Ozone National Ambient Air Quality Standard Health Exceedances on August 24, 2020

Exceedance Locations and Levels

On Monday, August 24, 2020, 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 8/24/2020

STATION	Daily Maximum 8-Hr Average (ppb)
Ancora State Hospital	47
Bayonne	47
Brigantine	38
Camden Spruce St	41
Chester	52
Clarksboro	53
Colliers Mills	59
Columbia	39
Flemington	46
Leonia	53
Millville	45
Monmouth University	63
Newark Firehouse	54
Ramapo	44
Rider University	52
Rutgers University	49
Washington Crossing*	49
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 non-attainment 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 Non-Attainment Areas on 8/24/2020

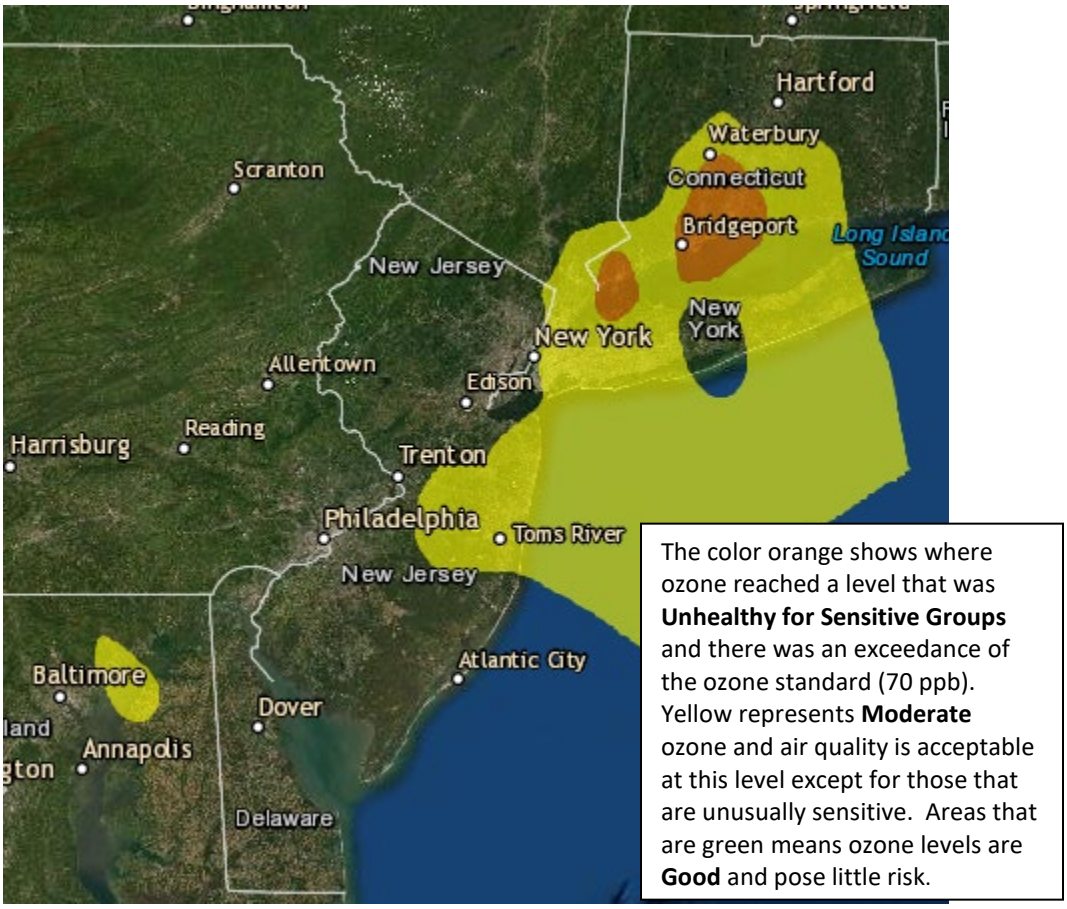
STATE	STATION	Daily Maximum 8-Hr Average (ppb)
CT	Danbury	52
CT	Greenwich	74
CT	Madison-Beach Road	65
CT	Middletown-CVH-Shed	55
CT	New Haven	78
CT	Stratford	73
CT	Westport	68
DE	BCSP (New Castle Co.)	No Data
DE	BELLFNT2 (New Castle Co.)	44
DE	KILLENS (Kent Co.)	34
DE	LEWES (Sussex Co.)	33
DE	LUMS 2 (New Castle Co.)	54
DE	MLK (New Castle Co.)	52
DE	SEAFORD (Sussex Co.)	30
MD	Fair Hill	50
NY	Babylon	61
NY	Bronx - IS52	57
NY	CCNY	53
NY	Fresh Kills	47
NY	Holtsville	52
NY	Pfizer Lab	57
NY	Queens	66
NY	Riverhead	55
NY	Rockland Cty	47
NY	White Plains	55
PA	BRIS (Bucks Co.)	51
PA	CHES (Delaware Co.)	49
PA	NEWG (Chester Co.)	46
PA	NORR (Montgomery Co.)	53
PA	LAB (Philadelphia Co.)	44
PA	NEA (Philadelphia Co.)	49
PA	NEW (Philadelphia Co.)	48
	TOTAL EXCEEDANCES	3

The number of days in 2020 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 2020

STATE	# of Days NAAQS was Exceeded January 1 – August 24, 2020 NAAQS = 70 ppb
Connecticut	17
Delaware	2
Maryland	0
New Jersey	5
New York	8
Pennsylvania	5

Figure 1. Ozone Air Quality Index for August 24, 2020



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 broad swath of high pressure was in place over much of the eastern seaboard on Monday, August 24th, 2020, with a weak area of low pressure over the New England region. This synoptic setup allowed for favorable meteorological conditions that increased ozone concentrations for coastal Connecticut, resulting in multiple exceedances of the ozone NAAQS.

High pressure began to strengthen slightly over the southeastern United States, as well as, the mid-Atlantic region on Sunday August 23rd. The strengthen high caused the multiple frontal boundaries that influenced the non-attainment area on the August 21st and 22nd to be pushed further north into New England. This allowed for a more consistent weather pattern throughout the region on Monday, with mostly sunny skies, south/southwesterly winds, and temperatures reaching the upper 80's to low 90's. However, early on Monday, a surface trough formed because of the persistent weak low pressure over New England. The trough extended from southern Maine southward over Massachusetts, northern Connecticut, the New York City metropolitan area, and eventually over New Jersey along the I-95 corridor. Locations west of the surface trough saw more enhanced cloud cover, as well as pop-up showers and thunderstorms that helped to limit ozone production. However, locations east of the trough, such as coastal portions of New Jersey, NYC, Long Island, and coastal Connecticut saw less cloud cover, little to no precipitation, and enhanced mixing of pollutants aloft down to the surface. New Jersey monitors such as Monmouth and Colliers Mill that reside east of the trough saw 8-hour ozone averages close or greater than 60 ppb, while some monitors west of the trough saw 8-hour averages in the good category. A sea-breeze front was also developed along the Connecticut coastline, causing a more southerly flow that aided transport of additional NYC metropolitan area pollutants trapped over the Long Island Sound to Connecticut.

The ozone exceedances observed in the Connecticut on Monday, August 24th can be attributed to its location east of the stationary front, favorable meteorological conditions, and the sea breeze front that transported pollutants trapped over the Long Island Sound to the exceedance locations.

Where Did the Air Pollution that Caused Ozone Come From?

Please note, this exceedance is occurring while COVID-19 restrictions in New Jersey are in place, which have impacted transportation, business operations and energy use. As more data becomes available, the Department may have a better characterization of the conditions that influenced elevated ozone pollution levels in 2020.

Figures 2, 3, and 4 show the back trajectories starting at different wind heights for the monitored exceedances on August 22, 2020. 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)
CT	Greenwich	74
CT	New Haven	78
CT	Stratford	73

Back trajectories from August 24th show that the exceedances in Connecticut were likely influenced by the favorable weather conditions mentioned above, as well as localized transport over New York City, Long Island, and the Long Island Sound. In addition, the air mass over the area was already polluted the day prior, and this build-up of pollutants, in combination with a stagnant air mass, caused ozone to reach the unhealthy for sensitive groups category areas along the Connecticut coast.

The surface level back trajectories (Figure 2) show that air originated off the Mid-Atlantic coast and was influenced by a surface trough over the area. The trajectories moved in a northerly direction, with one trajectory moving along the New Jersey coast and the other two moving north over the Atlantic. These trajectories then traveled over New York City, Long Island and the Long Island Sound, where they picked up local emissions from cars, trucks, industry and power production. The short paths of these trajectories indicate that air was moving slowly over these areas, allowing more pollutants to build up throughout the day. They finally reached their endpoints along the Connecticut coast, an area which observed moderate air quality the day prior.

Mid-level back trajectories (Figure 3) show that air at 500m originated in central Virginia and traveled in a northeasterly direction, following a generally direct route through transit. Trajectories at the mid-level passed over the Washington D.C. area and Maryland before crossing the Pennsylvania border. Here, trajectories traveled over southeastern Pennsylvania, including the city of Lancaster, picking up emissions from industry along the way. Continuing in a northeasterly fashion, trajectories then passed over northern New Jersey and the New York City metropolitan area, picking up emissions from cars, trucks, industry, and power plants. Before reaching their endpoints, mid-level trajectories crossed the Long Island Sound where local emissions from the previous day may have lingered as a result of a stagnant air mass. While trajectories at this level traversed a greater distance than other levels, they still maintained a slow speed through arrival, allowing the air mass to become increasingly polluted.

In Figure 4, upper-level air (1500 meters) originated in in parts of northern New Jersey and Pennsylvania, and northeastern Maryland. The upper level trajectory from the Greenwich, CT monitor rotated in a clockwise direction following high-pressure, before encountering a weak low-pressure area in the NYC metropolitan area, shifting to a more easterly direction. The parcel may have picked up pollutants from the prior day. The second set of trajectories were heavily influenced by a weak low-pressure system and light winds aloft, causing the air parcels to remain over the NYC metropolitan area during the 48-hours preceding the high ozone event. This allowed the air parcels to grow increasing polluted leading up to the monitored exceedances. A surface trough moving over the nonattainment zone caused the parcels to sink before reaching their endpoints in Stratford and New Haven, CT.

Figure 5 shows the National Air Quality Index observed on August 23rd, the day prior to this exceedance event. As shown in the figure, moderate ozone levels were observed in the NYC metropolitan area /

Long Island Sound vicinity, as well as, portions of coastal New Jersey on this day. The localized transport of pollutants, in combination with favorable meteorological conditions, led to the exceedances along coastal Connecticut on August 24th.

Figure 2. 48-hour Back Trajectories for August 24, 2020 at 10 meters

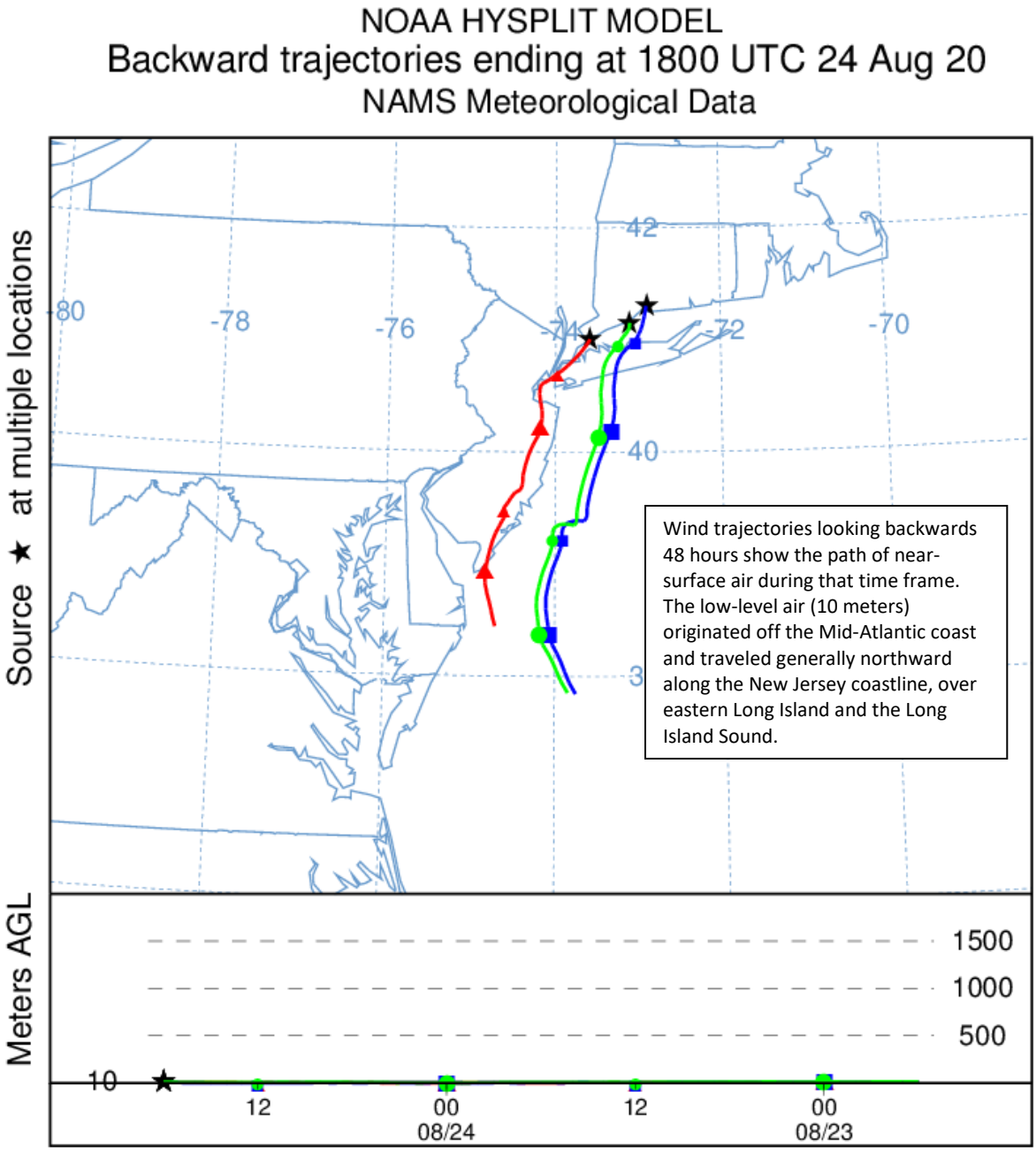


Figure 3. 48-hour Back Trajectories for August 24, 2020 at 500 meters

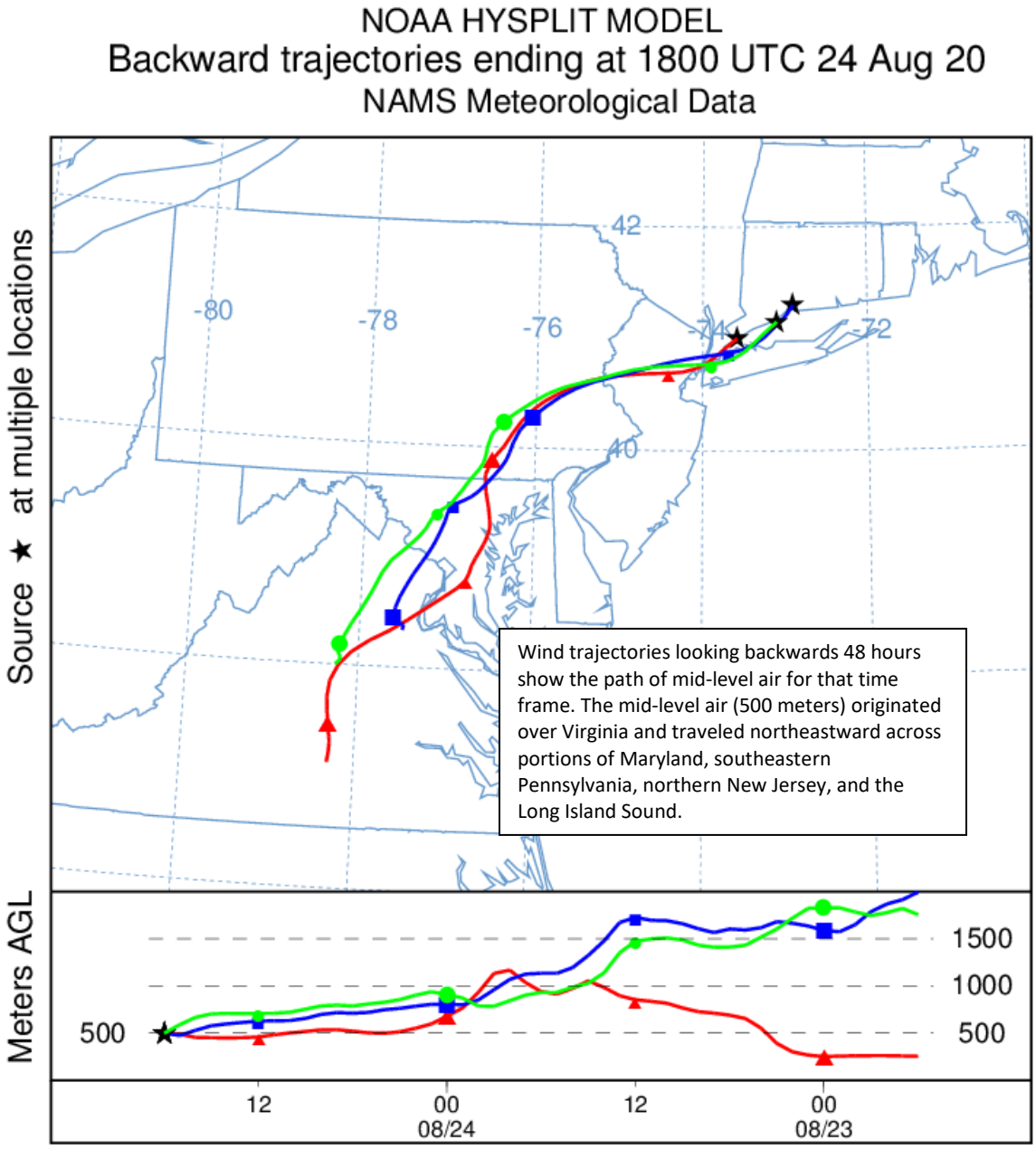


Figure 4. 48-hour Back Trajectories for August 24, 2020 at 1500 meters

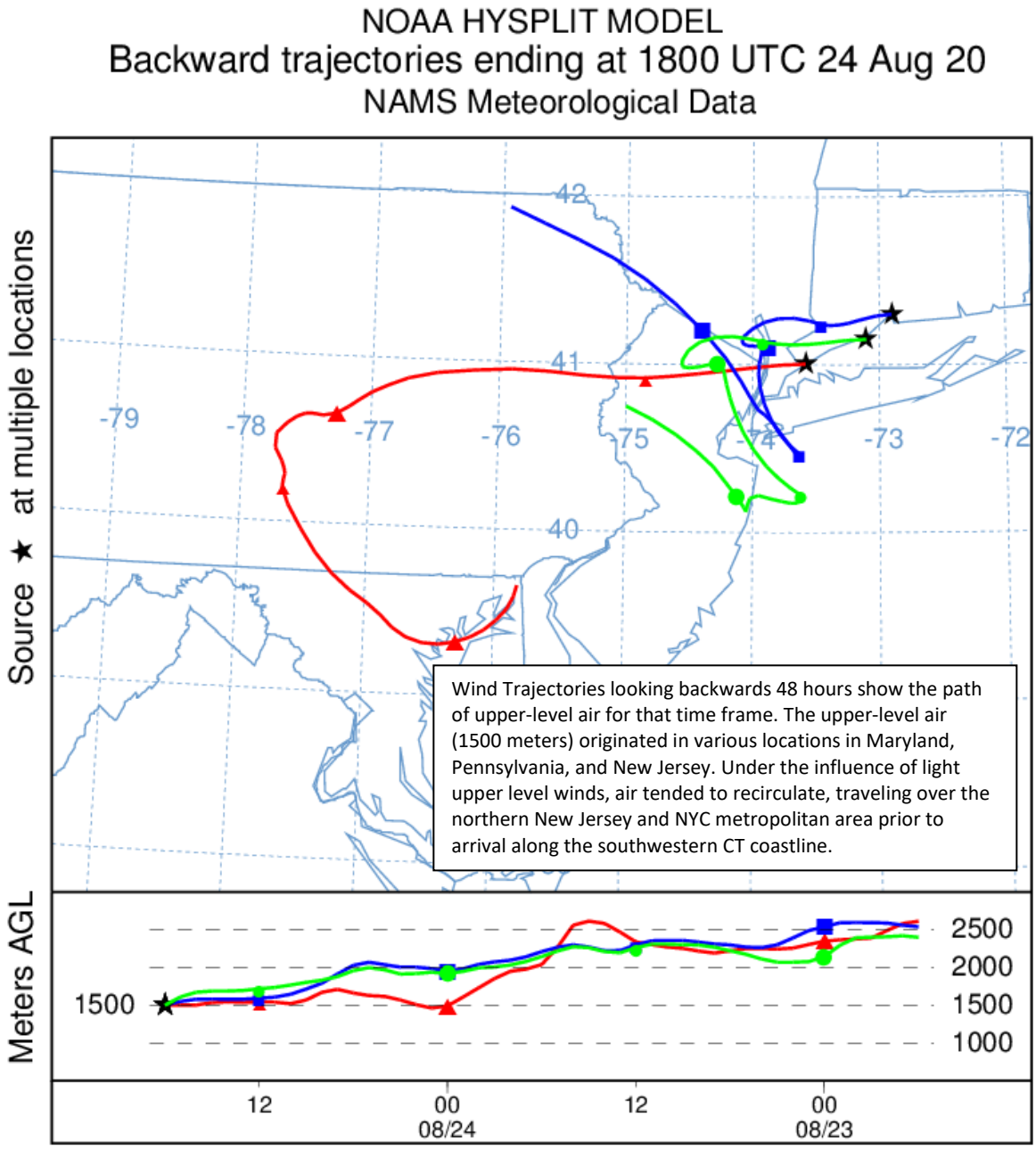
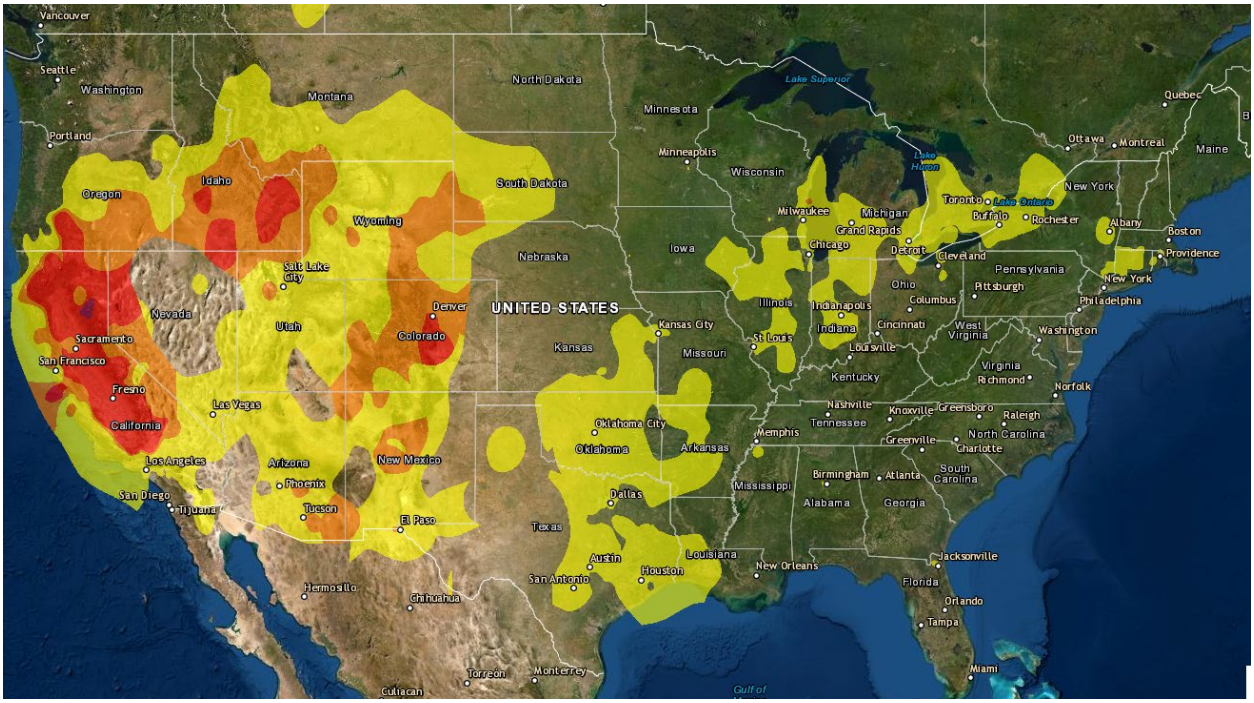


Figure 5. Combined Air Quality Index for the United States on August 23, 2020



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/ .