Ozone National Ambient Air Quality Standard Health Exceedances on May 19, 2021

Exceedance Locations and Levels

On Wednesday, May 19, 2021, there were five (5) exceedances 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 5/19/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	72
Bayonne	65
Brigantine	68
Camden Spruce St	67
Chester	64
Clarksboro	71
Colliers Mills	75
Columbia	53
Flemington	63
Leonia	66
Millville	74
Monmouth University	79
Newark Firehouse	61
Ramapo	54
Rider University	67
Rutgers University	68
Washington Crossing*	63
TOTAL EXCEEDANCES	5

*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 nonattainment areas, there were three (3) exceedances of the ozone NAAQS. See Table 2.

Table 2. Ozone Concentrations at Out-of-State Monitoring Stations in New Jersey's Ozone Nonattainment Areas on 5/19/2021

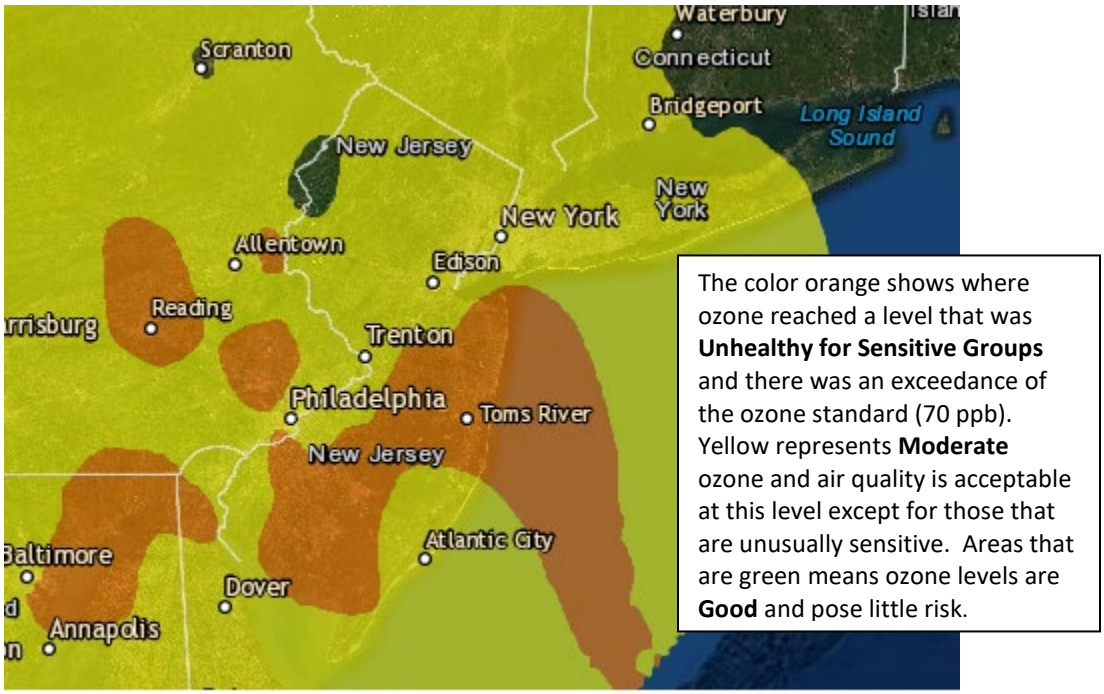
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	54
CT	Greenwich	63
CT	Madison-Beach Road	52
CT	Middletown-CVH-Shed	54
CT	New Haven	51
CT	Stratford	55
CT	Westport	60
DE	BCSP (New Castle Co.)	67
DE	BELLFNT2 (New Castle Co.)	67
DE	KILLENS (Kent Co.)	66
DE	LEWES (Sussex Co.)	60
DE	LUMS 2 (New Castle Co.)	71
DE	MLK (New Castle Co.)	66
DE	SEAFORD (Sussex Co.)	62
MD	Fair Hill	72
NY	Babylon	64
NY	Bronx - IS52	61
NY	CCNY	60
NY	Fresh Kills	68
NY	Holtsville	56
NY	Pfizer Lab	61
NY	Queens	68
NY	Riverhead	56
NY	Rockland Cty	59
NY	White Plains	59
PA	BRIS (Bucks Co.)	69
PA	CHES (Delaware Co.)	69
PA	NEWG (Chester Co.)	60
PA	NORR (Montgomery Co.)	73
PA	LAB (Philadelphia Co.)	69
PA	NEA (Philadelphia Co.)	70
PA	NEW (Philadelphia Co.)	70
	TOTAL EXCEEDANCES	3

The number of days in 2021 on which exceedances of the ozone NAAQS were recorded for all the states within New Jersey's ozone nonattainment areas is summarized in Table 3.

Table 3. Number of Days Ozone NAAQS was Exceeded in NJ's Nonattainment Areas in 2021

STATE	# of Days NAAQS was Exceeded January 1 – May 19, 2021 NAAQS = 70 ppb
Connecticut	0
Delaware	1
Maryland	1
New Jersey	1
New York	0
Pennsylvania	1

Figure 1. Ozone Air Quality Index for May 19, 2021



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

A large swath of high pressure was located over much of the east coast on Wednesday, May 19th, with a cold front approaching the area from the northeast. Favorable meteorological conditions, a buildup of pollutants, and the position of this front as well as a sea breeze front allowed ozone concentrations in southern New Jersey, parts of Eastern Pennsylvania, and northern Delaware and Maryland to exceed the ozone NAAQS.

High pressure centered over the Mid-Atlantic dominated the weather pattern for multiple days leading up to the May 19th exceedance. This allowed for multiple days of sunny skies and temperatures in the high 70s and 80s across the region, all conditions conducive for ozone formation. Ozone had begun to build up over the area, as well as areas upwind, leading up to the May 19th exceedance. On the morning of May 19th, a cold front began to make its way through New England and approach our area from the northeast. This "backdoor" cold front then pushed through Connecticut and New York City by early afternoon and stalled before it could cross into New Jersey. The front was able to clean out the areas it passed over and kept ozone levels within the good and moderate categories. However, areas to the west of this front did not have this influence, and ozone continued to build over the previously polluted air mass from days prior. Winds across the region were generally from the northwest, however, a sea breeze was able to develop along the Connecticut and New Jersey coasts as well as over Long Island. This allowed an onshore flow at these locations. The position of the front with the influence of a sea breeze allowed pollutants to build up over southern New Jersey, Eastern Pennsylvania, and parts of northern Delaware and Maryland.

The ozone exceedances observed over southern New Jersey, can be attributed to the buildup of pollutants for the days prior to May 19th, as well as the position of a backdoor cold front and a sea breeze that allowed pollutants to build up even more over these areas.

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 exceedances on May 19, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Eight monitoring stations were chosen to model back trajectories and are listed in Table 4.

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)
NJ	Ancora State Hospital	72
NJ	Clarksboro	71
NJ	Colliers Mills	75
NJ	Millville	74
NJ	Monmouth University	79
DE	LUMS 2 (New Castle Co.)	71
MD	Fair Hill	72
PA	NORR (Montgomery Co.)	73

Back trajectories from May 18th show that exceedances observed in New Jersey, Pennsylvania, Delaware, and Maryland were heavily influenced by both localized transport along the I-95 Corridor and high-pressure influence. High pressure caused a sinking motion at all levels of the atmosphere that allowed for air transported from the Great Lakes Region, where widespread moderate air quality was observed, to mix down to the surface. This transport, along with favorable weather conditions, led to multiple exceedances throughout the nonattainment area.

The surface back trajectory (Figure 2) shows that the majority of surface-level air entered the area from the Chesapeake Bay region. Under the influence of high-pressure, trajectories travelled in a clockwise rotation, passing through the metropolitan areas of Washington D.C., Baltimore, and Philadelphia, before reaching their respective endpoints. It is worth note, air traveled slowly and at the surface for much of its path, transporting not only emissions from cars, truck, and industry up the I-95 corridor but, previously polluted air from the Chesapeake Bay region. Air impacting the Monmouth University area originated over the Great Lakes Region and traversed in a southeasterly direction through New York and the northeast section of Pennsylvania. Additionally, areas of USG were noted in the trajectory's path the day leading up to this exceedance event. As such, it is likely that this air at the surface, under favorable weather conditions, became increasingly polluted throughout the day.

In Figure 3, the mid-level back trajectories that entered New Jersey (500 meters) originated in the Great Lakes and southern Canadian region, an area that observed widespread moderate and isolated areas of unhealthy for sensitive groups (USG) the day prior, as seen in Figure 5. These trajectories traveled in a clockwise direction around high pressure centered over the eastern United States, and experienced a sinking motion towards the surface throughout the entirety of its path. As the mid-level air approached the nonattainment zone, it traversed over the heavily industrialized metropolitan centers of Philadelphia and New York City, picking up ozone precursors aloft and transporting them towards the surface. A second set of trajectories that arrived in Delaware and Maryland originated in eastern Virginia, and meandered around the Delmarva region under the influence of overhead high pressure. The mid-level air in this region traversed very slowly throughout its path compared to the other trajectories, allowing for enhanced gathering of ozone precursors aloft.

Figure 4 shows that the upper-level air (1500 meters) followed an almost identical path to the mid-level trajectories. The majority of the trajectories originated in the Great Lakes and southern Canadian region

as well, and traveled over the major metropolitan centers of Philadelphia and New York City before arriving at its endpoint. The second set of trajectories originated in Maryland and western Pennsylvania. This upper-level air meandered across Pennsylvania, taking almost 2 days to travel across the state to its destination.

Figure 5 shows the National Air Quality Index observed on May 18th, the day prior to this exceedance event. As shown in the figure, widespread moderate ozone levels were observed across the Northeast, Ohio River Valley, and Great Lakes Region on this day, with isolated areas of unhealthy for sensitive groups (USG) in the Great Lakes Region. The regional transport of ozone precursors to a previously polluted surface, in combination with the favorable meteorological conditions mentioned above, led to these exceedances across the southern nonattainment zone.

Figure 2. 48-hour Back Trajectories for May 19, 2021 at 10 meters

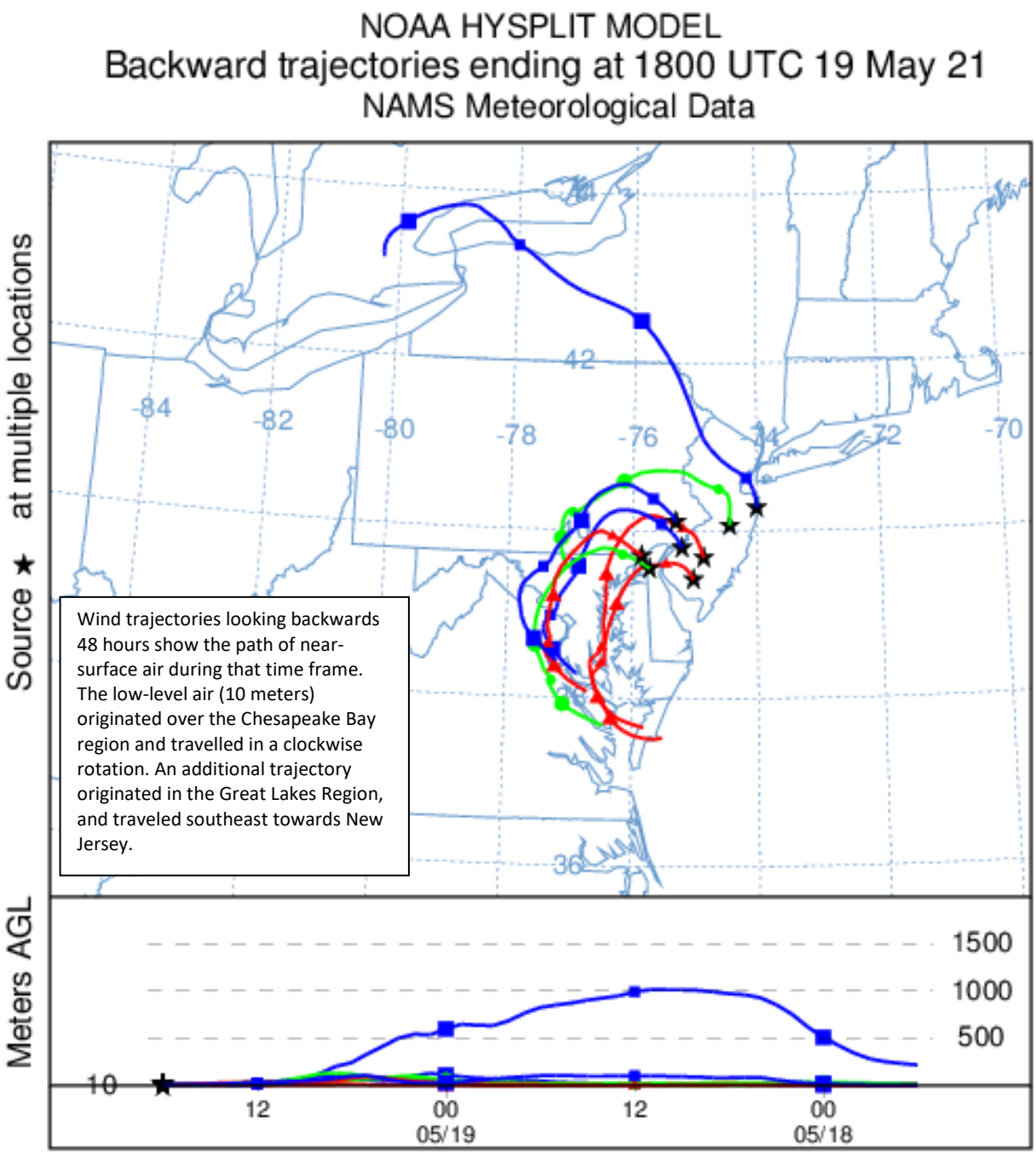


Figure 3. 48-hour Back Trajectories for May 19, 2021 at 500 meters

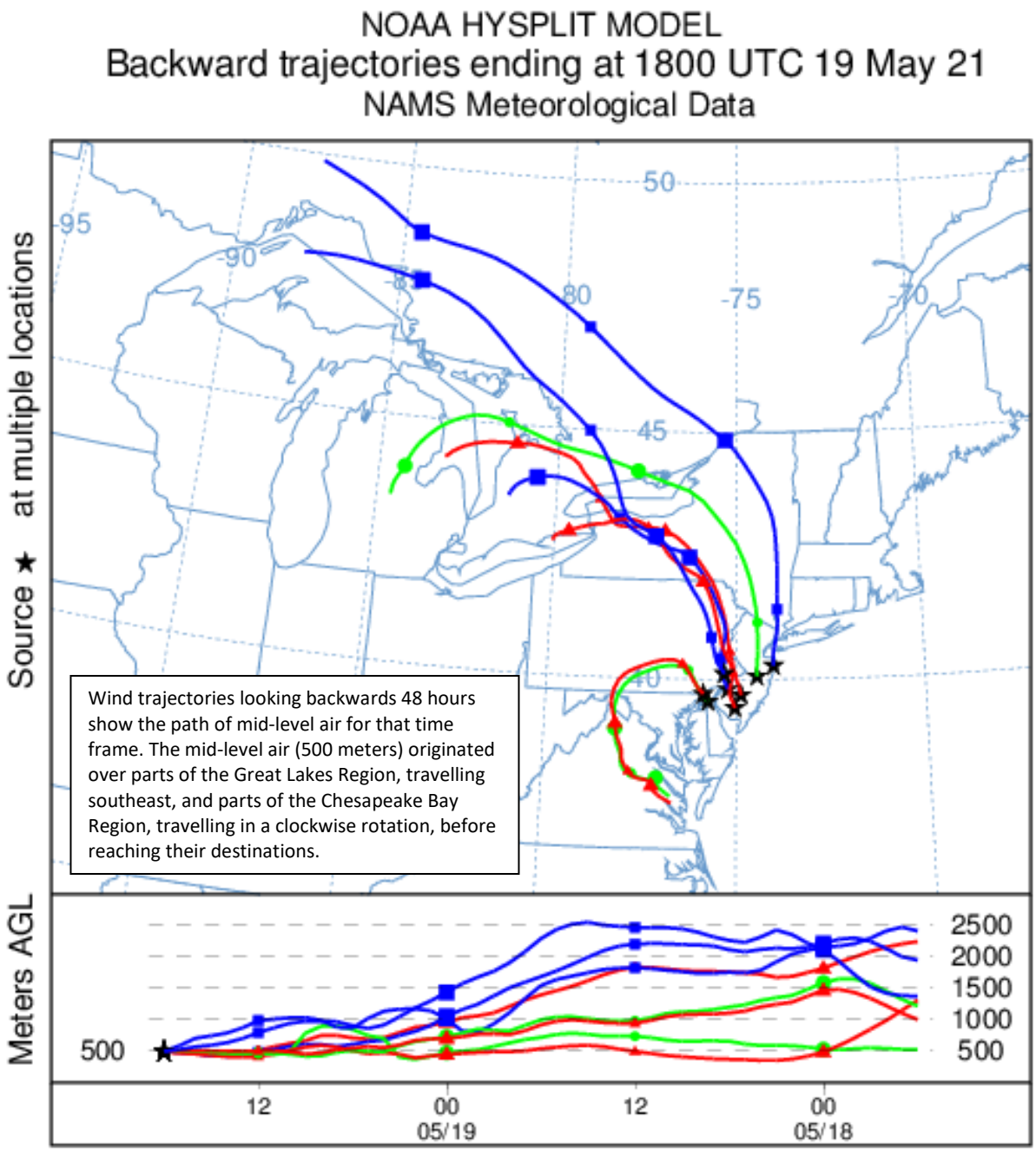


Figure 4. 48-hour Back Trajectories for May 19, 2021 at 1500 meters

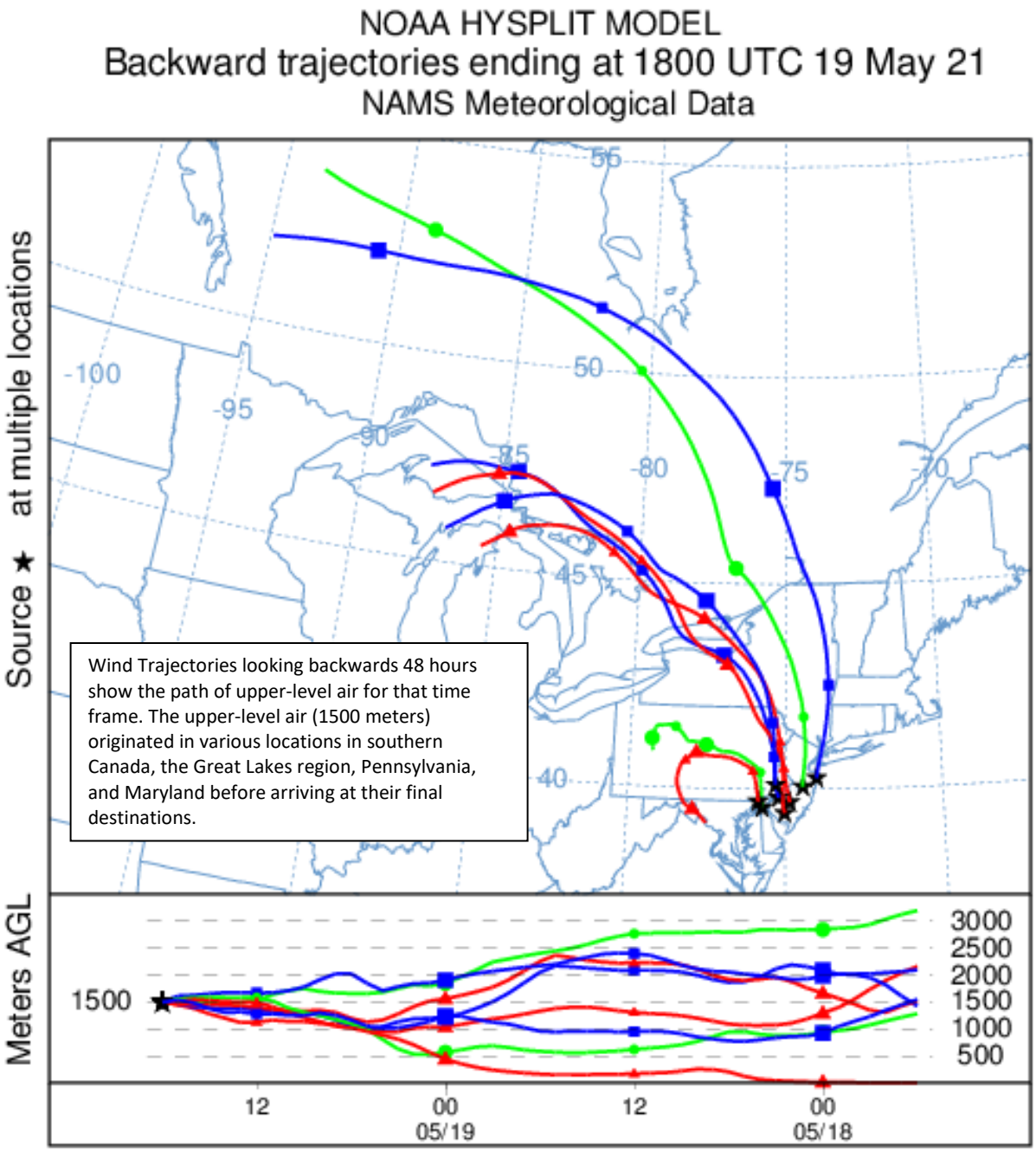
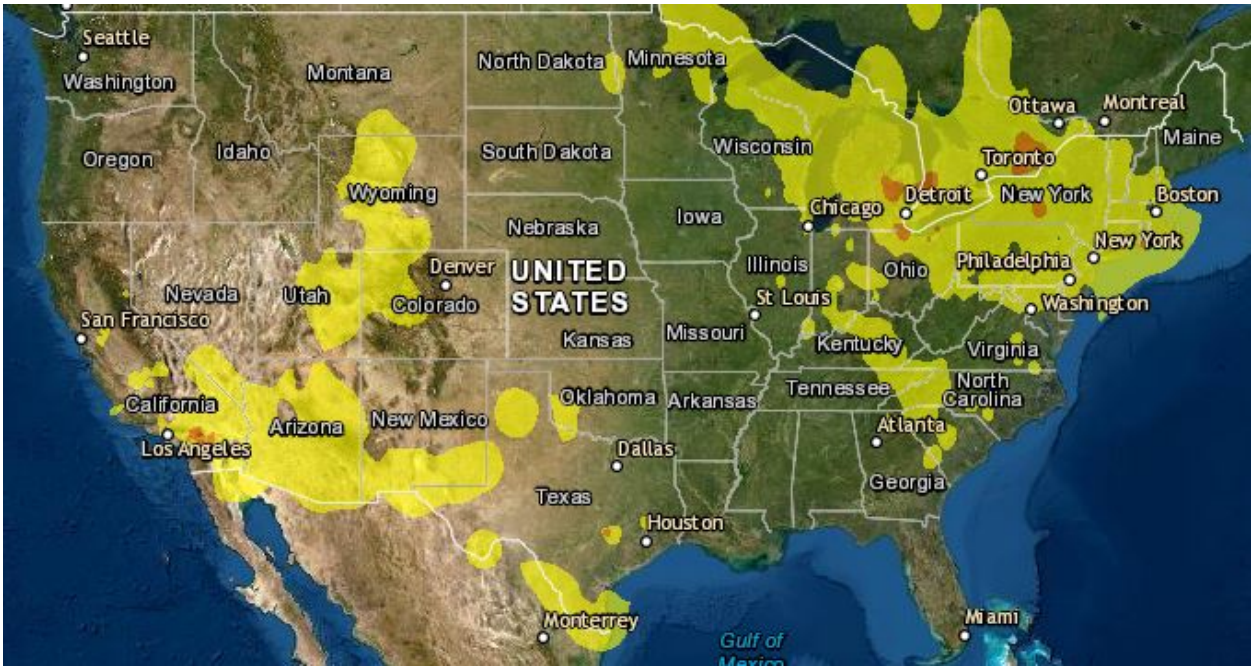


Figure 5. Combined Air Quality Index for the United States on May 18, 2021



Source: www.airnow.gov

How is Ozone Created?

Ground-level ozone is an air pollutant known to cause several 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

Learn more about your local ozone air quality forecast by visiting the "What's Your Air Quality Today?" page at http://www.nj.gov/dep/cleanairnj/ .