Ozone National Ambient Air Quality Standard Health Exceedances on July 15, 2021

Exceedance Locations and Levels

On Thursday, July 15, 2021, 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 7/15/2021

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	40
Bayonne	67
Brigantine	44
Camden Spruce St	63
Chester	53
Clarksboro	52
Colliers Mills	55
Columbia	51
Flemington	53
Leonia	47
Millville	48
Monmouth University	60
Newark Firehouse	62
Ramapo	50
Rider University	No Data
Rutgers University	67
Washington Crossing*	58
TOTAL EXCEEDANCES	0

*The Washington Crossing station is operated and maintained by EPA as part of the nationwide Clean 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 7/15/2021

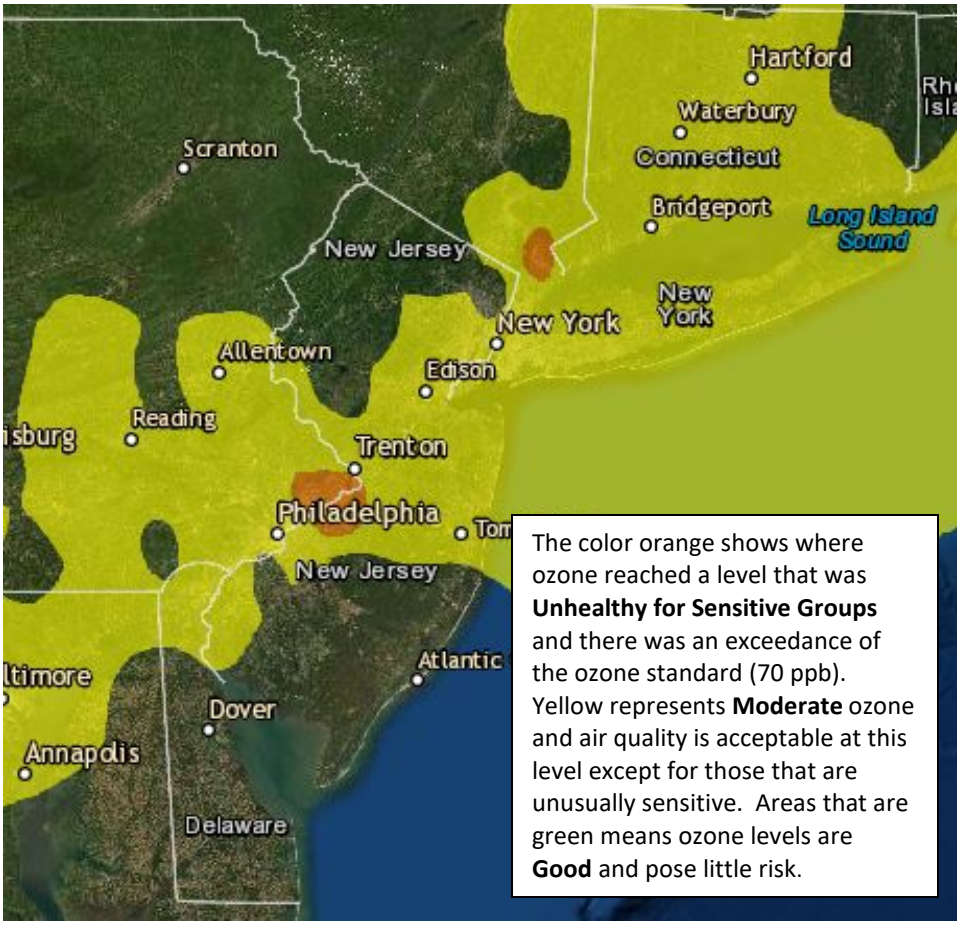
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	65
CT	Greenwich	57
CT	Madison-Beach Road	58
CT	Middletown-CVH-Shed	64
CT	New Haven	60
CT	Stratford	59
CT	Westport	62
DE	BCSP (New Castle Co.)	56
DE	BELLFNT2 (New Castle Co.)	55
DE	KILLENS (Kent Co.)	44
DE	LEWES (Sussex Co.)	41
DE	LUMS 2 (New Castle Co.)	54
DE	MLK (New Castle Co.)	58
DE	SEAFORD (Sussex Co.)	37
MD	Fair Hill	63
NY	Babylon	No Data
NY	Bronx - IS52	65
NY	CCNY	65
NY	Flax Pond	59
NY	Fresh Kills	70
NY	Holtsville	65
NY	Pfizer Lab	69
NY	Queens	35
NY	Riverhead	57
NY	Rockland Cty	56
NY	White Plains	71
PA	BRIS (Bucks Co.)	77
PA	CHES (Delaware Co.)	64
PA	NEWG (Chester Co.)	53
PA	NORR (Montgomery Co.)	61
PA	LAB (Philadelphia Co.)	66
PA	NEA (Philadelphia Co.)	71
PA	NEW (Philadelphia Co.)	69
	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 – July 15, 2021 NAAQS = 70 ppb
Connecticut	11
Delaware	2
Maryland	3
New Jersey	5
New York	8
Pennsylvania	7

Figure 1. Ozone Air Quality Index for July 15, 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

Bermuda high pressure set up over much of the eastern United States on Thursday, July 15th. This brought hot and humid conditions to the region. Meanwhile, a surface trough stationed over the I-95 corridor allowed for the mixing of pollutants aloft to the surface, concentrating much of the ozone formation in this area. Although meteorological conditions were conducive for ozone formation, scattered cumulus clouds over the area were able to limit this formation enough in most areas, which led to there being only a few isolated exceedances in Pennsylvania and New York.

High pressure centered over Bermuda moved offshore during the morning hours of July 15th. This allowed for another hot and humid day across the region, with temperatures reaching the upper 80s across much of the region. As the afternoon progressed, a sea breeze developed over Long Island and New Jersey as a surface trough moved over the I-95 corridor. Some brief, isolated storms developed along these boundaries, with plenty of fair-weather cumulus developing throughout much of the region. Calm to light southwest winds were observed in New Jersey and eastern Pennsylvania, while a light southerly flow over Connecticut was observed and a light southeast wind over the New York City Metropolitan area. This allowed for localized transport of emissions from cars, trucks, and industry along the I-95 corridor. The surface trough provided vertical motion in the atmosphere, mixing down pollutants aloft, enhancing ozone formation to areas along the I-95 corridor, where isolated locations in Pennsylvania and New York reached the unhealthy for sensitive groups category. Despite these favorable conditions, spotty cloud cover across the area was able to limit ozone formation in other locations, where moderate air quality was observed throughout much of the nonattainment area.

Favorable weather conditions, along with localized transport of pollutants were all factors that led to the isolated exceedances in Pennsylvania and New York.

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 15, 2021. The figures illustrate where the air came from during the 48 hours preceding the 8-hour ozone standard exceedances. Three 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)
NY	White Plains	71
PA	Bristol	77
PA	NEA	71

Back trajectories from July 15th show that air at the surface traveled off of, and along, the Mid-Atlantic coast, while air at upper levels came from a westerly direction and traveled along a large area of high pressure over the region. Surface trajectories were able to pick up emissions at the ground while the gentle sinking motion aloft, due to the influence of a surface trough, allowed pollutants to mix down to

the surface. This, in combination with the favorable meteorological conditions mentioned above, led to the exceedances in Pennsylvania and New York.

The surface-level back trajectories (Figure 2) show that air originated over Virginia and travelled in a northeasterly direction. From there, trajectories traversed over the Chesapeake Bay Region and Delaware, where they likely picked up emissions from cars, trucks, and industry. Traveling at ground level during their path, the trajectories continued to pick up emissions as they moved northeastward over Philadelphia, where two trajectories would arrive at their destinations. One additional air parcel originated off the coast of New Jersey and travelled in a westerly direction. The parcel then took a sharp turn and moved in a northeasterly direction. Under the influence of high pressure, the air parcel continued in clockwise direction around its destination in New York, allowing optimal time to pick up ozone precursors from previously polluted air.

Mid and upper-level back trajectories (Figures 3 & 4) followed similar transport pathways. Air Parcels orginated over parts of Tennessee, Kentucky, and Illonois, before travelling in a generally eastern direction, while passing over many states during transit. Trajectories then travesed in a clockwise rotation following the perimeter of high pressure, over the heavily populated and industrialized region of the Ohio River Valley. Air parcels proceeded to travel over central and southern portions of Pennsylvania, along with portions of northern Maryland. It is likely, after exiting this region that trajectories accumulated pollutants from various metropolitan centers such as Pittsburg and Washington D.C.before arriving at the exceedance locations in Pennsylvania and New York. Under the influence of persistent high pressure, as well as the presence of a surface trough, air at both levels made a descent to lower elevations which may have provided an opportunity for polluted air aloft to mix down to the surface.

Figure 5 shows the National Air Quality Index observed on July 14th, the day prior to this exceedance event. As shown in the figure, a few isolated areas in the nonattainment zone reached the moderate category the day before, indicating that previously polluted air was transported to the surface from upper levels. Despite the lack of widespread moderate and unhealthy for sensitive groups air quality in the region, southwesterly winds were able to transport a plume of ozone precursors into Pennsylvania and New York from upwind locations including the Baltimore area. All these conditions, along with favorable meteorological conditions mentioned above, allowed ground level ozone concentrations to reach the USG category in isolated locations.

Figure 2. 48-hour Back Trajectories for July 15, 2021 at 10 meters

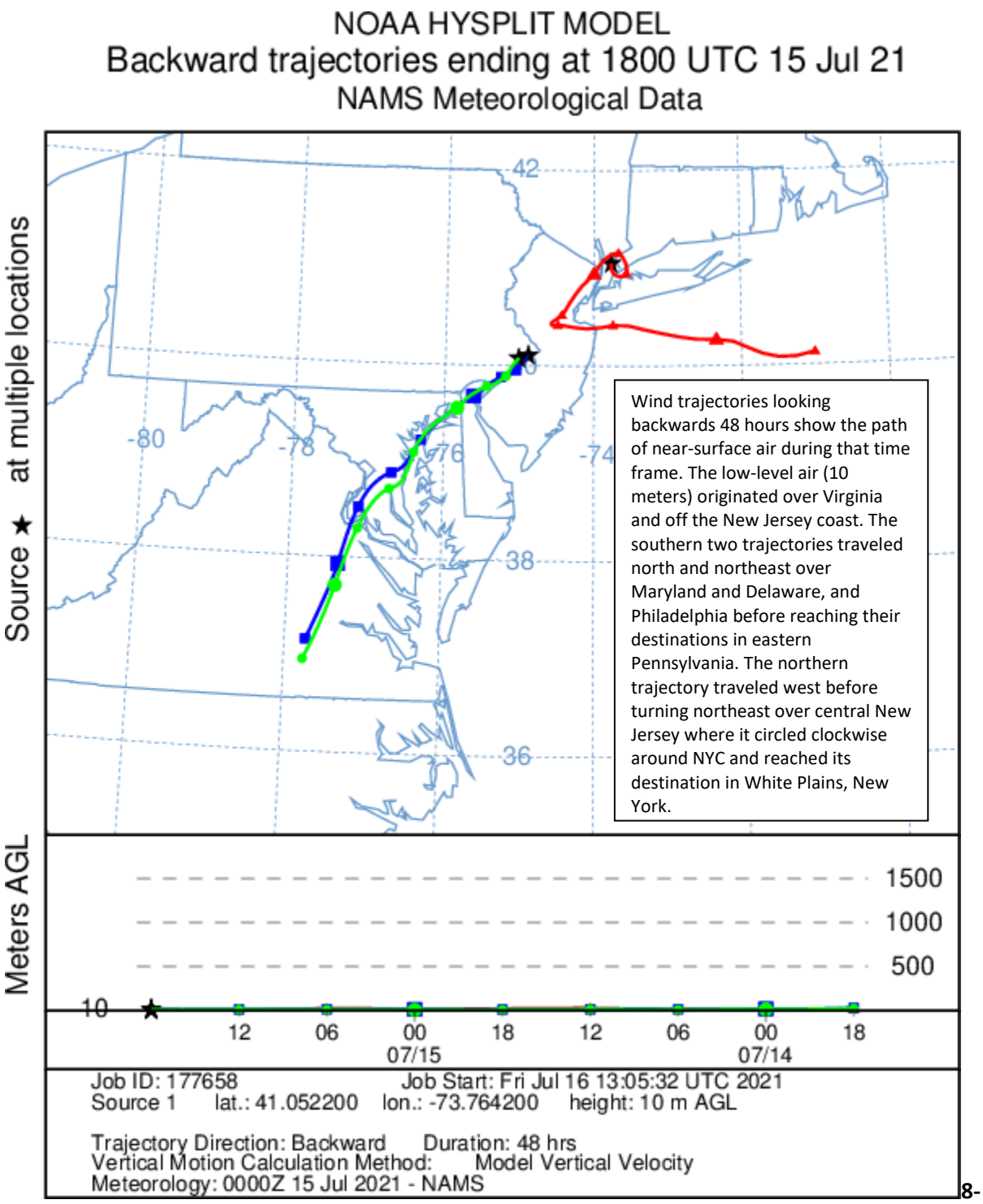


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Figure 3. 48hour Back Trajectories for July 15, 2021 at 500 meters

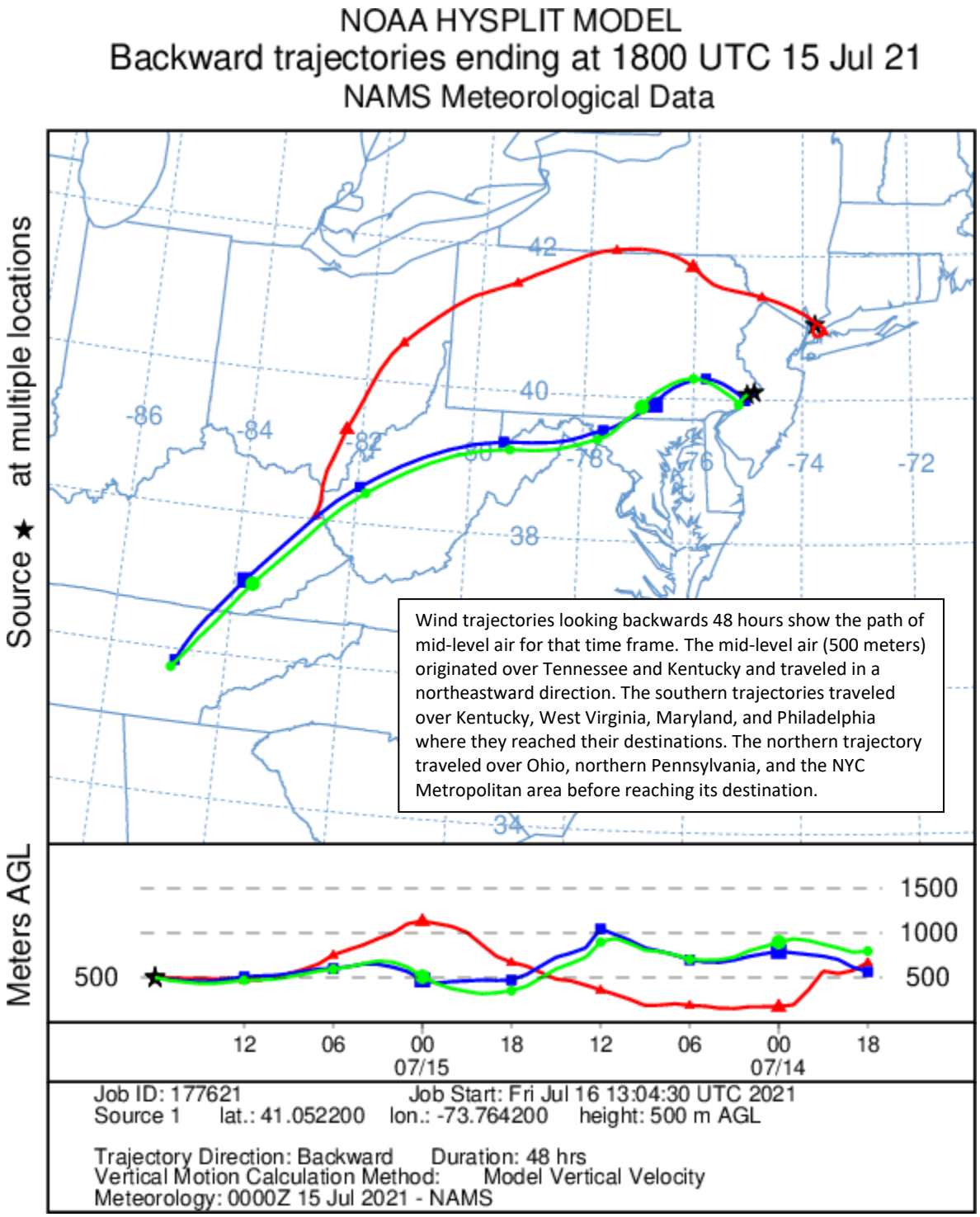


Figure 4. 48-hour Back Trajectories for July 15, 2021 at 1500 meters

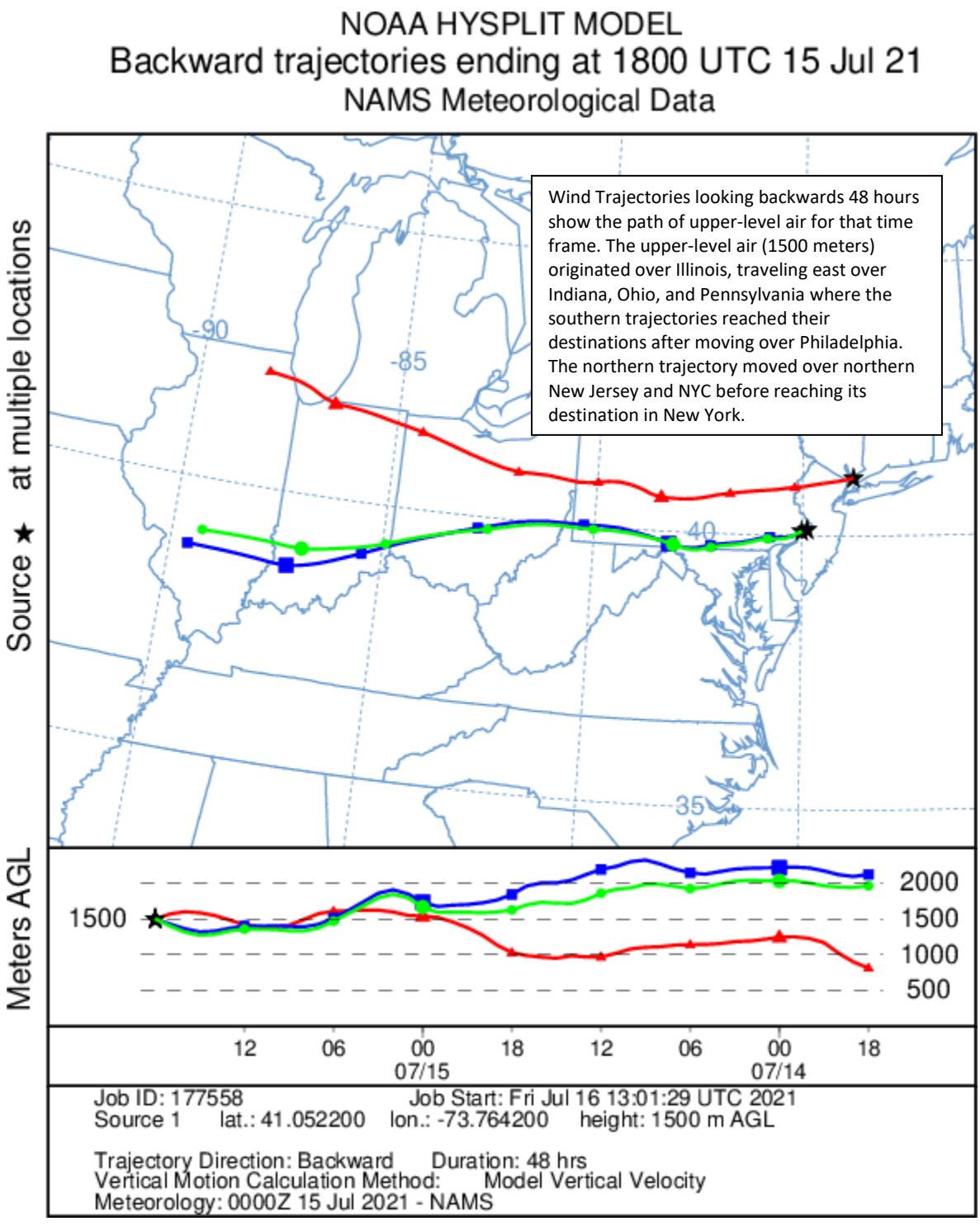
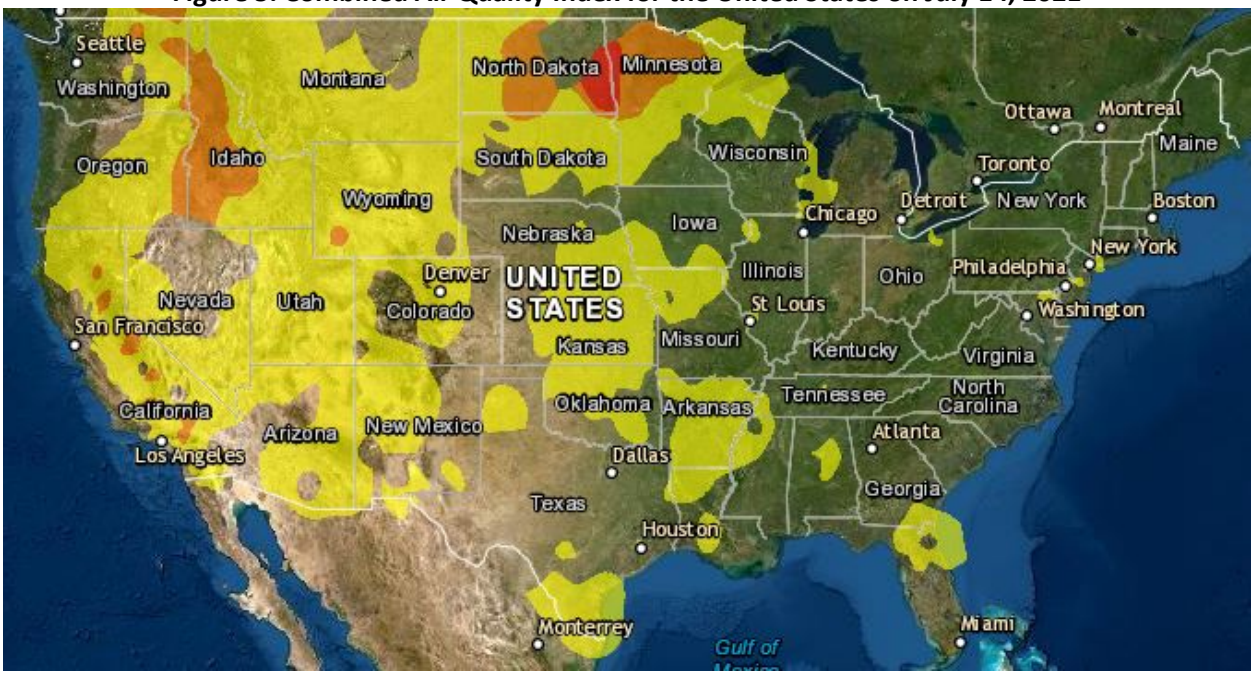


Figure 5. Combined Air Quality Index for the United States on July 14, 2021



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/ .