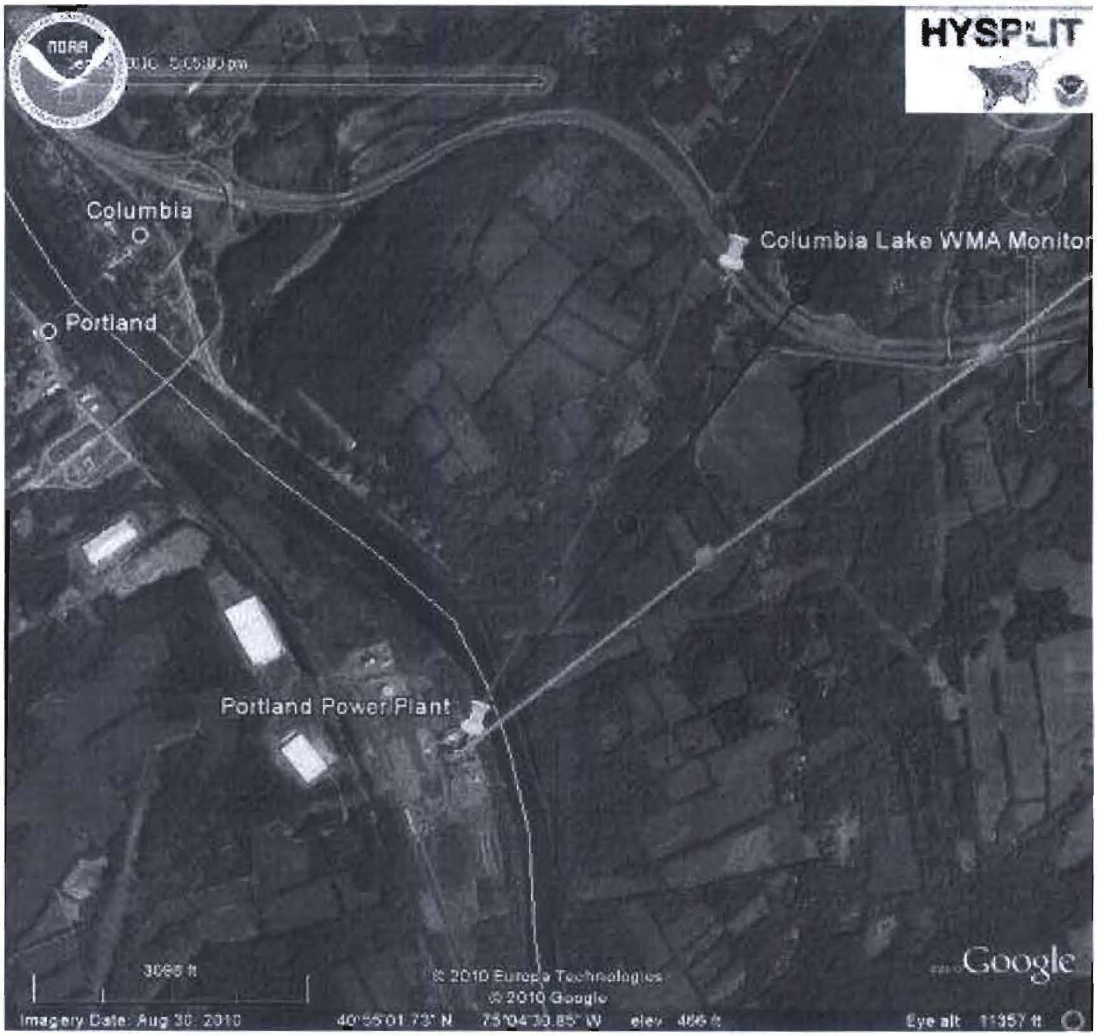

Figure 7. September 24, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 1pm EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 136 ppb

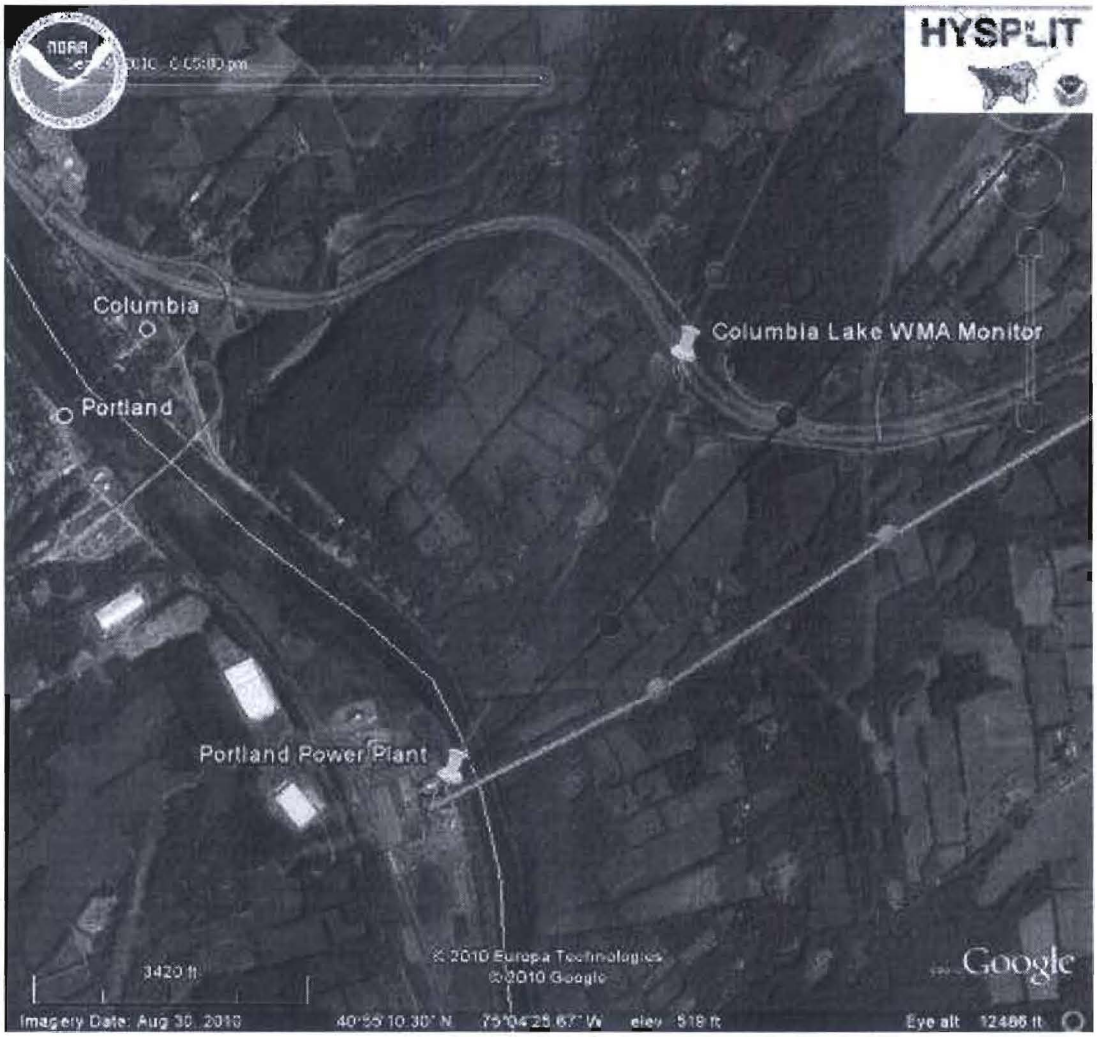

Figure 8. September 24, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 2pm EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 89 ppb

Episode II (September 29, 2010)

A 1-hour high SO_2 episode that occurred on September 29, 2010 was evaluated. The SO_2 concentrations monitored from hours 10 thru14 EDT (10:00 am to 2:59 pm EST) on September 29, 2010 are listed in Table 4. During hour 11 the measured 1-hour SO_2 concentration in this episode exceeds the 1 hour SO_2 NAAQS. The SO_2 values measured before, during, and after this one hour exceedance are shown graphically in Figure 9.

The hourly SO_2 emissions from the Portland Power Plant Units 1 and 2 and Martins Creek Power Plant Units 3 and 4 during Episode II are also listed in Table 2. Portland Unit's 1 and 2 emitted between 50-60 percent of their allowable SO_2 during this episode. Martins Creek Units 3 and 4 were not in operation.

Table 4. Hourly Measured Sulfur Dioxide Concentrations at the NJDEP Columbia Lake WMA Monitor - Hours 10 thru 14 September 29, 2010

Hour (EST)	SO_2 (ppb)	SO_2 ($\mu g/m^3$)	Portland Unit 1 (lbs/hr)	Portland Unit 2 (lbs/hr)	Martins Creek Units 3 & 4 (lbs/hr)
10	14	37	3,117	4,926	0
11	**92**	**240**	3,197	4,951	0
12	46	120	2,700	4,327	0
13	22	58	3,154	4,854	0
14	5	13	3,218	4,993	0

a. Exceedance of 1-Hour SO_2 NAAQS of 75 ppb (196 ug/m^3) in bold.

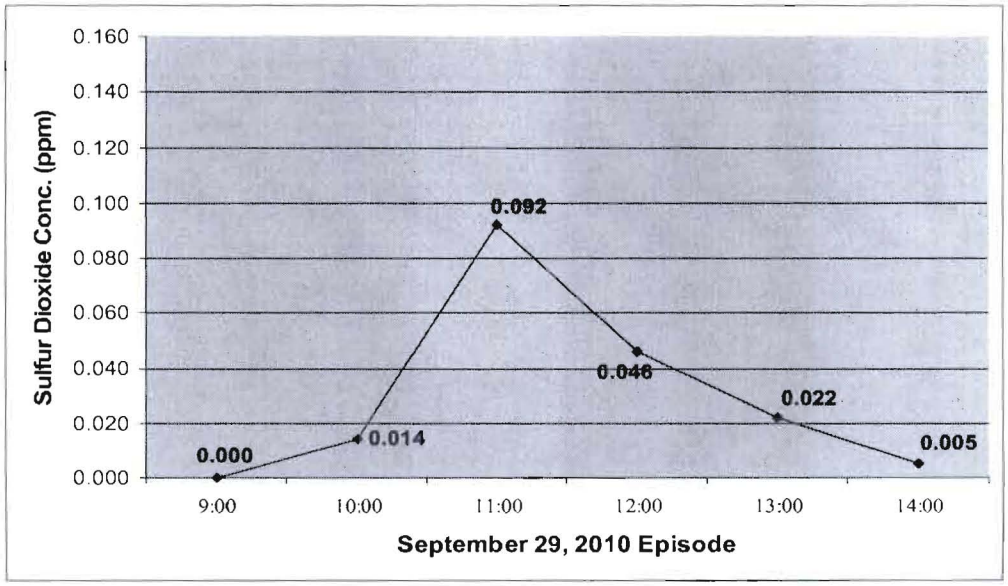

Figure 9. Hourly Sulfur Dioxide Measurements at the Colombia Lake Monitor from 9:00 to 14:00 September 29, 2010.

Figure 10 shows the three forward trajectories of the air at different heights for the one hour during this episode that the monitor's measurement exceeded the 1-hour 75 ppb threshold. Little directional or speed wind shear is shown. The wind speed at all three levels is relatively low, approximately 3 mph. The plume trajectory carries directly to the monitor.

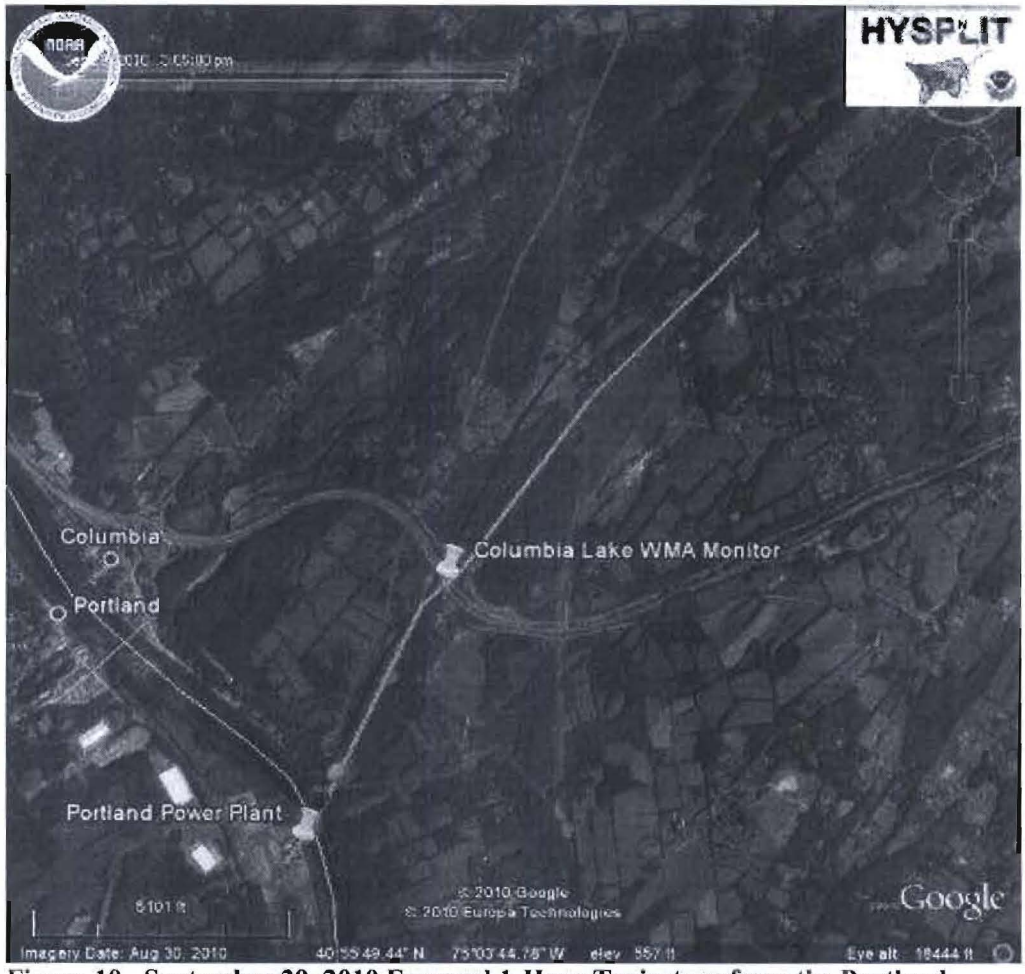

Figure 10. September 29, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 11 am EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 92 ppb

Episode III (October 30, 2010)

The extended period of high SO_2 concentrations that occurred on October 30, 2010 was evaluated. The SO_2 concentrations monitored from hours 7 - 23 EDT (7:00 am to 11:59 pm EDT) on October 30, 2010 are listed in Table 5. During three of the hours of this episode the measured 1-hour SO_2 concentration exceeded the 1 hour SO_2 NAAQS. The concentration on hour 20 (183 ppb or 479 ug/m^3) is the highest 1-hour concentration measured between September 23 and February 17, 2011. In addition, the 1-hour SO_2 concentration measured on hours 13 and 21 also exceed the 1-hour NAAQS. The SO_2 values measured during this episode are shown graphically in Figure 11.

Portland Unit's 1 and 2 emitted between approximately 25- 45 percent of its allowable SO_2 during the exceedances of the NAAQS that occurred during this episode, while Unit 2 emitted between approximately 35- 45 percent of its allowable SO_2 emission rate. These emissions Units 1 and 2 are lower than Episodes I and II. As in the previous episodes, Martins Creek Units 3 and 4 were not in operation.

Table 5. Hourly Measured Sulfur Dioxide Concentrations at the NJDEP Columbia Lake WMA Monitor - Hours 7 thru 23 October 30, 2010

Hour (EST)	SO_2 (ppb)	SO_2 (µg/m^3)	Portland Unit 1 (lbs/hr)	Portland Unit 2 (lbs/hr)	Martins Creek Units 3 & 4 (lbs/hr)
7	3	8	1,830	3,728	0
8	22	58	2,477	3,788	0
9	72	189	2,594	3,830	0
10	31	81	2,618	4,011	0
11	3	8	2,579	3,752	0
12	61	160	1,688	3,428	0
13	**83**	**217**	1,553	3,359	0
14	7	18	1,542	2,024	0
15	8	21	1,527	1,960	0
16	5	13	1,514	2,087	0
17	6	16	1,946	3,824	0
18	3	8	2,818	4,276	0
19	68	178	2,527	3,805	0
20	**183**	**479**	2,552	3,848	0
21	**149**	**390**	2,202	3,449	0
22	39	102	1,599	2,812	0
23	3	8	1,667	2,085	0

a. Exceedance of 1-Hour SO_2 NAAQS of 75 ppb (196 ug/m^3) in bold.

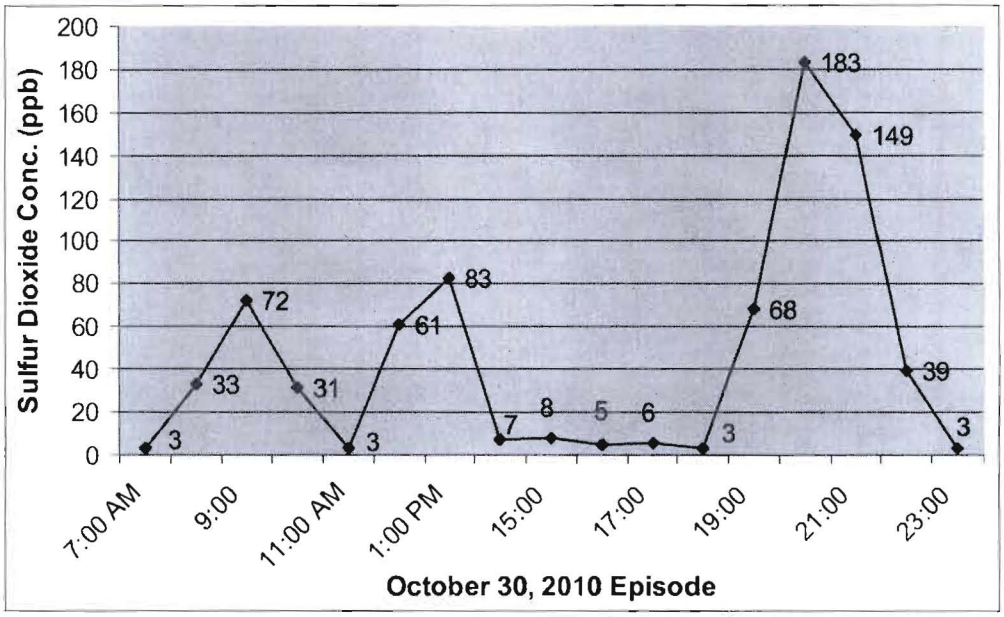

Figure 11. Hourly Sulfur Dioxide Measurements at the Colombia Lake Monitor from 7:00 to 23:00 October 30, 2010.

The trajectory for the first hour of exceedance (hour 13) is shown in Figure 12. Though not shown to be directly impacting the monitor, the winds are in a general direction that transports the plume towards the monitor. The winds are relatively strong with no vertical wind shear. Unfortunately, there is no NAM wind trajectory data available from the HYSPLIT web site for the other two hours episode when the 1-hour NAAQS is exceeded (hours 20 and 21). Data is available from the previous hour, hour 19 (7 pm). The trajectories for this hour are shown in Figure 13. The trajectories at all three levels are toward the monitor.

Figure 12. October 30, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 1 pm EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 83 ppb

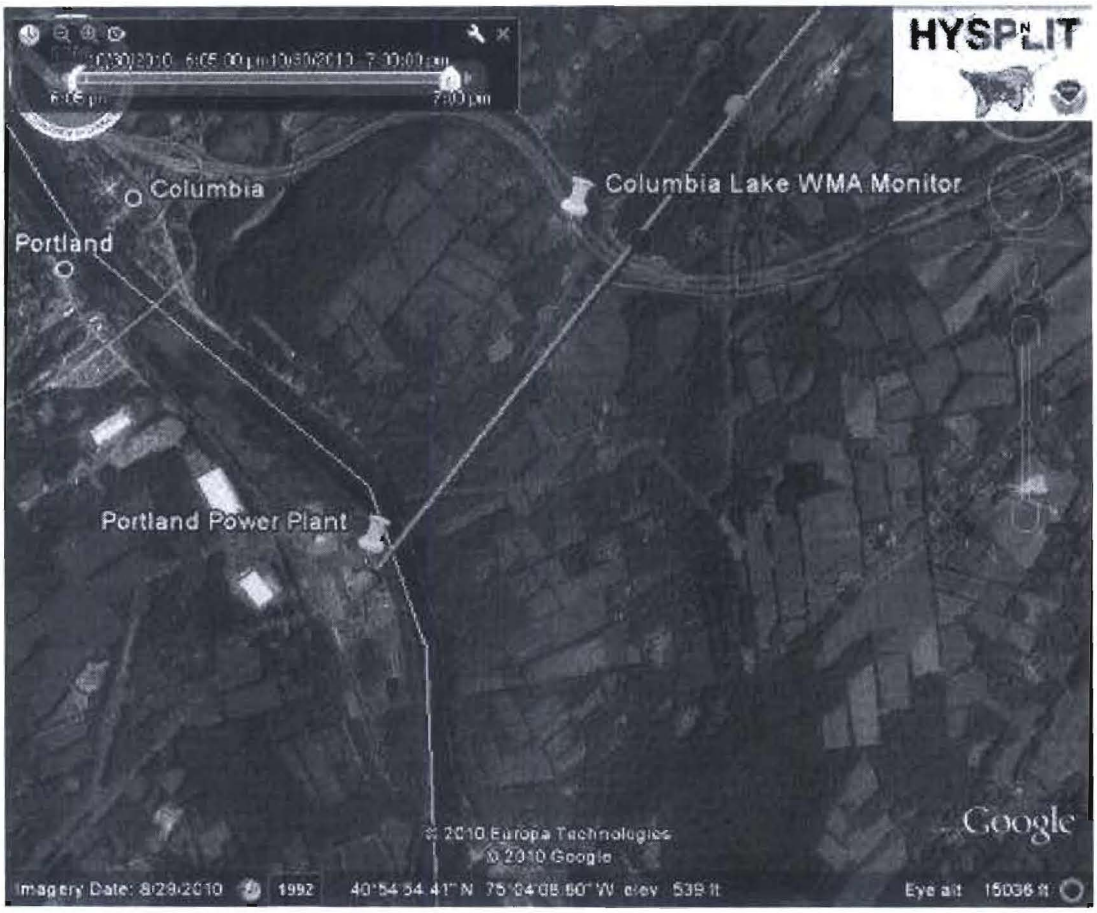

Figure 13. October 30, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 7 pm EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 68 ppb, next hour (8 pm) = 183 ppm

Episode IV (December 30, 2010)

The final episode evaluated occurred on December 30, 2010 during the middle of the day. The 1-hour SO_2 concentrations measured during this episode exceeded the new 1-hour SO_2 NAAQS during one hour, hour 12 (EST). The measured values before, during, and after the exceedances are listed in Table 6.

The hourly SO_2 emissions from the Portland Power Plant Units 1 and 2 and Martins Creek Power Plant Units 3 and 4 during Episode IV are also listed in Table 6. Unit 1's SO_2 emissions were at approximately 55 percent of its allowable rate when high SO_2 values were measured at the monitor. The emissions from Unit 2 were dropping from 45 percent of its allowable in the previous hour to 0 percent in the subsequent hour after exceedance. The Martins Creek units were not in operation. The SO_2 values measured before, during, and after this episode are shown graphically in Figure 14.

Table 6. Hourly Measured Sulfur Dioxide Concentrations at the NJDEP Columbia Lake WMA Monitor - Hours 9 thru 15 December 30, 2010

Hour (EDT)	SO_2 (ppb)	SO_2 ($\mu g/m^3$)	Portland Unit 1 (lbs/hr)	Portland Unit 2 (lbs/hr)	Martins Creek Units 3 & 4 (lbs/hr)
9	0	0	3,992	6,365	0
10	17	45	3,890	6,158	0
11	56	147	3,403	3,942	0
12	**83**	**217**	3,330	1,713	0
13	39	102	3,213	0	0
14	8	21	3,255	0	0

a. Exceedance of 1-Hour SO_2 NAAQS of 75 ppb (196 ug/m^3) in bold.

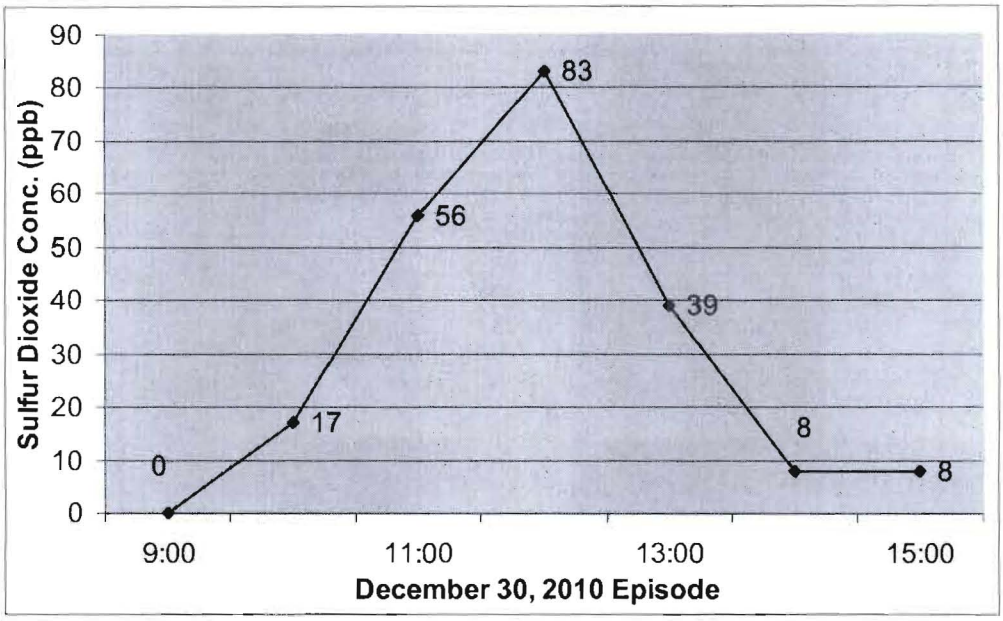

Figure 14. Hourly Sulfur Dioxide Measurements at the Colombia Lake Monitor from 10:00 to 16:00 December 30, 2010.

Figure 15 shows the three forward trajectories of the air at different heights for the one hour during this episode that the monitor's measurement exceeded the 1-hour SO_2 NAAQS level of 75 ppb. A great deal of vertical directional and speed wind shear is shown. The wind speeds at the 10m level are low, approximately 3 mph. As the plume travels down through the atmosphere, the lower level winds transport it in a westerly direction towards the monitor.

Figure 15. December 30, 2010 Forward 1-Hour Trajectory from the Portland Power Plant (starting time of 11 am EDT)

Red Line = 10 meter above ground trajectory (approximate monitor height)
Blue Line = 100 meter above ground trajectory
Green Line = 221 meter above ground trajectory (approximate initial plume height)

Columbia Lake WMA Monitor = 83 ppb

Comparison of the Concentrations Measured at the Columbia Lake WMA Ambient Air Monitor with AERMOD Model Predictions

Predictions of the 1-hour SO_2 impacts from SO_2 emissions from the Portland Power Plant are documented in the NJDEP Bureau of Technical Services reports: *AERMOD Modeling Analysis of the 1-Hour Sulfur Dioxide Impacts Due to Emissions from the Portland Generating Station* (July 30, 2010). Using the model setup and assumptions described in this document, an additional AERMOD model run was conducted with a receptor located at the Columbia Lake WMA monitor.

To our knowledge, meteorological data suitable for use in AERMOD that is concurrent with the September 23, 2010 to February 17, 2011 monitoring period is not being collected at this time. Therefore, concentrations at the Columbia Lake WMA monitor had to be estimated using the September 23, 1993 to February 17, 1994 meteorological data. Three emission scenarios were modeled.

Emission Scenario #1 **(Average Emissions)**
The first scenario used the average hourly SO_2 emission rates of Portland Units 1 and 2 during the period when Columbia Lake WMA monitoring is available. The hourly SO_2 emissions data is only available from 2010; there is no 2011 data. Therefore, concentrations at the Columbia Lake WMA monitor were estimated using the average hourly SO_2 emission rate of Portland Units 1 and 2 from September through December 2010. As in the trajectory analysis, the hourly emissions of SO_2 from Portland Power Plant Units 1 and 2 and the Martins Creek Power Plant Units 3 and 4 were obtained from the EPA Clean Air Markets web site (http://www.epa.gov/airmarkets/emissions/).

The average hourly SO_2 emission rate from September through December 2010 was as follows:

Unit 1 = 1,749 lb/hr (30 percent of the allowable emission rate of 5,820 lb/hr),
Unit 2 = 3,426 lb/hr (38.5 percent of the allowable emission rate of 8,900 lb/hr)

The average hourly heat input for the two units in MMBtu was also available from the EPA Clean Air Markets web site. The average hourly heat input during the September through December 2010 time period was as follows:

Unit 1 = 665 MMBtu/hr (40 percent of the maximum heat input of 1,657 MMBtu/hr),
Unit 2 = 1,281 MMBtu/hr (51 percent of the maximum heat input of 2,512 MMBtu/hr)

The exit velocity of each stack will be a function of the unit's heat input. Therefore, each unit's maximum load exit velocity was reduced by 60 percent for Unit 1 and 49 percent for Unit 2. Using these adjusted emission rates and exit velocities, the AEMOD model was run and predictions made at the location of the Columbia Lake WMA monitor.

Emission Scenario #2 **(50 Percent of Allowable Emissions)**
The trajectory analysis found that during the monitored exceedances of the 1-hour SO_2 NAAQS, Portland Units 1 and 2 on average typically were emitting SO_2 at approximately 50 percent of their allowable rate. Therefore, AEMOD model was run with Portland Units 1 and 2 were emitting SO_2 at 50 percent of their allowable rate. The exit velocities from the previous scenario were also used.

Emission Scenario #3 **(Allowable Emissions)**
The third scenario was run using the allowable SO_2 emission rate of both Unit 1 and Unit 2 and an exit velocity representative of 100 percent load.

Results
Table 7 compares the 10 highest AERMOD 1-hour predictions for the three emission scenarios with the top 10 monitored 1-hour SO_2 concentrations. Because the time period of the meteorology (September 23, 1993 thru February 17, 1994) is not the same year as the monitoring data (September 23, 2010 thru February 17, 2011), these results should be considered an approximation of model accuracy in reproducing observed concentrations at the Columbia Lake WMA monitor. That said, AERMOD using the Emission Scenario #1 (average actual SO_2 emissions) and Emission Scenario #2 (50 percent of allowable SO_2 emissions) predict lower concentrations than the monitored values. Emission Scenario #3 (allowable SO_2 emissions) provides the most accurate model predictions. This suggests that in the reports: *AERMOD Modeling Analysis of the 1-Hour Sulfur Dioxide Impacts Due to Emissions from the Portland Generating Station* (July 30, 2010), the model predictions made assuming Portland Unit 1 and 2 are emitting at their allowable SO_2 emission rate may most accurately reflect actual SO_2 concentrations in the vicinity of the plant.

Table 7. Comparison of Top 10 AERMOD Predicted 1-Hour SO_2 Concentrations to Monitored Values [a, b]

Ranked 1-Hour SO_2	Modeled Avg. SO_2 Emissions (ug/m^3)	Modeled 50 % of Allowable SO_2 Emissions (ug/m^3)	Modeled Allowable SO_2 Emissions (ug/m^3)	Monitored Concentrations (ug/m^3)
1	312	443	774	480
2	206	296	463	427
3	189	271	405	390
4	162	234	337	356
5	139	202	289	349
6	133	200	259	291
7	131	192	259	286
8	130	189	257	275
9	125	182	246	257
10	125	181	245	241
# of Exceedence Days	2	4	10	9

a. Model predictions based on meteorology from Sept. 23, 1993 through Feb. 17, 1994.
b. Monitored values measured from Sept. 23, 2010 through Feb. 17, 2011.

CONCLUSION

Monitoring data from the Columbia Lake Wildlife Management Area in Knowlton Township, Warren County, New Jersey showed exceedances of the 1-hour SO_2 NAAQS on nine days between September 23, 2010 and February 17, 2011. Of these nine exceedances, four episodes when concurrent hourly emissions data was available were evaluated. NJDEP's trajectory analysis combined with hourly emissions data determined that the Portland Power Plant in Northampton County, Pennsylvania was the likely cause of these exceedances. In addition, a comparison of AERMOD model predictions at the monitoring locations with measured data was made. Because there is no September 23, 2010 through February 17, 2011 meteorological data available for use by the model, a direct comparison of model predictions to monitored values was not possible. However, an approximation of AERMOD's accuracy using the September 23, 1993 through February 17, 1994 meteorological data and estimates of the actual emission rates of Portland Power Plant was possible. The model predictions were generally lower than the measured 1-hour concentrations at the monitor when using estimates of actual emissions. The allowable SO_2 emission rates scenario most accurately reflected actual SO_2 concentrations at the monitor.

Appendix A

Hourly Sulfur Dioxide Concentrations Measured at the Columbia Lake WMA Monitor

(September 23, 2010 through February 17, 2011)

Date	hr 0	hr 1	hr 2	hr 3	hr 4	hr 5	hr 6	hr 7	hr 8	hr 9	hr 10	hr 11	hr 12	hr 13	hr 14	hr 15	hr 16	hr 17	hr 18	hr 19	hr 20	hr 21	hr 22	hr 23	MAX
9/23/2010	**	**	**	**	**	**	**	**	**	**	**	**	41	15	4	1	1	1	1	1	1	1	1	1	41
9/24/2010	1	1	1	0	0	1	0	1	6	7	35	**98**	**109**	**136**	**89**	69	18	4	2	2	2	1	1	1	**136**
9/25/2010	2	1	1	1	1	1	1	1	2	2	2	1	1	2	2	2	2	2	1	1	1	0	0	0	2
9/26/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1
9/27/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9/28/2010	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	16	5	9	3	1	1	0	0	0	16
9/29/2010	0	0	0	0	0	0	0	0	0	0	14	**92**	46	22	5	17	1	0	0	0	0	0	0	0	**92**
9/30/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7	7	0	7
10/1/2010	0	0	0	0	0	0	0	0	0	0	0	**	**	0	0	0	0	0	0	0	0	0	0	0	0
10/2/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/3/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/4/2010	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2
10/5/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/6/2010	0	0	0	0	1	0	0	0	0	1	36	10	35	1	0	0	0	0	0	0	0	0	0	0	36
10/7/2010	0	0	0	0	0	0	0	0	0	0	0	**	**	0	0	0	0	0	0	0	0	0	0	0	0
10/8/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**	1	1	0	0	0	0	0	0	1
10/9/2010	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
10/10/200	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	2	0	0	0	0	0	0	2
10/11/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	**	**	0	0	0	0	0	0	0	0	0	0
10/12/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/13/2010	0	0	0	0	0	0	0	0	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/14/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/15/2010	0	0	0	0	0	0	0	0	0	**	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/16/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/17/2010	0	0	0	0	0	0	0	0	0	1	3	3	3	3	3	2	1	1	0	0	0	0	0	0	3
10/18/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/19/2010	0	0	0	0	0	0	0	0	0	0	0	2	5	15	10	4	1	0	0	0	0	0	0	0	15
10/20/2010	0	0	0	0	0	0	0	0	0	5	27	38	6	66	39	27	31	5	1	0	0	0	0	0	66
10/21/2010	0	5	25	7	0	0	44	57	58	12	1	0	0	0	0	0	0	0	0	0	0	0	0	0	58
10/22/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/23/2010	0	0	0	0	0	0	0	1	4	5	14	8	7	5	4	4	4	3	2	2	1	1	1	1	14
10/24/2010	0	0	0	0	0	0	0	0	0	1	2	6	2	19	28	14	7	2	1	1	1	1	1	0	28
10/25/2010	0	0	0	0	0	0	0	1	2	17	52	28	14	32	33	32	0	0	0	0	0	0	6	30	52
10/26/2010	2	1	0	**	**	**	**	0	0	0	4	**	**	**	**	**	**	**	**	**	**	**	**	0	4
10/27/2010	0	0	0	0	5	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5

Date	hr 0	hr 1	hr 2	hr 3	hr 4	hr 5	hr 6	hr 7	hr 8	hr 9	hr 10	hr 11	hr 12	hr 13	hr 14	hr 15	hr 16	hr 17	hr 18	hr 19	hr 20	hr 21	hr 22	hr 23	MAX
10/28/2010	0	0	0	0	0	0	8	41	28	40	67	65	3	0	0	0	0	1	1	0	0	0	0	0	67
10/29/2010	0	0	0	0	0	0	0	0	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10/30/2010	0	0	0	0	0	0	5	3	22	72	31	3	61	**83**	7	8	5	6	3	68	**183**	**149**	39	3	**183**
10/31/2010	1	1	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11/1/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/2/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/3/2010	0	0	0	0	0	0	0	0	0	0	6	22	11	19	72	43	2	0	0	0	0	0	1	1	72
11/4/2010	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11/5/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/6/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/7/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/8/2010	0	0	0	0	0	0	0	0	0	0	0	0	**	**	**	**	**	**	**	**	**	**	**	**	0
11/9/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/10/2010	0	0	0	0	0	0	0	0	0	0	**	**	0	0	0	0	0	0	0	0	0	0	0	0	0
11/11/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/12/2010	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
11/13/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/14/2010	0	0	0	0	0	0	0	0	0	0	0	0	1	2	0	0	0	0	0	0	0	0	0	0	2
11/15/2010	0	0	0	0	0	0	0	0	0	0	0	2	4	12	1	0	1	0	0	0	0	0	0	0	12
11/16/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/17/2010	0	0	0	0	0	0	0	2	0	0	**	**	0	0	0	0	0	0	0	0	0	0	0	0	2
11/18/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	0	1
11/19/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/20/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/21/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	9
11/22/2010	0	0	0	0	0	0	0	0	1	0	12	4	16	28	16	1	4	0	0	0	0	0	0	0	28
11/23/2010	0	0	0	0	0	0	0	0	0	0	1	8	24	33	17	16	10	1	2	0	3	0	0	0	33
11/24/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/25/2010	0	0	0	0	0	0	0	0	0	0	18	70	22	16	10	4	4	0	0	0	0	0	0	0	70
11/26/2010	0	0	0	0	0	0	1	12	2	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	12
11/27/2010	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7
11/28/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11/29/2010	0	0	0	0	0	0	0	**	0	0	0	0	32	1	0	0	0	0	0	0	0	0	0	0	32
11/30/2010	0	0	0	0	0	0	0	0	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/1/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**	0	0	0	0	0	0	0	0	0

Date	hr 0	hr 1	hr 2	hr 3	hr 4	hr 5	hr 6	hr 7	hr 8	hr 9	hr 10	hr 11	hr 12	hr 13	hr 14	hr 15	hr 16	hr 17	hr 18	hr 19	hr 20	hr 21	hr 22	hr 23	MAX
12/2/2010	0	0	0	0	0	0	0	0	0	**	**	**	**	0	0	0	0	0	0	0	0	0	0	0	0
12/3/2010	0	0	0	0	0	0	0	0	0	0	0	**	**	**	**	**	**	**	**	**	**	**	**	**	0
12/4/2010	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	**	0	0	0	0	0	0	0	0	0
12/5/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/6/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/7/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/8/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/9/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/10/2010	0	0	0	0	0	0	0	0	0	0	0	**	9	1	1	0	0	0	0	0	0	0	0	0	9
12/11/2010	0	0	0	0	0	0	0	0	0	0	14	7	8	52	58	7	4	1	1	1	0	4	6	2	58
12/12/2010	3	2	1	0	0	0	0	0	0	0	0	0	0	0	0	7	16	0	0	0	4	0	0	0	16
12/13/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/14/2010	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/15/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/16/2010	0	0	0	0	1	2	11	38	5	5	54	20	35	8	36	5	7	1	0	0	0	0	0	1	54
12/17/2010	1	1	0	0	1	0	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1
12/18/2010	0	0	1	0	0	0	0	0	0	12	3	2	5	32	22	14	4	8	4	1	1	0	0	0	32
12/19/2010	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	0	1	0	1
12/20/2010	0	0	0	0	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1
12/21/2010	0	0	0	0	0	0	0	0	0	0	**	**	0	0	0	0	0	0	0	0	0	0	0	0	0
12/22/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/23/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/24/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/25/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/26/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/27/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/28/2010	0	0	0	0	0	0	0	0	0	0	**	**	**	0	1	0	0	0	0	0	0	0	0	0	1
12/29/2010	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12/30/2010	0	0	0	0	0	0	0	0	0	0	17	56	**83**	39	8	8	9	3	2	2	3	2	3	2	**83**
12/31/2010	1	1	0	0	0	0	0	0	1	4	23	71	9	6	6	5	4	1	0	1	0	0	0	0	71
1/1/2011	0	0	0	0	0	0	0	0	0	0	31	7	12	16	33	16	3	1	1	2	1	1	0	0	33
1/2/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	1
1/3/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/4/2011	0	0	0	0	0	0	0	1	1	2	4	7	8	30	19	5	1	2	4	4	3	2	0	0	30
1/5/2011	0	0	0	0	0	0	0	0	0	0	0	**	**	0	0	0	0	0	0	0	0	0	0	0	0

Date	hr 0	hr 1	hr 2	hr 3	hr 4	hr 5	hr 6	hr 7	hr 8	hr 9	hr 10	hr 11	hr 12	hr 13	hr 14	hr 15	hr 16	hr 17	hr 18	hr 19	hr 20	hr 21	hr 22	hr 23	MAX
1/6/2011	0	0	0	0	0	0	0	0	0	0	0	28	12	20	35	2	1	0	0	0	0	0	1	1	35
1/7/2011	1	1	1	0	0	1	1	0	0	1	1	10	2	4	2	1	1	1	0	0	0	0	0	0	10
1/8/2011	0	0	0	0	0	0	0	0	0	0	0	0	11	23	22	6	5	2	2	3	3	2	1	0	23
1/9/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/10/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**	**	**	**	**	0
1/11/2011	**	**	**	**	**	**	**	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
1/12/2011	1	1	0	0	0	0	0	1	4	7	7	6	5	1	0	0	**	0	0	0	0	0	0	0	7
1/13/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/14/2011	0	0	0	0	0	0	1	0	1	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0	1
1/15/2011	0	0	0	0	0	0	0	0	0	0	2	8	6	4	21	5	5	18	14	2	2	2	2	2	21
1/16/2011	3	3	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
1/17/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	4	3	2	4
1/18/2011	2	2	3	2	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3
1/19/2011	0	0	0	0	0	0	1	2	2	1	3	1	2	2	1	0	0	0	0	0	0	0	0	0	3
1/20/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	7	1	0	1	0	0	0	0	7
1/21/2011	0	0	0	0	1	1	0	2	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	2
1/22/2011	0	0	0	0	0	0	0	1	2	0	0	0	0	20	43	**133**	21	0	0	0	0	0	1	1	**133**
1/23/2011	0	0	1	0	2	5	11	10	8	5	3	1	0	0	0	0	0	0	0	0	0	0	0	0	11
1/24/2011	0	0	0	0	0	0	0	0	0	0	**	**	**163**	33	**76**	32	57	7	2	2	3	4	5	6	**163**
1/25/2011	6	6	7	9	6	5	4	8	6	8	21	14	33	28	27	13	6	6	5	4	4	5	4	4	33
1/26/2011	4	3	4	5	4	5	6	7	6	6	6	6	5	2	1	2	2	1	1	1	0	0	0	0	7
1/27/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1/28/2011	0	0	0	0	0	0	0	0	0	1	3	6	26	26	21	15	3	2	2	2	2	2	1	0	26
1/29/2011	0	0	0	0	0	0	0	0	0	3	3	2	42	13	15	14	3	1	2	2	2	1	0	0	42
1/30/2011	0	0	0	0	0	0	0	0	0	0	4	3	2	1	0	0	0	0	0	0	0	0	0	0	4
1/31/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/1/2011	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2/2/2011	0	0	0	1	1	0	0	0	0	0	0	**	**	**	**	**	**	**	0	1	1	1	1	0	1
2/3/2011	0	0	0	0	0	0	0	0	0	0	0	**	0	0	0	0	0	0	**	0	0	0	1	0	1
2/4/2011	2	6	4	2	4	3	2	2	4	11	11	19	13	15	4	31	44	17	4	4	3	1	1	1	44
2/5/2011	1	1	1	2	2	2	2	2	3	10	8	5	4	2	1	0	0	0	0	0	2	12	7	0	12
2/6/2011	4	5	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
2/7/2011	0	0	0	0	0	0	1	0	0	1	12	37	21	50	46	7	16	17	16	8	3	1	0	0	50
2/8/2011	0	0	0	0	0	**	0	0	0	0	0	0	**	0	0	0	0	0	0	0	0	0	0	0	0
2/9/2011	0	0	0	0	0	**	1	1	26	7	9	3	42	33	54	48	4	1	12	7	35	30	14	**	54

Date	hr 0	hr 1	hr 2	hr 3	hr 4	hr 5	hr 6	hr 7	hr 8	hr 9	hr 10	hr 11	hr 12	hr 13	hr 14	hr 15	hr 16	hr 17	hr 18	hr 19	hr 20	hr 21	hr 22	hr 23	MAX
2/10/2011	1	6	4	4	4	4	4	2	0	0	0	0	0	0	0	0	0	0	1	1	1	6	6	15	15
2/11/2011	22	31	40	7	3	**	2	2	3	18	51	66	**	49	54	37	7	2	3	3	3	2	1	1	66
2/12/2011	0	1	0	1	1	1	1	1	3	20	8	2	2	2	1	1	0	0	0	0	0	0	0	0	20
2/13/2011	0	0	0	0	0	0	0	0	1	1	61	**78**	**85**	**111**	56	71	71	11	3	1	11	1	1	1	**111**
2/14/2011	0	0	0	0	1	1	3	4	23	38	**78**	38	0	1	0	0	0	0	0	0	0	0	0	0	**78**
2/15/2011	0	0	0	0	0	0	0	0	0	0	**	**	0	**	0	0	0	0	0	0	0	0	0	0	0
2/16/2011	0	0	0	0	0	0	0	0	2	32	64	**105**	33	39	21	33	1	4	1	1	0	0	0	1	**105**
2/17/2011	1	1	1	1	0	0	0	1	2	2	2	2	1	2	2	3	3	2	1	1	1	0	0	0	3

** = missing or bad data