Ozone National Ambient Air Quality Standard Health Exceedances on July 30, 2019

Exceedance Locations and Levels

On Tuesday, July 30, 2019, there was one (1) exceedance in New Jersey of the National Ambient Air Quality Standard (NAAQS) for ozone (daily maximum 8-hour average of 70 ppb). See Table 1.

Table 1. New Jersey Ozone Concentrations on 7/30/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	59
Bayonne	62
Brigantine	48
Camden Spruce St	61
Chester	53
Clarksboro	55
Colliers Mills	54
Columbia	57
Flemington	63
Leonia	72
Millville	60
Monmouth University	54
Newark Firehouse	59
Ramapo	59
Rider University	No Data
Rutgers University	63
Washington Crossing*	52
TOTAL EXCEEDANCES	1

*The Washington Crossing station is operated and maintained by EPA as part of the nationwide Clear Air Status and Trends Network (CASTNET).

From the out-of-state stations within New Jersey's ozone non-attainment areas, there were eight (8) exceedances of the ozone NAAQS. See Table 2.

Table 2. Ozone Concentrations at Out-of-State Monitoring Stations in New Jersey's Ozone Non-Attainment Areas on 7/30/2019

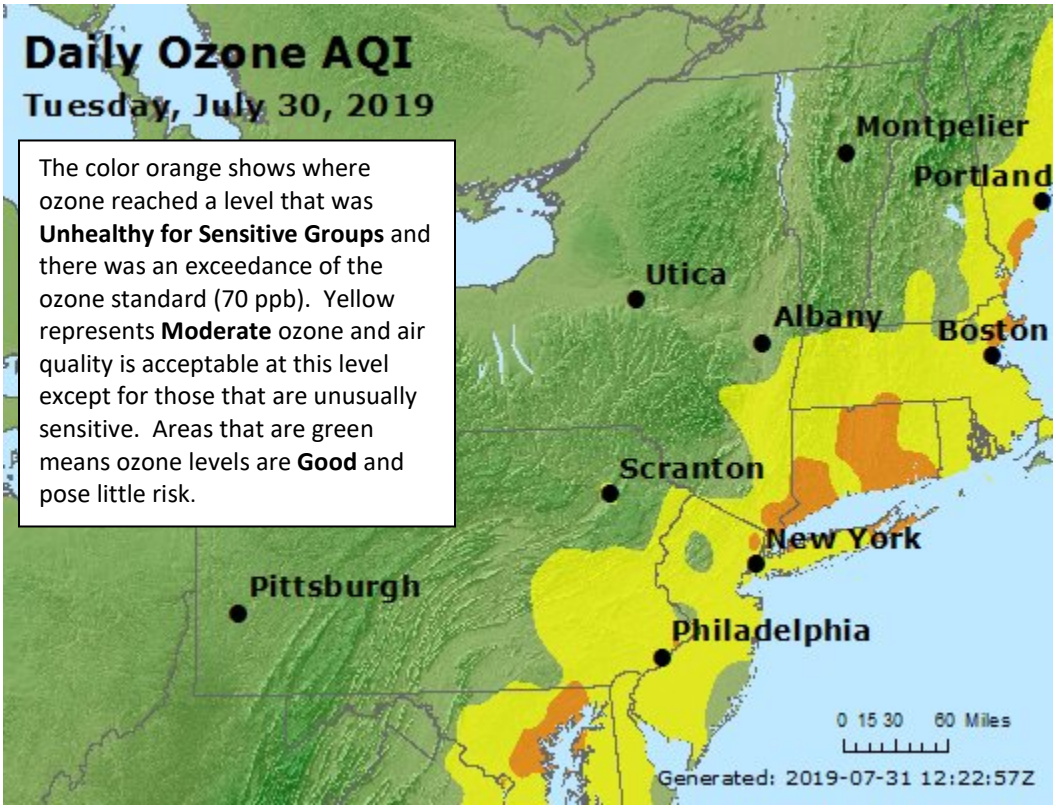
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	75
CT	Greenwich	84
CT	Madison-Beach Road	77
CT	Middletown-CVH-Shed	76
CT	New Haven	66
CT	Stratford	77
CT	Westport	79
DE	BCSP (New Castle Co.)	56
DE	BELLFNT2 (New Castle Co.)	59
DE	KILLENS (Kent Co.)	60
DE	LEWES (Sussex Co.)	50
DE	LUMS 2 (New Castle Co.)	56
DE	MLK (New Castle Co.)	59
DE	SEAFORD (Sussex Co.)	58
MD	Fair Hill	62
NY	Babylon	63
NY	Bronx - IS52	63
NY	CCNY	64
NY	Fresh Kills	65
NY	Holtsville	64
NY	Pfizer Lab	65
NY	Queens	69
NY	Riverhead	70
NY	Rockland Cty	No Data
NY	White Plains	72
PA	BRIS (Bucks Co.)	65
PA	CHES (Delaware Co.)	60
PA	NEWG (Chester Co.)	60
PA	NORR (Montgomery Co.)	59
PA	LAB (Philadelphia Co.)	64
PA	NEA (Philadelphia Co.)	71
PA	NEW (Philadelphia Co.)	67
	TOTAL EXCEEDANCES	8

The number of days in 2019 on which exceedances of the ozone NAAQS were recorded for all the states within New Jersey's ozone non-attainment areas is summarized in Table 3.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Non-Attainment Areas in 2019

STATE	# of Days NAAQS was Exceeded January 1 – July 30, 2019 NAAQS = 70 ppb
Connecticut	15
Delaware	3
Maryland	2
New Jersey	12
New York	10
Pennsylvania	7

Figure 1. Ozone Air Quality Index for July 30, 2019



Source: www.airnow.gov

For ozone terminology definitions see NJDEP Air Quality Planning's Glossary and Acronyms webpage: http://nj.gov/dep/baqp/glossary.html

Weather

High pressure was the dominant weather pattern in the days prior to this high ozone event resulting in multiple days of favorable weather conditions for ozone formation. On Tuesday, July 29th high pressure shifted off the Atlantic coast providing light winds out of the south/southwest. These conditions in combination with a polluted air mass and localized transport into the nonattainment area resulted in several exceedances of the 8-hour average NAAQS for ozone.

As the day progressed, the high pressure off the Mid-Atlantic coast began to push offshore, resulting in a clockwise circulation of moist Atlantic Ocean air into the Northeast. The high-pressure system promoted southwesterly winds, sunny skies, and hot temperatures; all of which are common components to producing high ozone concentrations. As a result, temperatures reached the low 90s across Philadelphia and New Jersey while locations along coastal Connecticut reached the upper 80s. Radar images indicate that a sea breeze front developed in the late afternoon in response to the light winds aloft and at the surface. In this instance, the sea breeze front acted as a cleaning mechanism, thus reducing coastal ozone concentrations in New Jersey. In addition, the surface trough that formed over the Appalachians on Monday progressed further westward and maintained a steady southwesterly flow of hot and humid air up the coast. This pattern favored localized transport and allowed pollutants to accumulate across the nonattainment area for several days.

Based on this weather analysis, the exceedances observed on July 30th can be attributed to multiple days of moderate and scattered unhealthy for sensitive groups (USG) ozone levels within the non-attainment area and upwind. In addition, favorable weather conditions mentioned above in combination with localized transport led to multiple exceedances throughout the non-attainment area.

Where Did the Air Pollution that Caused Ozone Come From?

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedance on July 30, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Nine (9) monitoring stations with an 8-hour average ozone exceedance was used to run back trajectories. The selected site and 8-hour average ozone levels recorded are listed in Table 4 below.

Table 4. Monitoring Stations with an 8-hr Ozone Exceedance that Were Selected to Run 48-hr Back Trajectories

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	75
CT	Greenwich	84
CT	Madison-Beach Road	77
CT	Stratford	77
CT	Westport	79
NJ	Leonia	72
NJ	Rider University	71

NY	White Plains	72
PA	NEA	71

Backward trajectories from July 30th show that air at all levels was influenced by a high-pressure system sliding off the coast of the Southeastern United States. This system provided transport from the Mid-Atlantic states, picking up emissions from cars, trucks, industry and peak demand electric generating units (EGUs) along the way. The transport of previously polluted air combined with favorable meteorological conditions mentioned above caused nine exceedances in the non-attainment area.

At the surface, trajectories originated off the coast of North Carolina and Virginia (Figure 2). The air followed a clockwise rotation around a departing high-pressure system and then moved northward, hugging the coast until it reached Delaware. Here, the trajectory for Philadelphia, Pennsylvania moves further inland and over an already deteriorated air mass before arriving at its destination. The rest of the trajectories continued to move up the coast through New York City before arriving at their destinations in Leonia, New Jersey, and White Plains, New York. In some cases, air also traveled over Long Island and the Sound where peaking units may have been operating before reaching their destination in coastal Connecticut.

Mid and upper level trajectories show pathways further inland than at the surface. At mid-levels (Figure 3), most of the trajectories originated in North Carolina, while two originated in West Virginia. Following rotation around the high pressure, they traveled in a northeasterly direction, picking up emissions from cars, trucks, industry and power plants as they moved through the cities of Washington DC, Baltimore, and Wilmington, before reaching one destination in Philadelphia. From there, air traveled up the I-95 corridor and through the New York City metropolitan area to their destinations in New Jersey, New York, and Connecticut. At upper-levels (Figure 4), trajectories originate from further west over Ohio and West Virginia. The pathways at this level also follow the high-pressure rotation, picking up emissions from industry and power plants while passing over North Carolina, Maryland, and Pennsylvania before converging and following a similar path to the mid-level trajectories. Air at this level has a gentle sinking motion as well which allowed for polluted air to mix down to the surface.

Figure 5 shows the national Air Quality Index observed on July 29th, the day prior to this exceedance episode. As shown in the figure, widespread areas of moderate air quality were observed in the Mid-Atlantic as well as the New York City metropolitan area and Connecticut. Baltimore, Maryland, Long Island, New York, and coastal Connecticut all observed ozone values in the unhealthy for sensitive groups (USG) category. Back trajectories for July 30th suggest that previously polluted air was transported into the non-attainment area at all levels of the atmosphere. Localized transport of industrial emissions, favorable meteorological conditions, and deteriorated air quality from days prior led to multiple exceedances in the non-attainment area.

Figure 2. 48-hour Back Trajectories for July 30, 2019 at 10 meters

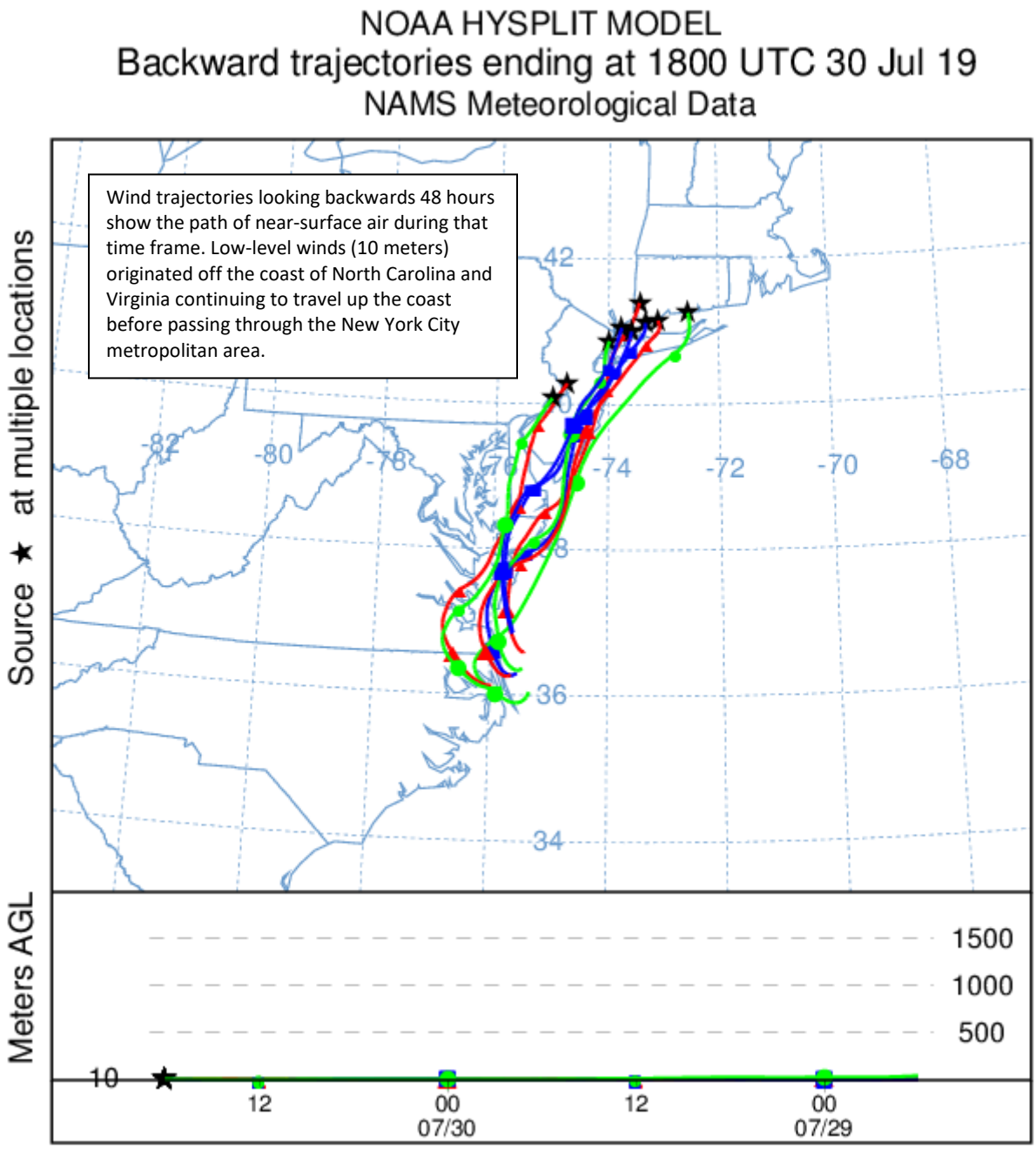


Figure 3. 48-hour Back Trajectories for July 30, 2019 at 500 meters

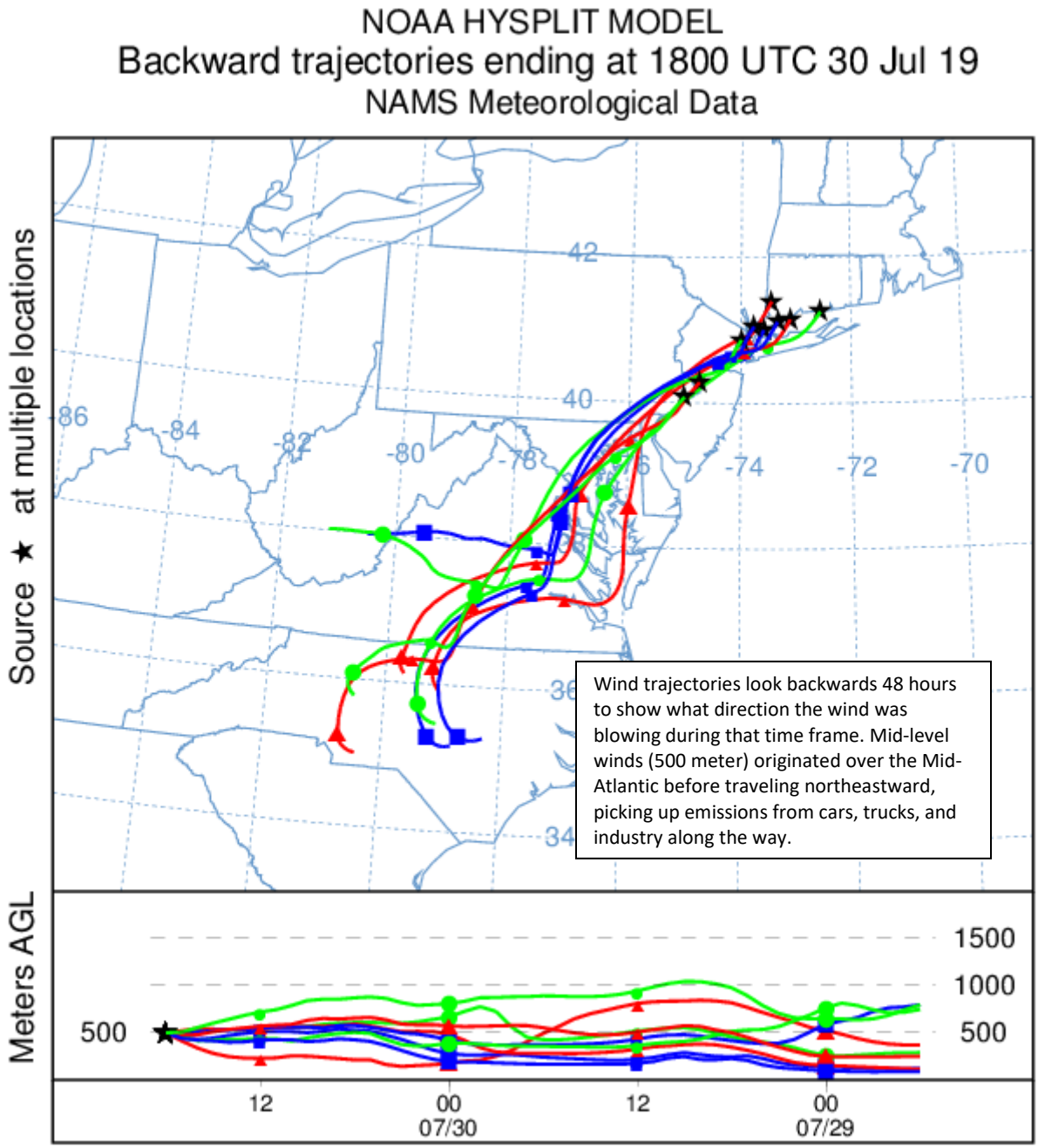


Figure 4. 48-hour Back Trajectories for July 30, 2019 at 1500 meters

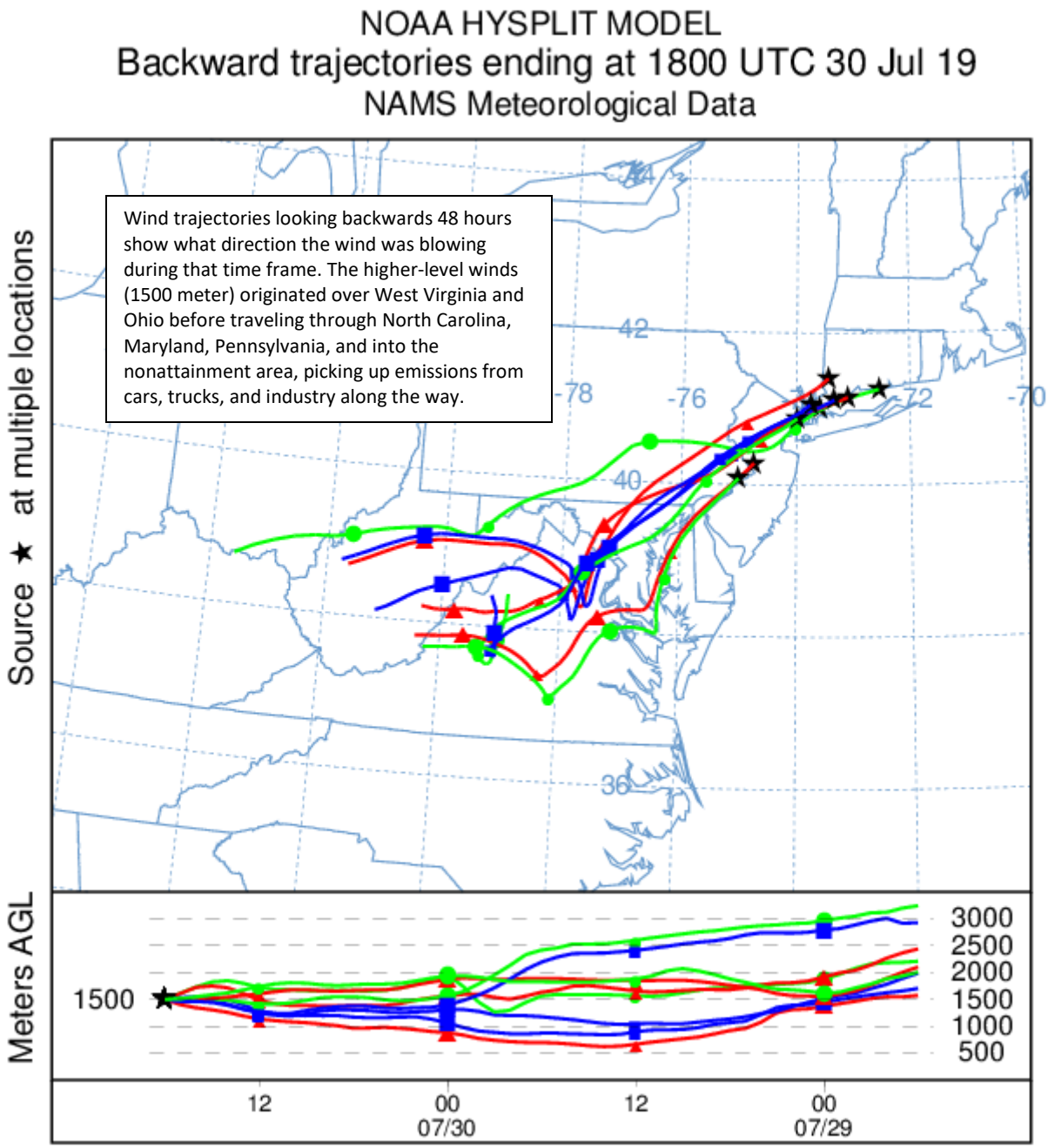
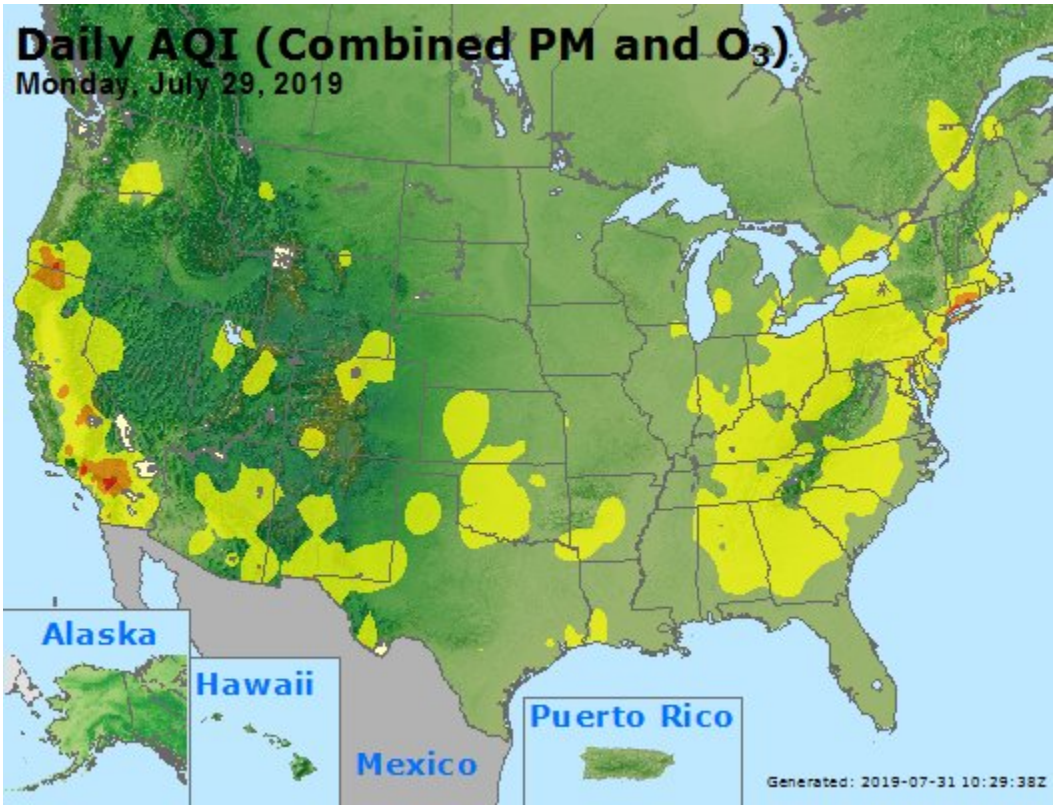


Figure 5. Combined Air Quality Index for the United States on July 29, 2019



Source: www.airnow.gov

How is Ozone Created?

Ground-level ozone is an air pollutant known to cause a number of health effects and negatively impact air quality and the environment in New Jersey. Ozone is formed when oxides of nitrogen (NOx) and volatile organic compounds (VOCs) react in the presence of sunlight. Ozone can irritate any person's lungs, but the effect may be more pronounced for those with existing lung-related deficiencies, and therefore, one should take extra precautions on bad ozone days.

Find Out About Air Quality Every Day

The "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ tells you how to sign up to receive notifications and find out when your local air has reached unhealthy ozone levels.