Ozone National Ambient Air Quality Standard Health Exceedances on July 19, 2019

Exceedance Locations and Levels

On Friday, July 19, 2019, there were no 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 7/19/2019

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	51
Bayonne	54
Brigantine	41
Camden Spruce St	67
Chester	48
Clarksboro	59
Colliers Mills	60
Columbia	43
Flemington	56
Leonia	66
Millville	54
Monmouth University	51
Newark Firehouse	56
Ramapo	44
Rider University	58
Rutgers University	58
Washington Crossing*	59
TOTAL EXCEEDANCES	0

*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 four (4) 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 7/19/2019

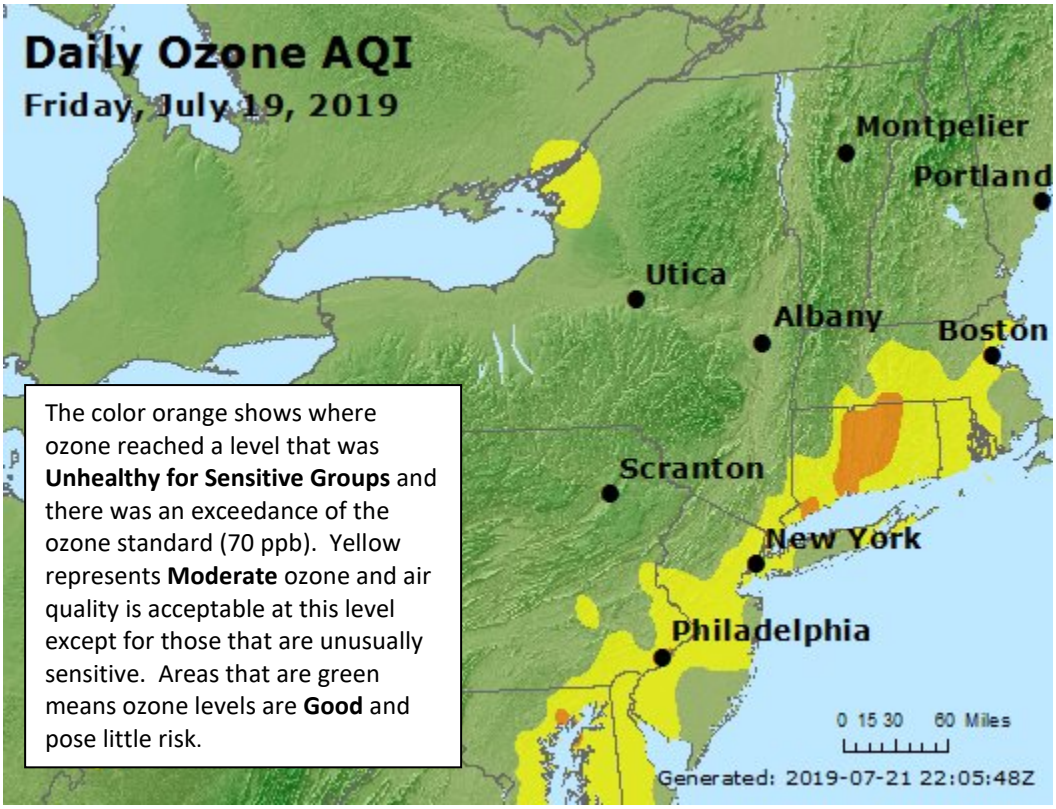
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	66
CT	Greenwich	64
CT	Madison-Beach Road	58
CT	Middletown-CVH-Shed	77
CT	New Haven	71
CT	Stratford	67
CT	Westport	72
DE	BCSP (New Castle Co.)	59
DE	BELLFNT2 (New Castle Co.)	65
DE	KILLENS (Kent Co.)	57
DE	LEWES (Sussex Co.)	53
DE	LUMS 2 (New Castle Co.)	59
DE	MLK (New Castle Co.)	65
DE	SEAFORD (Sussex Co.)	57
MD	Fair Hill	62
NY	Babylon	49
NY	Bronx - IS52	63
NY	CCNY	61
NY	Fresh Kills	56
NY	Holtsville	50
NY	Pfizer Lab	63
NY	Queens	56
NY	Riverhead	56
NY	Rockland Cty	49
NY	White Plains	68
PA	BRIS (Bucks Co.)	64
PA	CHES (Delaware Co.)	60
PA	NEWG (Chester Co.)	56
PA	NORR (Montgomery Co.)	52
PA	LAB (Philadelphia Co.)	58
PA	NEA (Philadelphia Co.)	58
PA	NEW (Philadelphia Co.)	72
	TOTAL EXCEEDANCES	4

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 19, 2019 NAAQS = 70 ppb
Connecticut	10
Delaware	3
Maryland	2
New Jersey	8
New York	8
Pennsylvania	5

Figure 1. Ozone Air Quality Index for July 19, 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

On Friday July 19, 2019, a large region of high pressure began to build from the southeastern United States resulting in exceptionally hot temperatures, sunny skies, and southwesterly winds. These favorable meteorological conditions led to several ozone exceedances in coastal Connecticut and Philadelphia, Pennsylvania.

Early on Friday, a stationary front was in place over northeastern New York State and extended southward over northern New Jersey along with a surface trough to the south of our region. The frontal boundary was attached to a weak low-pressure system off the coast of southern New England. As the morning progressed, the low-pressure center moved further off the coast, causing the stationary front to transition into a warm front and push east over the entire New England region. As the front advanced east, it allowed high pressure in the southeast to move into our region and cause winds to shift primarily out of the southwest. However, the New Jersey and Long Island coastlines saw a primarily southerly wind flow which inhibited ozone formation in these locations. This frontal boundary along with the surface trough allowed for additional mixing of upper level air down to the surface in our non-attainment area. As high pressure built throughout the day, the skies began to clear, allowing surface temperatures to rapidly climb into the mid-upper 90's throughout New Jersey and Pennsylvania with temperatures reaching only the mid 80's for Long Island, NY and Connecticut. Additionally, dewpoints throughout our non-attainment area remained in the mid to upper 70's, resulting in the start of an oppressive heat wave that lasted throughout the weekend.

The meteorological conditions, along with the mixing from the frontal boundary and surface trough, produced favorable conditions for ground level ozone production, which led to exceedances in Philadelphia and coastal Connecticut.

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 July 19, 2019. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Three (3) monitoring stations with 8-hour average ozone exceedances were used to run back trajectories. The selected sites and 8-hour average ozone levels recorded are listed in Table 4 below.

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

STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Westport	72
CT	New Haven	71
PA	NEW	72

The back trajectories from July 19th and the preceding days show that the transport of air at the surface and at upper levels was heavily influenced by high pressure located in the southeastern United States. This pattern resulted in recirculation of locally generated emissions at the surface and transport from industrialized regions to the West. This pattern allowed a previously polluted air mass, in the presence of favorable weather conditions mentioned above, to increase ground-level ozone concentrations.

Surface trajectories (Figure 2) show that air at the surface followed different transport pathways. Air traveling to northern portions of the non-attainment area originated in southern New Hampshire and Connecticut before recirculating around the Boston metropolitan area and northern Connecticut. This air then traveled southwestward through portions of Connecticut and the city of New Haven picking up emissions from cars, trucks, power plants and industry along the way. The air mass then recirculated over Long Island and the Sound, picking up emissions from cars, trucks, industry and power plants, which may have included peak demand electric generating units (EGUs). Meanwhile, air traveling to portions of the southern non-attainment area originated off the coast of North Carolina and traveled northward up the coast. Air at the surface passed through Maryland and Delaware before recirculating around the Philadelphia metropolitan area before reaching its destination. Air at the surface remained at the surface for the duration of its path allowing it to increase in air pollutants through transit.

Back trajectories at the mid-levels (Figure 3) show that the air was highly influenced by an approaching frontal boundary. This front assisted in steering the air out of the north followed by air shifting out of the westerly direction. Air at the mid-levels originated in portions of Ontario and upstate New York and traveled southward through the city of Erie, Pennsylvania. At this time, air passed through heavily industrialized portions of central Pennsylvania, where several large EGUs are located. Trajectories traveling to Connecticut also passed over Scranton, PA, and the New York City metropolitan area before reaching its endpoint. Meanwhile, air impacting the southern non-attainment area passed through Lancaster, PA and Philadelphia, where it may have picked up additional emissions from cars, trucks, power plants and industry. Air at the mid-levels originated at higher levels of the atmosphere and mixed down to 500m during transit.

Upper level trajectories (Figure 4) show that air at higher levels was highly influenced by high pressure located in the southeastern United States. As a result, air at this level followed the perimeter of high pressure leading to transport predominantly from the west. Upper level trajectories originated in the Mid-West and traveled westward through the Ohio River Valley which is historically known for its industrialized cities. Air at the upper levels also passed through industrialized portions of western and central Pennsylvania. Similar to the mid-levels, trajectories followed different pathways before reaching their destinations. Air traveling toward southeastern PA passed through the cities of Lancaster and Philadelphia enhancing an already polluted air mass. Meanwhile, air traveling toward coastal Connecticut passed through New York State and the New York City metropolitan area before reaching its endpoint. These upper level trajectories were previously polluted from multiple days of hot, sunny weather and picked up emissions from industrialized areas and power plants as it traversed the Mid-West and Lower Great Lakes Regions.

Figure 5 shows the national Air Quality Index observed on July 18th, the day prior to this exceedance episode. As shown in the figure, some isolated locations of moderate air quality were observed over the Great Lakes region and Ohio. This air mass grew increasingly polluted as it traveled eastward before it was transported into the northeast. Back trajectories for July 19th suggest that localized transport and influence from industrial locations and power plants to the west combined with favorable weather

conditions led to several exceedances in the northern and southern portions of the non-attainment area.

Figure 2. 48-hour Back Trajectories for July 19, 2019 at 10 meters

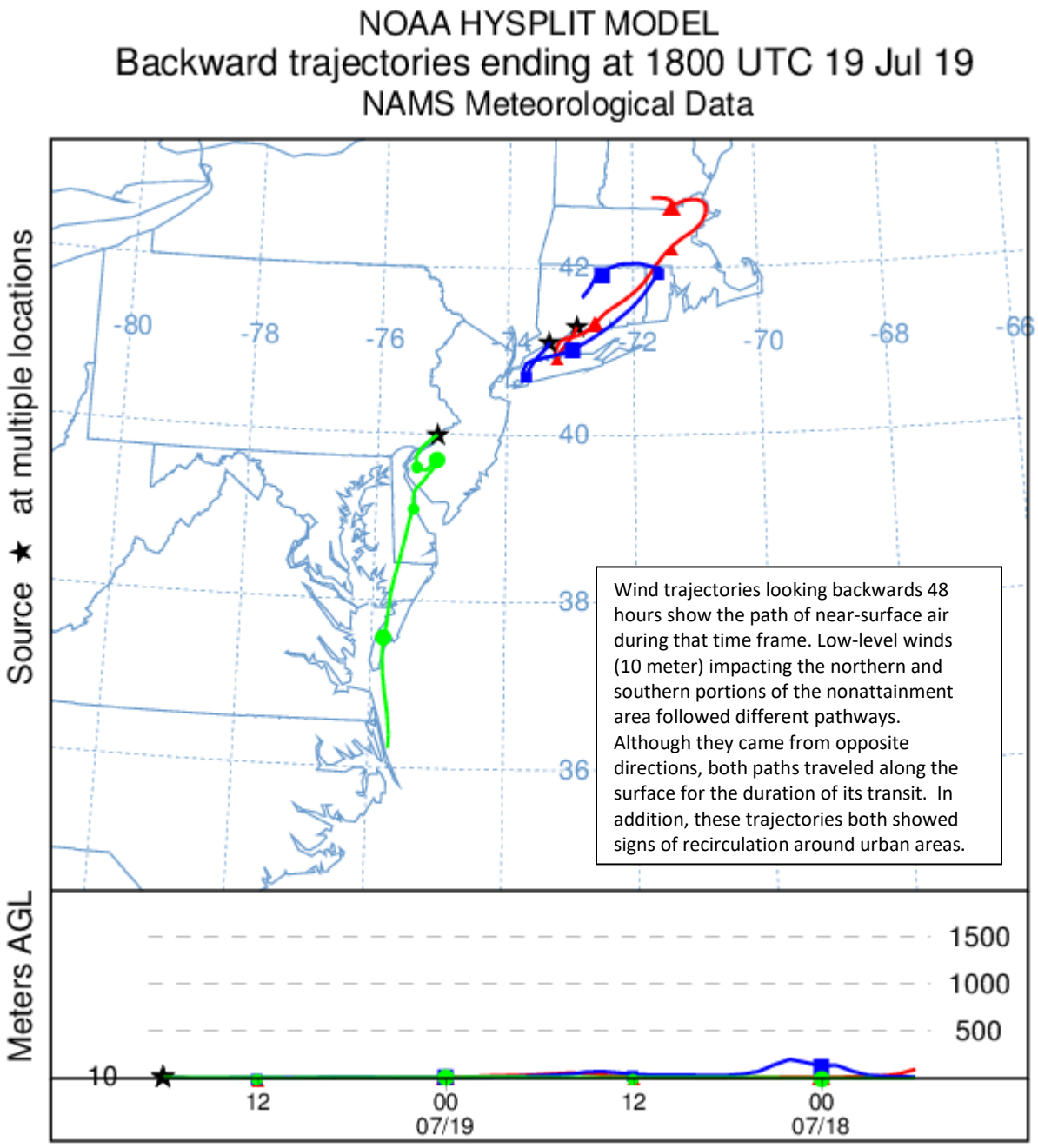


Figure 3. 48-hour Back Trajectories for July 19, 2019 at 500 meters

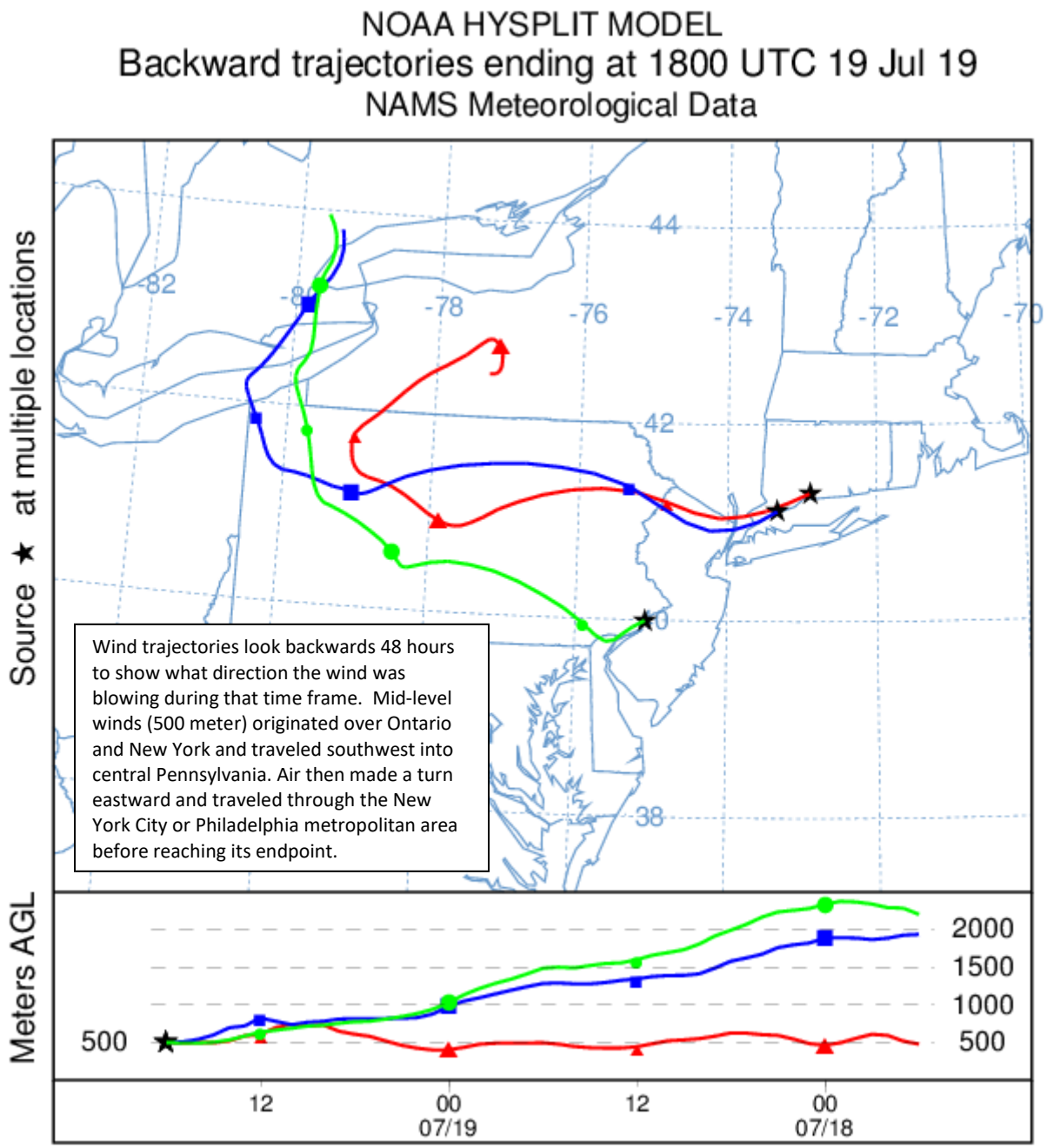


Figure 4. 48-hour Back Trajectories for July 19, 2019 at 1500 meters

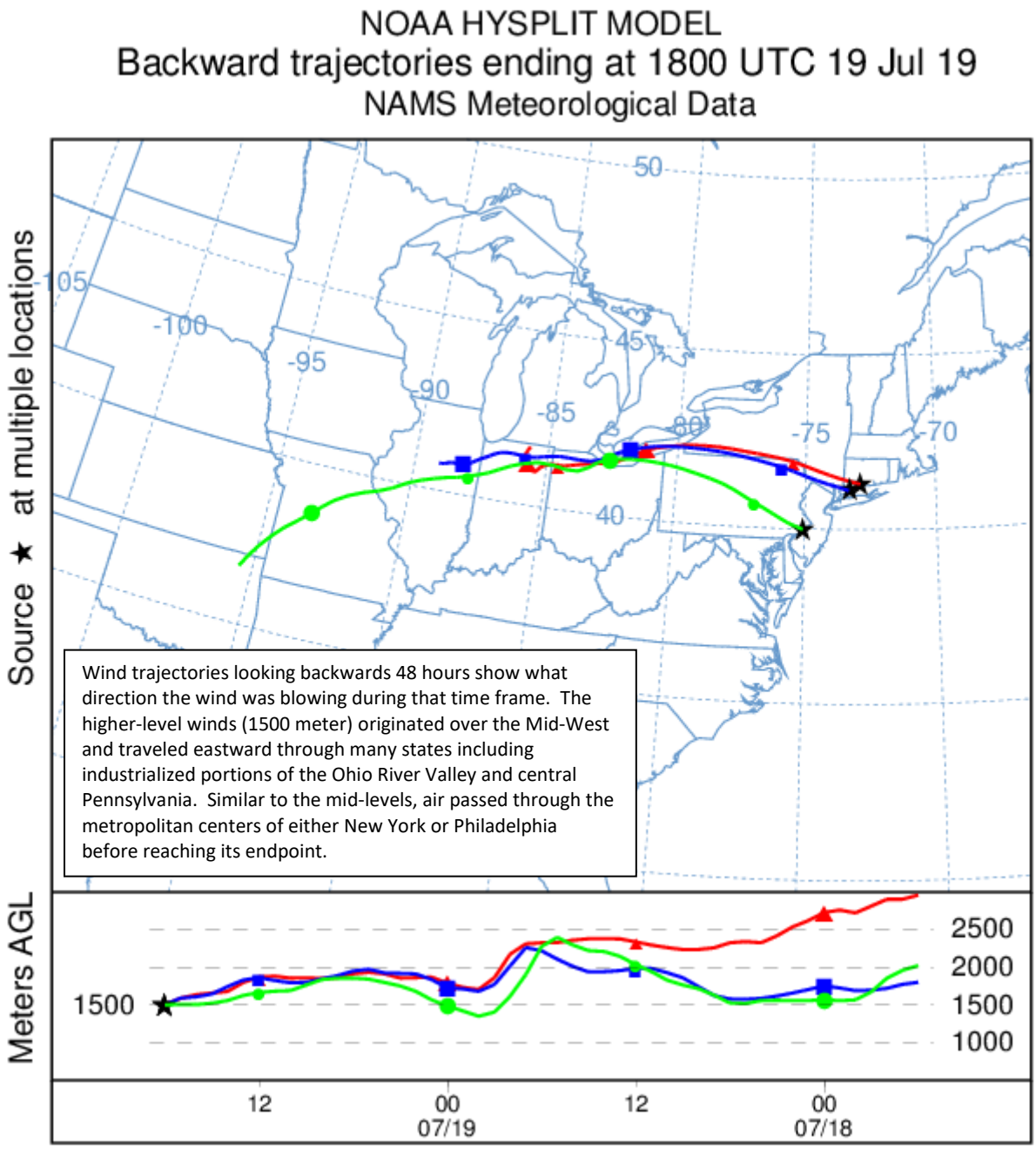
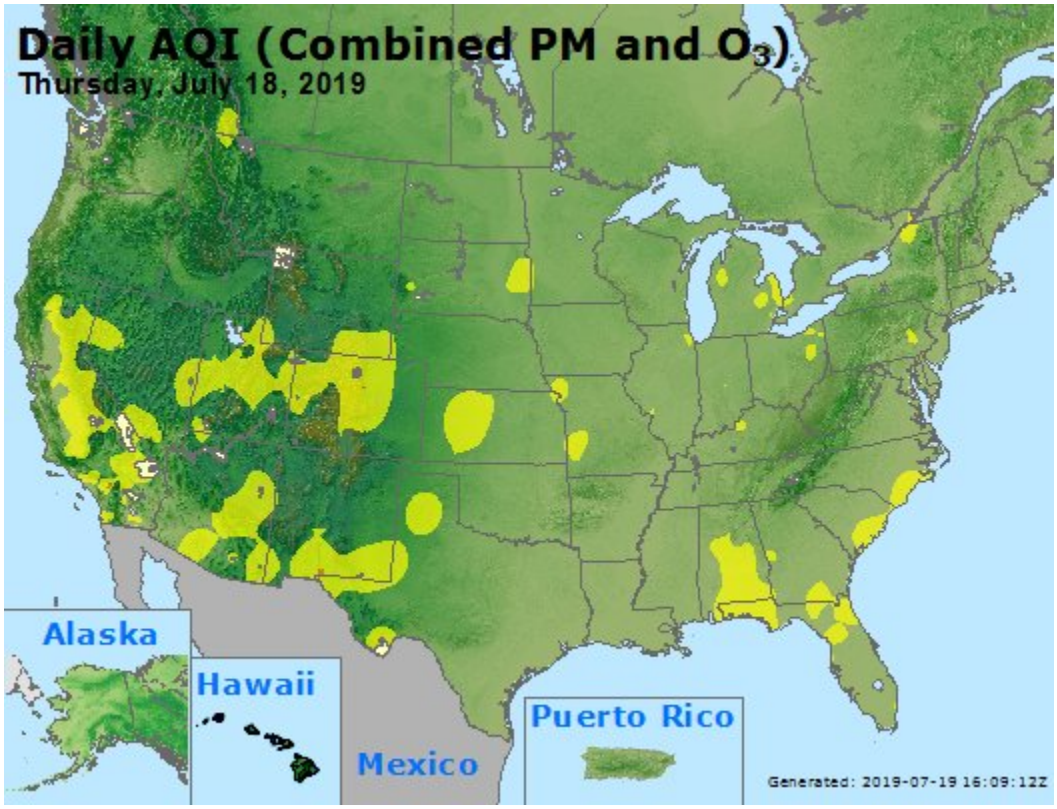


Figure 5. Air Quality Index for the United States on July 18, 2019



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.