Supporting Materials Demonstrating Enhanced Ozone concentrations in the Chicago Ozone Nonattainment Area Resulting from Canadian Wildfire Influence in 2023

Prepared by:
Alpine Geophysics, LLC
387 Pollard Mine Road
Burnsville, NC 28714

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Background

In the summer of 2023, Canada experienced its most severe wildfire season on record. Smoke from these fires was transported across the Upper Midwest region of the United States, leading to widespread increases in surface-level ozone concentrations, as observed by the U.S. AQS monitoring network. These events were particularly significant because they occurred early in the fire season (May - July) and resulted in the highest regional-scale surface ozone levels ever recorded across the northern U.S.[1]

Figure 1 below shows statistics extracted from the Canadian National Fire Database[2], and shows the extreme acres burned in Canada in 2023 compared to the past five decades.

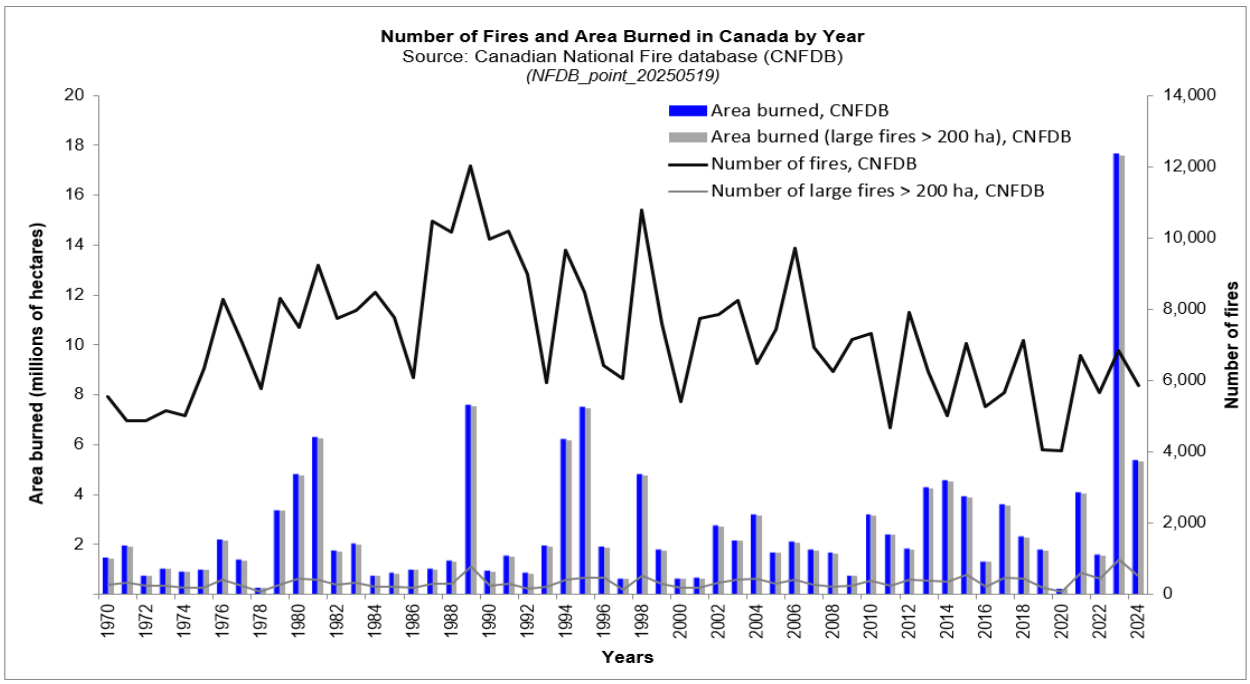

Figure 1. Number of fires and area burned in Canada by year, 1970-2024.

Additional studies[3] show that significant amounts of Canadian wildfire emissions were emitted into the atmosphere during the 2023 calendar year. Table 1 presents an accounting of those emissions as estimated using the U.S. Forest Service's BlueSky modeling framework. Much of those emissions eventually made their way into the northern and eastern regions of the U.S. This resulted in observable smoke coverage on most of the days during calendar year 2023 and for most of the eastern states, with significant spikes in May through September 2023 due to unprecedented levels of wildfire activity.

[1] https://doi.org/10.1029/2024GL111481
[2] https://cwfis.cfs.nrcan.gc.ca/ha/nfdb
[3] https://doi.org/10.1016/j.dib.2024.111208

Table 1. Monthly 2023 Canada wildland fire emissions (short tons)

Month	CO (tons)	CO2 (tons)	NOx (tons)	PM2.5 (tons)	VOC (tons)
Jan	174,640	2,943,797	2,509	24,299	54,063
Feb	26,430	466,961	426	3,716	8,673
Mar	33,191	597,026	564	4,765	11,244
Apr	29,440	569,269	601	4,228	10,448
May	4,530,476	76,361,970	65,021	607,398	1,346,389
Jun	8,572,781	138,754,014	112,729	1,134,010	2,442,094
Jul	6,592,839	112,494,448	101,312	883,722	2,046,350
Aug	5,765,409	98,807,492	89,586	780,091	1,809,509
Sep	3,871,245	65,528,376	56,429	527,038	1,177,193
Oct	327,395	5,690,758	5,044	45,253	102,992
Total	**29,923,847**	**502,214,113**	**434,222**	**4,014,519**	**9,008,956**

Cumulative smoke data annual statistics are derived by aggregating daily Hazard Mapping System (HMS) smoke polygons into a grid and counting the number of days when individual cells were covered by either light, medium or heavy smoke during the year. Contour lines and labels depicting the number of observed smoke days are used to help with data interpretation. The smoke contour map for 2023 is presented in Figure 2 and indicates that much of the eastern U.S. was covered in observed smoke for up to 55% (~ 200 days) of the year.

During the late spring and summer of 2023, the Chicago metro area experienced some of its worst recorded air quality as smoke and unhealthy haze from Canada's wildfires spread southward, as reported by multiple sources at the time.[4,5,6,7,8]

[4] https://www.cbsnews.com/news/chicago-worst-air-quality-canadian-wildfire-smoke-june-27-2023/
[5] https://www.cnn.com/2023/06/27/us/canada-wildfire-smoke-great-lakes/index.html
[6] https://www.foxweather.com/weather-news/90-million-in-air-quality-alerts-canada-wildfire-smoke-chicago-to-washington-dc
[7] https://www.cbsnews.com/chicago/news/air-quality-unhealthy-level-chicago/
[8] https://doi.org/10.1029/2024GL111481

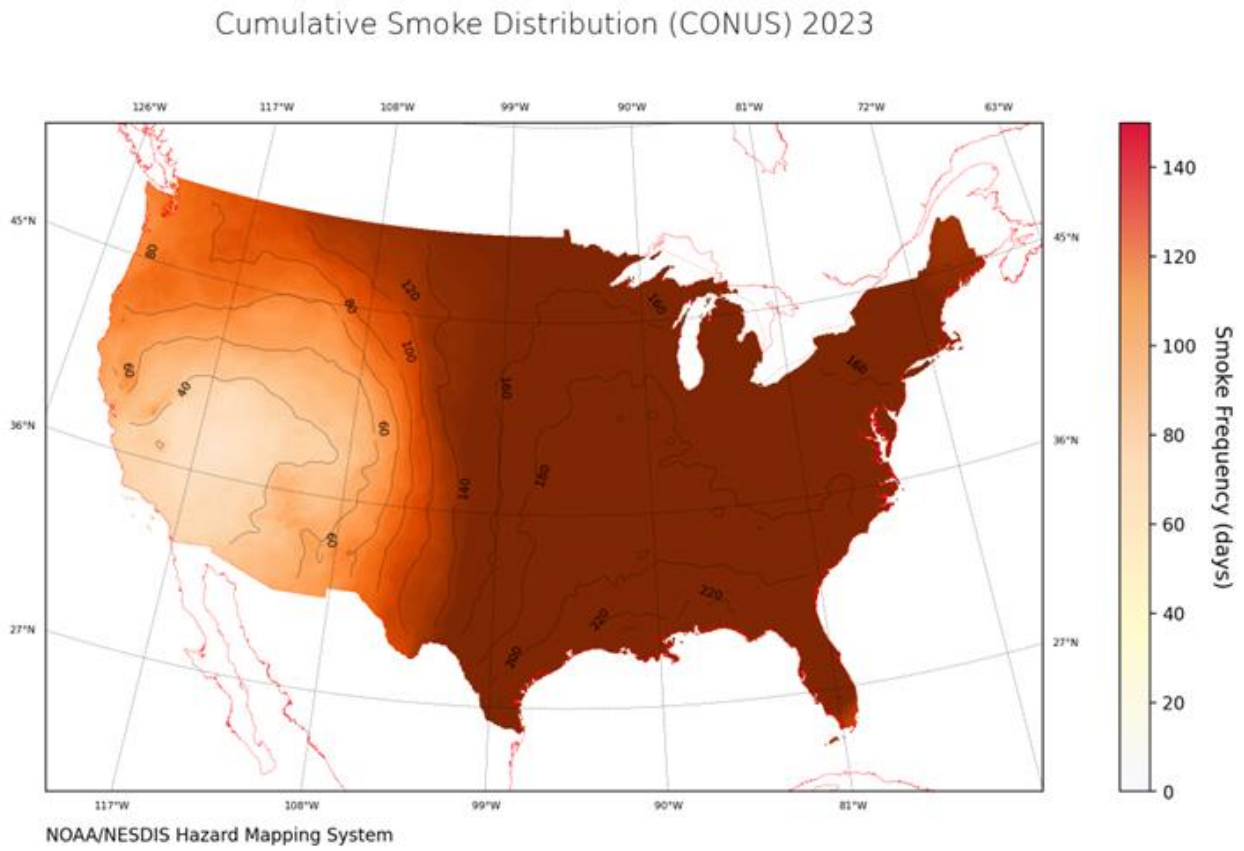

Figure 2. Cumulative smoke distribution observed across the continental U.S. in 2023.

Purpose and Presentation

This document is intended to provide objective, technical, supporting information related to wildfire smoke influence on ozone concentrations observed in the Chicago ozone nonattainment area (NAA) in support of EPA's reconsideration of the NAA reclassification to "Serious" (e.g., "bump up").

Using protocols established in EPA's "Guidance on the Preparation of Exceptional Events Demonstrations for Wildfire Events that May Influence Ozone Concentrations,"[9] presented here is supporting information consistent with Tier 1 and Tier 2 approaches to addressing the clear causal relationship element within a wildfire/ozone demonstration.

And while not a formal exceptional events demonstration, information in this document provides the following key findings and evidence supporting the need for and likely result of such a demonstration:

1. Ozone concentrations in the spring and summer of 2023 at multiple Chicago area monitors were above the 99th percentile of the 5-year distribution of ozone monitoring data at the site, were among the highest ozone concentrations for the year, and were among the highest observations in the most recent 5-year period.
2. Considerable ozone was created upstream of and in the Chicago airshed due to the large-scale presence of ozone precursors (Nox, VOC) generated during Canada's largest recorded wildfire year, which were then transported into the Chicago/Lake Michigan region during the late spring and summer seasons.
3. Satellite images captured visual smoke plumes that were transported into the Chicago region on days when the ozone concentrations were highest.
4. Analysis of the National Oceanic and Atmospheric Administration's (NOAA) Hazard Mapping System (HMS) smoke product and Ozone Air Quality Index (AQI) shows an enhanced ozone concentration impact at monitors along the wildfire smoke transport path that eventually culminates with excess ozone observations in Chicago.
5. Regional upwind measurements identify multiple monitors with unusually high ozone concentrations during the dates when the transported smoke plume passes through the region.
6. Fine particulate matter (PM2.5) was also elevated during the event, consistent with a wildfire smoke plume.
7. PM2.5 speciated data (organic carbon and potassium ion) showed elevated wildfire attributable concentrations.

Several analytical methods were used to develop evidence that many of the 8-hour ozone concentrations above 70 parts per billion (ppb) recorded during the 2023 calendar year meet the rules for data exclusion as an Exceptional Event. In summary, satellite images and data, screening tools, and speciated PM2.5 data were used to assess whether conditions were favorable for transport of smoke from the Canadian wildfires to monitors that showed 8-hour ozone concentrations above 70 ppb. The

[9] https://www.epa.gov/system/files/documents/2023-12/guidance-on-the-preparation-of-ee-wf-ozone.pdf

data also showed that the transported smoke enhanced ozone concentrations and degraded air quality in the Chicago nonattainment area, as well as in many regional areas in the Midwestern U.S.

Data presented here are related to ozone monitors in the Chicago ozone nonattainment area, inclusive of monitors in Illinois, Indiana, and Wisconsin. Comparable information is available for regionally located monitors in these states.

Information in this document is presented for the monitors shown in Table 2.

Table 2. 4th high ozone observations at monitors in the Chicago nonattainment area; 2020-2024.

				4th High Ozone Design Value (ppb)				
State	**County**	**Site ID**	**Local Site Name**	**2020**	**2021**	**2022**	**2023**	**2024**
IL	Cook	170310001	Village Garage	76	68	73	82	68
IL	Cook	170310032	South Water Filtration Plant	77	77	72	83	66
IL	Cook	170310076	Com Ed Maintenance Bldg	68	70	74	80	63
IL	Cook	170311003	Taft HS	77	68	70	73	71
IL	Cook	170311601	Cook County Trailer	78	72	71	81	69
IL	Cook	170313103	IEPA Trailer	68	60	62	81	64
IL	Cook	170314002	Cook County Trailer	79	67	68	80	65
IL	Cook	170314007	Regional Office Building	72	69	70	83	70
IL	Cook	170314201	Northbrook Water Plant	79	75	70	86	69
IL	Cook	170317002	Water Plant	74	78	71	81	76
IL	DuPage	170436001	Morton Arboretum	73	69	68	82	62
IL	Kane	170890005	Larsen Junior High	73	68	70	84	67
IL	Lake	170971007	Camp Logan Trailer	76	77	70	81	78
IL	McHenry	171110001	Cary Grove Hs	76	69	70	84	65
IL	Will	171971011	Com Ed Training Center	67	65	64	80	60
IN	Lake	180890022	Gary-IITRI	74	70	71	76	69
IN	Lake	180892008	Hammond Caap	71	68	69	75	67
IN	Porter	181270024	Ogden Dunes	76	72	73	77	70
IN	Porter	181270026	Valparaiso	67	66	67	72	65
WI	Kenosha	550590019	Chiwaukee Prairie Stateline	78	79	70	84	80
WI	Kenosha	550590025	Kenosha - Water Tower	78	72	71	80	73

Ozone Trends and 2023 Conditions in Chicago

Ozone has significantly decreased in the Chicago area over the past 25 years due to sizeable and sustained reductions in ozone precursor emissions. This is evident in Figure 3 below, showing the number of monitor-days in each year since 2000 where monitors in the Chicago core based statistical area (CBSA) have exceeded the 70 ppb NAAQS for ozone on certain dates. As is demonstrated in this Figure, 2023 was exceptional in the recent historical record as more than approximately twice the number of NAAQS monitor-day exceedances occurred in 2023 (38 occurrences) compared to complete years of reporting from 2019 through 2024 (12 to 20 occurrences)[10].

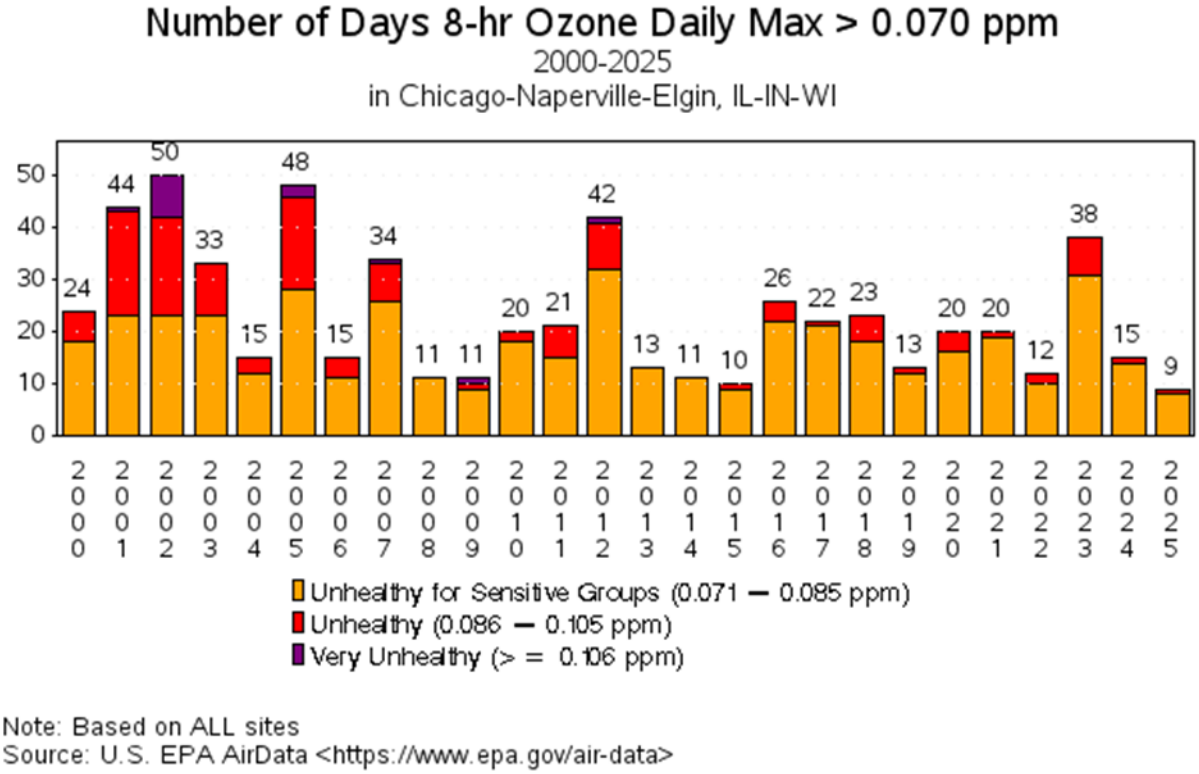

Figure 3. Number of days where Chicago CBSA monitors exceeded the level of the current ozone NAAQS.

However, at each of the regulatory monitors in the NAA, exceptionally high 4th high observations of maximum daily 8-hour averaged (MDA8) ozone in 2023, associated with the wildfire enhancements to ozone concentrations, resulted in estimated 3-year design values trending away from the decreases observed over the last decade. Elevated 4th high values in 2023 produced design value increases at 18 of the 21 monitors in the CBSA. These 4th high value trends can be seen in **Figure 4** and **Figure 5**. Note that future design values inclusive of the 4th high values from 2023 (through 2025) will be influenced by the excessively high observations that have been enhanced by the Canadian wildfire smoke in the spring and

[10] The number of exceedances in Figure 3 represent unique dates across all monitors, not necessarily the number of exceedances at any one monitor.

summer of 2023. This can already be seen in 2024 three-year design values, even though 2024 4th high observations were significantly lower than those in 2023.

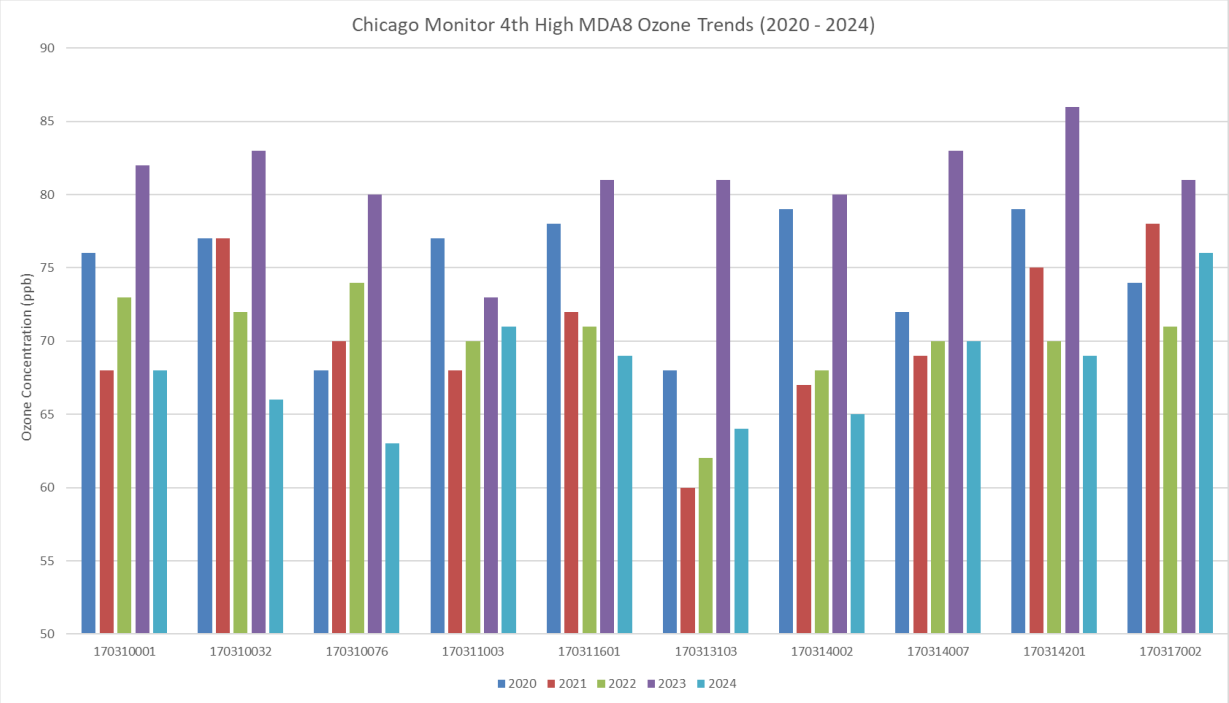

Figure 4. 4th high ozone concentration trends at Cook County monitors in the Chicago NAA.

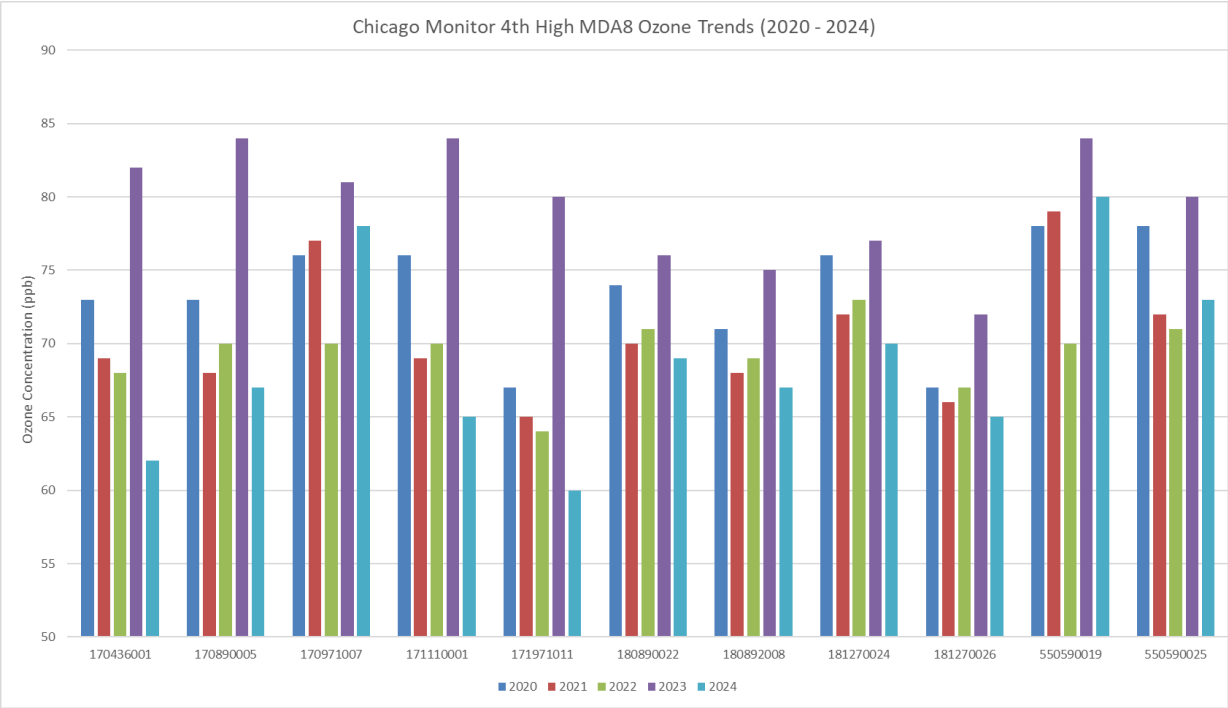

Figure 5. 4th high ozone concentration trends at remaining Illinois, Indiana, and Wisconsin monitors in the Chicago NAA.

In 2023, Chicago' ozone air quality index (AQI), the measurement EPA uses to communicate outdoor air quality and health, was above both the 5-year average (2019-2023) as well as exceeding levels of the 24-year high (2000-2023). Figure 6 presents these values as generated from EPA's AirData website[11].

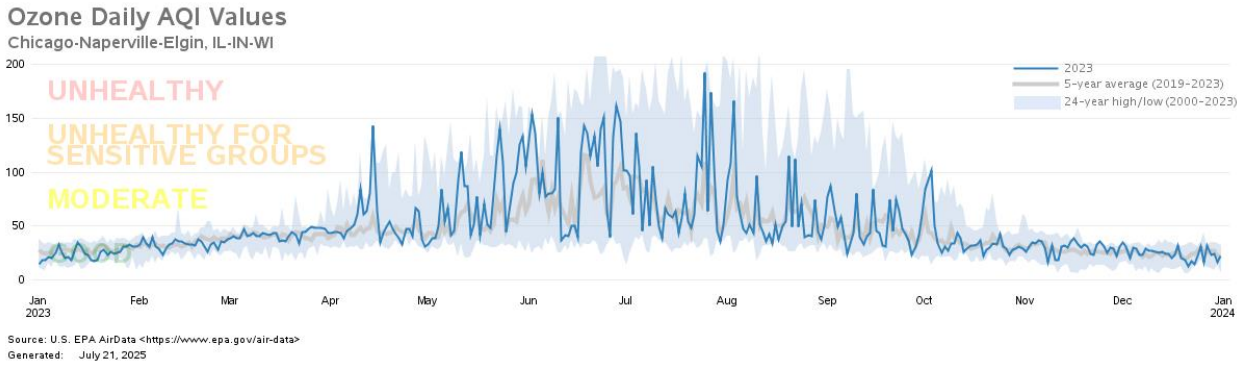

Figure 6. Chicago CBSA ozone daily AQI values; 2023 compared to 5-year averages (2019-2023) and the 24-year (2000-2023) high/low values.

Similarly, in 2023, Chicago experienced an exceptionally high number of days where the AQI exceeded 100, a measure indicating that air quality is unhealthy, at first for certain sensitive groups of people, then for everyone as AQI values get higher. The cumulative number of high (> 100) AQI days in 2023 is presented in Figure 7 and is seen as greater than the 5-year average and comparable through August to high values in the 24-year period from 2000-2023.

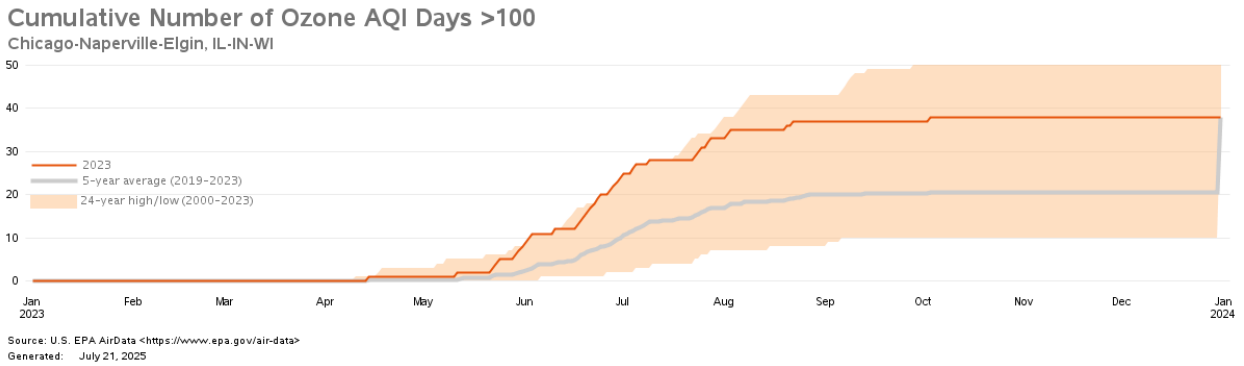

Figure 7. Cumulative number of ozone AQI days > 100 in the Chicago **CBSA; 2023 compared to 5-year averages (2019-2023) and the 24-year (2000-2023) high/low values.**

The significantly exceptional ozone episodes in 2023 are easily seen when daily AQI values are plotted for Chicago during the years 2020-2024. In the 2023 row presented in Figure 8, May through September are shown to have many more "Unhealthy for Sensitive Group" and "Unhealthy" AQI days than any other months in the five-year period. These high AQI values will be shown to correlate with dates when

[11] https://www.epa.gov/outdoor-air-quality-data

Canadian wildfire smoke was present in and around the Chicago region, enhancing the observed concentrations at multiple monitors.

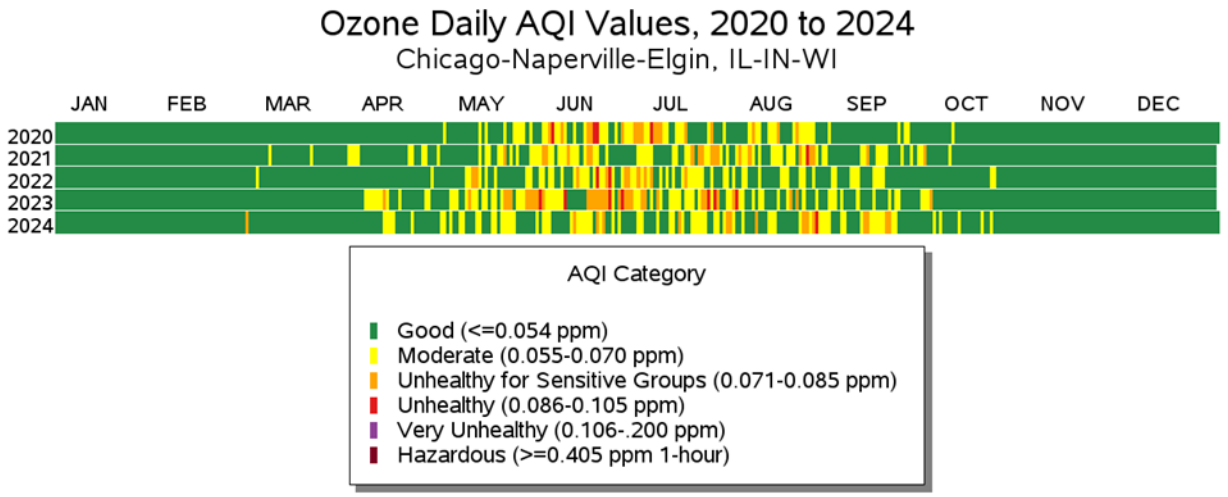

Figure 8. Ozone daily AQI values for Chicago CBSA, 2020-2024.

A study[12] using observed MDA8 ozone values and site-specific residuals (observed – predicted MDA8 ozone concentrations) from a Generalized Additive Model (GAM) evaluated the number of exceedance days—defined as days with MDA8 ozone above 70 ppb (≥71 ppb)—that were elevated due to smoke influence. The total observed exceedance days equaled the sum of (1) exceedance days not caused by smoke and (2) exceedance days where smoke made a significant contribution. Over the six-year period, of 2018-2023, all sites combined recorded 13,323 exceedance days.

This same study indicates a calculated enhancement in both ozone and PM2.5 concentrations across all U.S. states during May–September for 2018–2023, with large influences in 2020 and 2021, due to California fires, and 2023, due to Canadian fires. In 2023, wildfire smoke enhanced (increased) ozone concentrations by 7.6 ppb and PM2.5 concentrations on average by 11.7 µg/m3 in the central U.S. on days when smoke was present. This is shown in Figure 9 below.

[12] Environ. Sci. Technol. 2024, 58, 33, 14764–14774

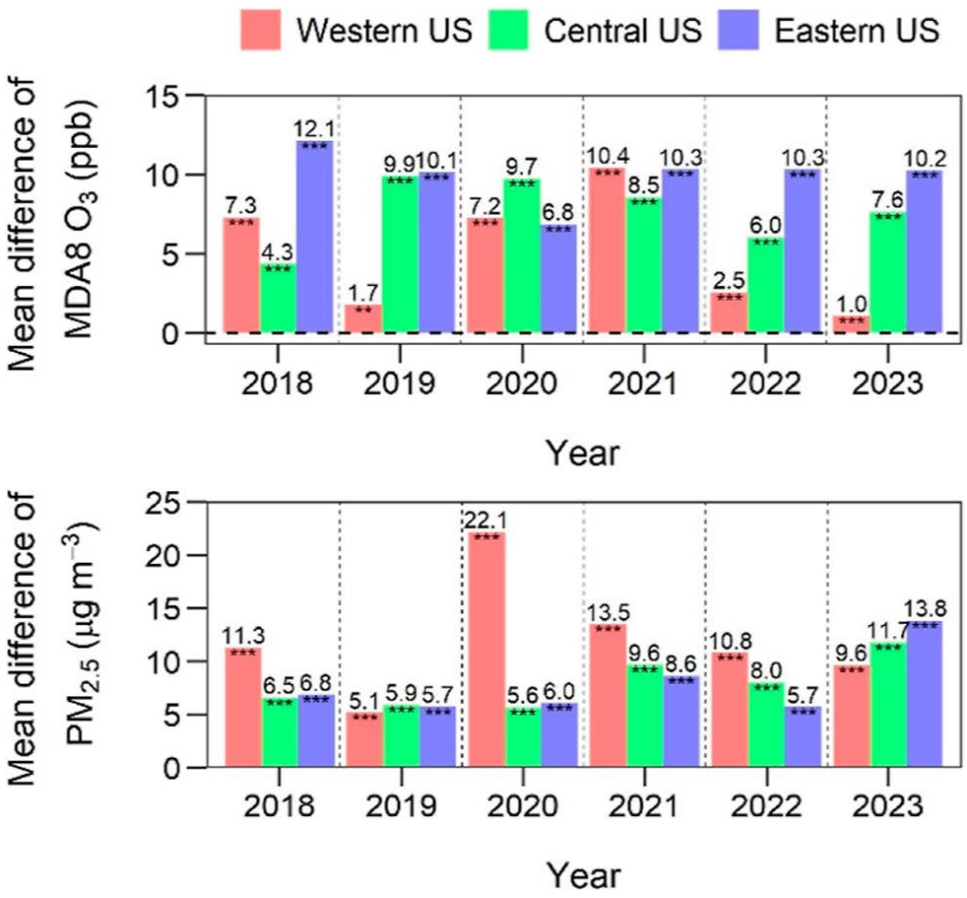

Figure 9. Mean difference between smoke and nonsmoke days (i.e., mean of smoke days – mean of nonsmoke days) for MDA8 O3 (ppb) [top] and PM2.5 (µg m–3) [bottom] across the Central, Eastern, and Western US over the years 2018 to 2023.

Furthermore, following U.S. EPA guidance, a 97.5th-percentile residual threshold for nonsmoke days was determined at each site. Smoke days with GAM residuals exceeding this threshold were classified as "exceedance days due to smoke." "Exceedance days not caused by smoke" were then calculated as the total exceedance days minus the exceedance days due to smoke.

Figure 10 summarizes U.S. exceedance days from 2018–2023 as calculated in this same study. Nationwide, about 25% of all exceedance days were linked to smoke. The highest total occurred in 2023 with 2,857 exceedance days. Annual smoke-related exceedances ranged from 72 to 1,072, peaking in 2023 when smoke accounted for 38% of the total. Exceedance days are typically more frequent in the Western U.S., but in 2023 the Central U.S. recorded more (1,522), with 52% smoke-related—both record highs.

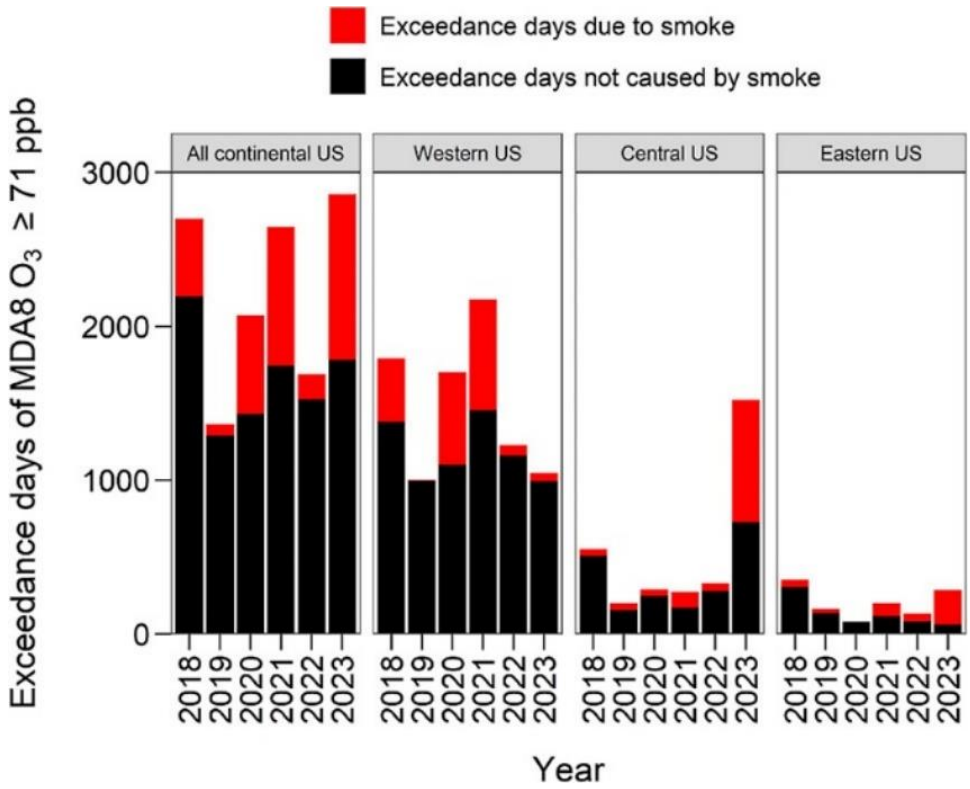

Figure 10. Number of exceedance days (MDA8 O3 over 70 ppb) for the continental US from 2018 to 2023. The red bars show days with a significant contribution due to the presence of smoke.

On a monitor-by-monitor basis, it can also be seen that ozone concentrations from multiple dates across the spring and summer of 2023 were influenced by the Canadian wildfire smoke as it entered the Chicago airshed.

Figure 11 through Figure 31 below present the MDA8 observations at select monitors located in the Chicago ozone nonattainment area for the May through September period of the past five years (2020-2024). Each daily value is color coded to represent historical thresholds, exceedances of NAAQS levels, and the 99th or higher percentile of the five-year distribution of ozone monitoring data. This is an easy way to compare dates and to find trends and episodes that may be significantly different than historical averages.

In each figure, green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data at that monitor.

What is initially noticeable is the fact that each of these monitors has multiple dates and observations that exceed the 99th percentile values of the past five years (blue cells). It is also notable that these 99th percentile dates are spread throughout the late spring and summer (May through September 2023), concurrent with known episodes of Canadian wildfire smoke intrusion.

ALPINE GEOPHYSICS

monitor 170310001 78 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
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2023																															
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8	55	59	83	58	52	42	47	48	45	48	47	49	36	29	33	47	38	54	47	68	40	58	48	55	32	41	37	53	48	32	49
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2022																															
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2021																															
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2020																															
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9	29	44	44	37	45	32	34	22	19	27	25	18	34	30	37	50	30	33	40	46	41	51	50	45	54	34	38	18	16	31	

Figure 11. Calendar view of MDA8 ozone observations from 2020-2024 from the Village Garage (170310001) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170310032 79 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
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2023																															
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6	70	73	70	52	63	38	42	38	47	84	23	40	29	40	25	27	37	78	74	58	76	68	74	63	52	38	42	79	57	69	
7	58	43	37	79	60	37	45	53	66	58	49	40	60	57	52	52	43	40	52	52	35	58	75	60	89	59	57	67	33	32	51
8	56	58	83	56	55	42	41	49	45	52	48	48	32	40	32	46	38	44	45	66	35	55	49	56	35	40	37	47	49	35	48
9	55	52	51	38	47	39	21	34	36	57	36	34	39	43	59	38	47	29	29	56	49	53	57	45	45	35	20	30	40	51	
2022																															
5	30	36	33	31	41	44	49	45	50	47	63	63	60	58	50	54	27	25	58	47	36	42	38	49	30	48	32	43	54	56	49
6	32	50	62	49	48	50	45	41	55	50	50	42	50	61	46	62	59	38	60	76	68	61	46	79	53	47	47	59	80	67	
7	41	46	69	56	72	42	60	45	35	59	50	55	40	43	36	50	52	61	55	52	51	49	48	44	35	53	44	42	46	58	45
8	44	52	41	35	56	47	36	33	34	45	31	42	39	41	49	42	48	49	51	37	48	39	52	50	44	28	54	45	40	38	41
9	50	44	58	28	36	39	42	57	53	67	40	26	44	33	47	46	51	49	31	46	48	32	29	39	26		24	31	31	40	
2021																															
5	57	47	30	29	34	39	42	38	42	36	35	36	51	55	41	68	61	47	42	48	54	64	46	60	49	57	40	34	32	55	55
6	61		79	72	65	58	26	65	59	57	77	59	52	59	26	35	63	48		44	31	48	47	36	39	31	30	21	23	38	
7	27	21	50	62	48	57	54	22	29	37	38	37		49	59	41	39	46	42	71	38	77	68	59	57	60	71	62	59	30	36
8	26	27	43	44	40	35	37					37	39	50		56	62	52	56	67	46	45	61	50	82	82	73				59
9	37	45	45	37	50	43	45	38	38	41	51			35	40	62	68	49	59	31	37	32	32	52	40	48	68	43	62	62	
2020																															
5	41	55	51	44	45	45	48	36	49	37	36	48	55	45	55	42	45	37	44	51	58	43	51	62	56	54	60	53	59	32	39
6	47	68	58	74	87	39	49	64	47	46	52	36	38	42	52	69	77	85	91	60	47	45	41	40	51	46	65	47	47	59	
7	62	60	75	53	40	69	68	65	59	49	57	30	34	57	63	55	56	42	39	43	37	48	45	57	69	42	42	49	58	40	33
8	45	44	26	34	47	53	59	55	51	46	35	50	62	64	66	35	36	29	32	58	66	54	56	59	55	61	49	40	39	31	46
9	36	44	45	36	43	33	31	24	24	28	33	19	31	34	36	51	32	35	43	45	46	53	49	49	56	31	38	17	16	30	

Figure 12. Calendar view of MDA8 ozone observations from 2020-2024 from the South Water Filtration Plant (170310032) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170310076 77 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	53	49	40	54	40	47	43	47	27	37	40	53	42	29	31	42	53	54	46	50	53	49	58								61
6	34	54	51	48	45	43	43	44	47	38	54	60	59	55	63	59	52	32	56	39	63	47	29	56	43	55	30	30	43	31	
7	37	55	51	48	48	47	46	52	39	45	33	45	56	44	56	50	42	31	50	63	60	55	50	35	31	51	56	26	49	60	65
8	50	48	53	53	47	33	35	64	29	32	38	41	43	57	32	45	32	33		32	40	52	57	49	53	48	63	50	44	46	56
9	32	27	39	54	57	26	35	35	39	45	54	63	58	50	52	48	57	63	64	58	55	29	31	13	37	37	36	28	27	31	
2023																															
5	29	35	30	49	58	52	55	28	34	61	66	37	52	39	43	57	39	53	47	38	60	63	76	49	37	52	61	60	70	71	54
6	72	83	75	52	56	41	51	45	52	71	22	39	33	38	32	30	56	79	77	64	74	67	66	78	49	38	52	80	54	68	
7	61	38	39	65	55	30	44	48	64	57	47	36	54	54	52	51	45	46	60	49	35	54	61	62	83	54	68	57	40	33	50
8	53	58	90	53	52	38	44	47	43	48	48	47	32	24	31	46	35	48	46	61	34	56	43	56	28	40	37	50	47	32	46
9	52	58	52	37	46	39	13	31	36	56	19	31	37	40	57	35	42	27	30	48	27	40	56	45	39	28	17	26	38	52	
2022																															
5	30	33	25	25								66	64	60	50	55	20	8	58	45	30	41	39	46	30	43	29	48	57	58	47
6	28	58	58	47	59	53	46	33	49	47	51	41	42	57	46	62	59	37	62	78	67	65	40	80	53	46	47	60	77	66	
7	37	48	67	55	63	48	55	41	37	60	47	48	41	39	28	48	45	74	52	50	50	54	49	41	33	50	39	41	39	49	45
8	42	52	40	40	51	44	34	33	33	54	28	40	38	39	48	35	47	53	50	36	49	34	50	61	38	30	56	45	40	37	41
9	51	45	57	29	32	36	40	57	52	57	37	20	36	32	46	47	53	52	32	47	46	29	28	37	21	25	23	28	23	34	
2021																															
5	56	45	28	17	30	33	40	34	38	35	33	34	44	51	37	54	46	44	39	45	49	61	40	60	46	48	35	35	41	49	54
6	62	62	74	67	62	54	15	55	53	53	65	56	55	55	30	39	63	74	64	51	36	45	51	37	34	25	42	24	33	33	
7	28	23	45	52	45	55	54	17	30	33	33	33	38	41	45	38	41	46	46	67	34	59	58	51	60	54					
8											52	38	41	50	55	57	58	52	44	57	44	45	55	45	84	61	61	44	38	67	58
9	41	42	39	37	52	52	48	40	39	43	57	58	59	49	40	59	70	50	67	32	29	27	27	52	40	51	66	40	56	48	
2020																															
5	42	53	51	37	37	41	46	34	48	30																					
6																			84	62	63	47	52	37	69	53	58	53	43	62	
7	66	60	68	58	48	76				45	55	32	36	56	59	56	52	40	40	46	33	47	49	51	61	40	38	47	54	38	32
8	42	38	23	34	40	48	62	56	54	41	36	58	60	58	67																
9			45	36	43	33	32	22	18	26	25	19	32	26	36	45	29	32	39	45	42	50	51	46	54	34	36	18	15	30	

Figure 13. Calendar view of MDA8 ozone observations from 2020-2024 from the Com Ed Maintenance Bldg (170310076) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170311003 73 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	55	46	44	58	41	49	48	49	27	39	41	57	50	27	32	46	56	63	50	56	60	49	63	51	46	40	45	49	38	46	61
6	38	54	56	59	46	43	46	45	50	40	51	61	65	55	68	63	57	37	64	38	17		2	51	45	55	33	34	45	31	
7	40	59	50	49	50	45	49	55	47	47	32	46	61	50	65	54	41	33	53	63	54	51	53	36	31	51	60	34	39	67	75
8	53	49	49	58	44	32	36	54	29	32	36	51	44	54	30	47	41	34	29	33	41	61	63	70	59	73	71	50	43	43	56
9	33	33	46	58	57	27	37	36	42	50	61	68	64	55	54	50	62	66	73	63	62	31	33	24	41	42	37	33	32	34	
2023																															
5	32	35	30	45	56	47	51	32	37	60	67	51	55	38	45	54	39	45	50	38	57	61	72	38	38	51	58	60	67	67	47
6	73	77	71	50	56	35	40	38	44	67	21	35	26	35	22	26	45	72	72	55	68	63	63	73	48	37	43	71	60	59	
7	57	45	33	63	58	39	42	47	57	54	44	37	49	50	52	45	41	43	57	47	33	48	56	56	87	47	61	71	37	31	49
8	58	65	90		53	42	42	47	36	53	50	43	31	33	31	48	36	48	50	55	34	59	47	61	31	40	36	48	43	33	44
9	55	59	54	42	48	42	16	30	33	52	25	32	38	40	57	31	38	29	27	51	36	45	55	46		35	21	29	38	52	
2022																															
5	29	30	30	30	37	40	50	44	47	47	59	70	66	61	49	54	22	18	59	43	28	39	37	45	24	43	27	47	56	58	45
6	32	55	56	45	56	50	46	34	44	45	49	42	52	65	48	60	56	34	62	73	66	60	40	76	53	45	46	57	71	69	
7	40	46	60	58	58	39	62	35	35	62	41	47	40	36	29	46	48	55	58	48	49	64	50	44	33	51	41	38	33	53	47
8	41	59	48	35	49	52	40	31	34	51	29	41	41	40	47	37	49	54	55	40	51	38	49	59	37	29	59	45	37	35	39
9	49	49	49	27	29	36	44	54	57	59	38	25	40	32	49	49	53	52	34	41	43	28	26	31	27	25	22	28	24	33	
2021																															
5	61	51	34	27	37	41	46	38	44	40	38	38	49		43	59	49	45	42	47	51	60	35	62	44	48	35	36	40	47	55
6	60	65	71	68	62	57	25	59			73	58	54	58	31	41	68	69	67	57	36	46	53								
7															44	28	31	24	40	58	32	68	63	51	52	53	58	59	54	29	48
8	38	37	56	55	59	50	60	47	34	44	44	36	42	44	47	47	51	45	48	58	44	40	60	54	67	64	61	48	35	61	52
9	34	36	36	30	43	40	36	31		34				42	38	56	61	43	58	26			30	48	36	47	56	36	53	47	
2020																															
5	40	53	53	42	38	42	46	34	47	33	33	48	52	40	47	40	34	33	39	48	51	39	47	62	52	52	61	45	45	33	39
6	49	59	43	57	64	34	44	58	43	39	44	32	33	42	59		66	81	77	48	55	55		34	48	30	51	50	42		
7	58	56	61	49	44	67	81																39	48	59	33	33	37	45	28	29
8	36	35	19	30	31	51	54	52	47	45	36	47	61	67	78	38	36	20	28	55	59	46	45	47	49	50	43	33	34	27	45
9	29	39	40	32	36	30	27	23	19	26	25	17	28	29	39	48	30	31	40	46	42	53	50	46	57	35	37	19	14	31	

Figure 14. Calendar view of MDA8 ozone observations from 2020-2024 from the Taft HS (170311003) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170311601 79 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	60	57					49	53	31	39	42	54	44	31	35	43	58	58	54	55	59	54	68	43	52	43	45	47	35	46	61
6	33	57	52	46	44	43	42	40	47	42	54	64	60	65	66	61	54	35	61	65	64	48	31	62	47	54	36	37	45	37	
7	44	60	48	47	49	50	52	56	39	53	40	63	57	49	55	49	44	39	58	62	63	70	50	33	40	54	55	28	50	53	61
8	51	51	50	53	49	33	39	51	30	33	38	45	60	53	36	47	37	35	33	38	47	54	58	54	58	60	54	51	57	48	53
9	39	37	48	54	59	27	38	37	42	48	59	72	62	53	48	55	62	71	69	52	51	29	32	18	44	39	38	29	29	37	
2023																															
5	32	36	34	45	53	47	52	27	35	56								61	55	52	64	71	79	60	49	58	64	65	73	80	55
6	67	85	81	63	64	54	59	57	65	71	19	42	40	46	44	34	73	74	80	73	79	71	68	83	51	42	76	80	55	62	
7	59	45	58	62	55	49	61	47	56	55	50	39	56	52	50	49	40	56	58	48	47	51	58	72	78	52	83	55	50	39	55
8	54	58	72	58	50	41	45	45	42	44	47	45	37	28	33	44	34	50	46	75	45	54	43	55	40	40	39	57	46	34	54
9	51	60	50	39	45	38	14	28	41	52	28	34	40	36	60	33	38	32	30	49	24	41	57	41	40	30	20	21	39	48	
2022																															
5	31	35	28	30	29	35	50	47	44	45	51	61	61	68	49	55	23	13		45	32	41	41	46	30	43	21	47	54	59	47
6	32	58	58	44	66	46	49	36	49	49	51	43	48	60	49	63	60	44	62	75	63	62	61	80	54	46	54	59	75	71	
7	42	61	69	51	57	53	59	39	46	60	49	45	50	53	28	52	44	60	55	49	49	56	46	42	42	46	42	38	37	44	45
8	42	51	47	46	48	36	31	31	41	55	28	36	37	37	49	41	47	52	51	34	49	42	46	56	35	36	46	41	39	33	37
9	44	43	46	26	29	34	47	48	49	55	32	15	40	38	45	45	52	47	42	49	47	28	25	36	25	26	24	27	24	31	
2021																															
5	54	43	28	22	36	34	42	34	38	33	32	35	48	58	38	53	44	43	36	43	49	56	37	60	41	47	30	31	43	55	54
6	63	64	70	66	59	53	10	46	59	67	74	63	62	56	39	50	65	72	62	51	36	47	54	35	37	28	40	27	30	37	
7	34	32	43	49	44	50	52	14	40	35	30	30	40	42	39	36	43	57	57	62		55	55	48	54	76	57	51	57	34	46
8	45	45	54	73		49	55	44	34	39	42	31	46	51	51	59	60	46	48	49	33	48	46	45	58	43	46	39	32	69	53
9	40	49	37	30	46	51	44	35	41	40	51	49	56	43	42	50	61	52	50	27	26	22	29	49	37	46	58	38	57	51	
2020																															
5	48	51	52	34	35	45	49	32	47	29	35	48	51	43	48	43	36	32	35	45	33	36	45	52	47	45	44	46	45	36	46
6	49	63	50	71	56	45	59	66	43	44	50	52	40	48	56	64	78	88	74	57	53	50	40	41	57	48	52	56	34	42	
7	71	72	82	62	62	86	67	68	59	46	53	33	52	51	52	60	52	40	38	39	32	42	47	67	50	36	35	44	49		37
8	42	36	18	35	37	50	60	53	50	44	50	65	70	67	70	42	44	30	45	52	59	53	52	55	65	60	43	36	39	39	48
9	25	43	44	37	43	33	37	19	17	23	22	18	33	31	37	48	28	30	39	41	40	47	44	43	51	34	34	18	15		

Figure 15. Calendar view of MDA8 ozone observations from 2020-2024 from the Cook County Trailer (170311601) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170313103 71 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	47	40	42	56	40	44	42	43	24	37	39	54	43	30	32	39	55	60	49	48	57	45	56	46	46	38	37	41	38	43	59
6	37	52	49	51	38	35	38	43	43	38	47	49	55	54	68	63	52	35	58	43	62	48	27	53	43	47	31	28	41	33	
7	37	56	41	47	45	48	47	49	40	43	31	45	60	46		46	36	33	49	64	55	50	45	32	30	47	64	33	34	54	61
8	47	47	43	55	44	32	34	46	27	31	34	45	43	53	29	41	36	37	28	31	39	57	61	61	58	66	63	44	43	35	50
9	35	34	41	54	50	25	36	34	38	44	57	59	56	53	53	42	52	63	61	42	58	28	29	17	33	34	37	33	32	27	
2023																															
5	31	33	29	44	53	50	51	34	35	56	62	51	55	39	43	47	38	44	45	40	58	58	66	43	41	51	61	63	73	62	45
6	64	74	73	52	51	39	45	43	52	69	23	35	24	34	26	30	60	81	76	61	71	65	61	81	52	34	46	70	58	52	
7	50	42	42	59	55	40	44	48	55	53	41	35	45	48	47	43	37	45	62	43	33	46	54	54	84	42	72	62	40	32	45
8	53	61	82	49	51	42	42	41	32	47	48	40	31	29	30	45	31	46	49	55	34	61	41	54	27	42	37	47	40	33	38
9	51	57	54	45	44	35	13	29	35	53	19	29	34	34	54	30	37	25	24	41	22	38	53	46	31	30	18	25	30	53	
2022																															
5	28	27	27	27	31	39	49	42	42	37	48	58														30	21	44	51	54	36
6	25	45	45	39	53	41	39	30	37	36	42	40	44	54	41	54	47	34	59	64	57	49	37	78	47	38	40	51	62	57	
7	34	45	60	52	54	39	52	31	35	63	37	36	36	32	25	44	45	45	49	40	43	52	45	39	28	40	32	29	27	38	43
8	31	47	39	30	42	46	34	27	30	40	23	29	36	37	41	32	38	45	45	33	47	32	40	45	30	24	51	40	29	26	28
9	39	38	39	24	25	25	37	51	46	49	31	19	29	24	38	39	45	43	28	31	32	23	20	25	18	18	17	23	17	24	
2021																															
5	51	42	25	20	29	31	36	33	38	31	29	30	39	45	38	53	38	39	34	39	43	54	31	51	38	38	32	34	39	45	50
6	50	54	60	58	56	52	16	48	48	49	64	50	52	49	28	39	59	54	61	51	28	38	46	26	27	26	35	19	24	31	
7	26	22	36	46	42	46	43	16	27	33	35	31	31	37	41	27	38	35	39	51	29	57	51	45	42	56	48	47	45	26	39
8	38	30	47	50	52	40	51	45	26	36	36	29	39	41	45	40	44	35	38	48	37	38	46	39	52	49	55	39	29	55	42
9	34	32	31	27	36	42	35	28	30	38	48	45	61	34	31	48	51	39	56	27	23	20	21	40	30	41	46	27	39	32	
2020																															
5	33	47	47	37	34	38	40	31	44	29	30	43	45	29	39	39	25	29	33	41	40	29	41	55	47	43	45	40	36	30	38
6	40	54	45	59	62	36	49	62	40	32	45	33	35	43	44	62	62	72	69	53	52	48	35	35	52	27	47	55	31	44	
7	61	55	68	52	48	72	66	56	56	40	48	28	35	50	54	50	52	37	30	38	31	38	37	46	58	34	31	39	42	28	27
8	36	34	18	29	32	44	58	55	51	39	31	42	52	57	68	37	31	23	32	48	58	54	54	49	51	50	37	33	34	28	43
9	21	36	38	31	37	32	30	20	16	21	16	14	26	22	29	41	25	28	36	42	34	45	42	37	48	33	30	16	13	27	

Figure 16. Calendar view of MDA8 ozone observations from 2020-2024 from the IEPA Trailer (170313103) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170314002 78 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	53	45	42	56	41	47	47	47	26	40	41	55	45	29	32	45	53	59	50	55	58	51	60	48	45	41	44	48	38	46	61
6	38	57	54	55	48	45	46	45	50	39	55	63	65	57	66	63	58	36	63	44	71	50	32	55	49	57	32	31	47	33	
7	39	57	52	51	51	46	50	58	41	44	32	44	57	47	61	52	42	32	52	65	59	51	52	34	30	49	58	28	44	62	65
8	51	48	51	58	48	33	35	57	30	32	38	47	44	58	29	46	37	35	28	34	42	56	60	60	55	57	65	50	46	45	55
9	34	33	44	57	51	25	35	36	42	44	58	63	58	50	51	48	55	63	67	58	58	30	32	20	38	33	36	30	29	30	
2023																															
5			24	48	61	53	54	31	35	60	65	46	55	38	44																
6	73	79	74	52	53	41	51	45	51	73	24	41	31	34	28	31	52	80	78	65	75	69	69	78	54	40	51	81	63	71	
7	71		41	68	54	39	44	48	60											50	36	53	62	63	85	47	61	59	40	32	48
8	55	59	85	51	51	39	42	47	42	47	48	45	31	28	30	47	36	47	45	58	34	55	49	55	28	39	36	47	45	32	41
9	51	61	51	37	43	36	14	31	35	53	20	32	35	35	54	31	39	26		47	20	40	51	41	31	27	15				
2022																															
5	30	32	28	28	32	34	49	42	44	40	45	64	62	59	49	53	21	13	55	42	27	38	36	42	24	41	27	45	52	55	45
6	26	56	57	44	55	47	42	32	46	44	47	41	45	52	42	60	56	36	60	75	63	61	37	77	50	45	44	56	72	68	
7	38	46	62	53	56	42	58	38	35	60	45	45	41	37	23	46	46	63	55		50	58	47	41	30	51	42	38	37	48	45
8	40	53	42	36	49	44	36	33	34	55	27	35	38	40	47	35	47	50	51	36	49	35	51	56	36	30	54	43	36	36	39
9	47	45	52	26	30	34	42	53	52	58	38	21	37	30	46	46	51	50	34	39	44	27	24	33	26	25	22	27	22	31	
2021																															
5	55	43		18	30	34	40	31	37	33	32	33	42	51	34	56	45	42	34	41	50	57	33	61	43	48	33	32	39	44	52
6	59	61	72	67	59	52	16	53	50	48	66	54	53	55	31	41	62	68	63	51	35	45	47	33	31	28	42	22	36	39	
7	28	24	47	53	45	55	51	18	29	33	33	33	39	45	45	34	40	41	44	63	34	66	61	51	55	51	64	59	55	31	50
8	40	36	62	51	59	51	59	45	34	51	45	35	36	45	49	50	50	45	43	56	40	42	55	51	74	55	60	46	36	61	53
9	38	37	35	33	48	46	43	38	37	42	53	51	67	45	39	56	65	46	61	29	29	26	29	47	38	46	60	34	49	41	
2020																															
5	35	53	52	39	37	41	45	34	47	31	31	45	51	39	47	40	29	29	35	44	41	32	42	57	49	48	53	47	48	32	38
6	44	64	49	68	70	41	52	67	46	46	53	36	40	48	51	65	70	80	86	61	54	51	42	39	64	38	58	59	45	56	
7	69	64	74	60	50	82	78	60	56	42	50	26	30											46	60	38	38	46	51	33	29
8	38	36	19	31	37	44	59	54	51	43	34	50	59	67	79	38	35	25	33		67	53	54	61	60	65	46	40	40	31	49
9	27	44	43	37	43	32	32	22	18	24	25	15	29	27	37	51	29	31	39	45	42	53	52	45	53	32	37	19	15	31	

Figure 17. Calendar view of MDA8 ozone observations from 2020-2024 from the Cook County Trailer (170314002) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170314007 77 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	52	47	45	58	40	49	47	50	28	40	41	56	47	29	32	46	56	62	50	49	61	48	59	50	44	38	43	46	39	46	66
6	37	53	55	59	44	43	44	44	49	40	53	60	61	53	69	65	55	39	61	38	70	47	30	55	46	53	34	35	45	31	
7	42	61	48	50	50	47	48	55	50	47	30	47	62	48	63	54	38	35	57	65	52	48	51	37	33	52	65	35	38	59	75
8	56	49	47	60	42	33	39	49	28	33	34	52	49	58	34	48	42	37	31	35	43	63	68	74	61	68	67	48	45	39	53
9	35	35	50	63	57	28	39	38	42	50	66	68	65	56	55	51	62	70	75	55	64	32	35	21	42	42	39	34	33	35	
2023																															
5	35	39	36	53	62	52	55	39	42	66	75	56	60	44	50	56	44	54	54	44	61	67	77	43	43	55	65	66	73	72	58
6	78	82	74	53	60	40	44	46	58	77	22	40	27	42	25	31	54	83	78	60	73	69	68	83	52	38	46	82	70	60	
7	52	44	38	63	61	41	44	50	60	55	44	35	52	50	53	46	41	47	63	47	34	50	57	57	93	44	60	69	38	30	51
8	55	67	86	51	54	43	43	44	35	46	50	42	31	33	32	47	33	49	51	53	33	55	45	56	31	39	35	50	41	33	44
9	55	60	54	48	48	38	14	31	35	56	20	32	36	41	58	30	34	28	25	48	36	49	54	47	41	36	21	28	40	55	
2022																															
5	32	35	31	30	36	42	50	45	47	48	57	70	69	61	51	51	26	21	59	41	26	40	39	46	23	41	27	49	56	59	43
6	36	54	54	45	56	48	48	32	43	44	49	41	52	61	48	62	55	37	65	75	65	56	44	78	48	44	46	57	72	64	
7	41	49	60	57	50	40	63	36	36	64	44	45	41	38	33	49	51	51	56	47	48	60	52	44	38	55	39	35	32	55	49
8	37	56	46	35	47	50	39	33	36	45	28	42	41	41	48	38	45	53	55	41	51	41	53	63		29	61	47	36	33	38
9	47	49	44	28	30	38	46	59	58	63	38	26	38	34	47	51	54	51	38	43	41	31	27	33	27	26	23	33	29	36	
2021																															
5	55	45	32	24	35	38	40	36	39	36	34	37	47	55	45	61	51	48	41	48	49	59	34	58	43	46	37	39	40	48	55
6	59	63	69	66	63	56	25	55	57	57	74	59	56	56	32	41	69	64	67	59	33	45	53	36	37	36	40	34	32	46	
7	28	25	46	54	51	54	49	22	31	41	39	39	41	47	51	33	41	38	46	59	33	74	68	51	51	61	58	55	52	30	48
8	39	40	56	59	62	50	59	51	31	45	43	37	47	45	48	48	54	47	53	61	44	41	54	48	62	69	67	50	35	62	54
9	38	41	40	35	47	45	41	35	40	45	55	48	62	43	40	61	60	46	65	30	27	25	28	48	37	46	55	37	54	52	
2020																															
5	39	53	53	42	41	44	46	34	48	32	34	49	55	34	46	39	33	33	38	49	53	39	47	61	52	53	58	42	42	33	40
6	47	59	53	67	72	38	50	71	53	43	50	36	36	44	52	70	72	84	83	59	57	63	39	39	62	37	56	63	55	57	
7	67	64	70	55	50	88	65	63			50	30	40	59	58	58	60	43	35	41	41	43	40				33	43	52	33	33
8	39	39	21		33	51	61	55	52	47	37	44	57	62	69	38	36	26	35	53	69	56	54	52	57	55	42	35	35	29	49
9	33	39	42	34	39	33	30	22	19	26	26	16	27	31	35	44	29	31	39	44	41	50	42	41	53	33	33	16	14	28	

Figure 18. Calendar view of MDA8 ozone observations from 2020-2024 from the Regional Office Building (170314007) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170314201 75 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	53	45	42	53	39	47	45	51	28	39	38	55	50	27	31	45	52	60	48	49	58	48	53	51	44	40	40	43	37	40	61
6	39	51	54	59	43	41	43	43	47	36	50	59	59	47	60	61	54	38		28	59	45	29	46	44	52	32	37			
7		59	46	47	48	40	48	53	47	43	25	47	60	46	66	55	38	31	49	56	47	35	50	34	30	46	58	36	39	61	74
8	55	45	42	47	38	32	37	47	28	31	32	45	42	48	33	48	43	37	30	33	39	59	67	66	59	69	72	44	36	39	51
9	33	33	47	60	58	27	36	36	43	52	65	64	64	54	54	56	60	64	71	61	54	34	33	24	42	43	37	32	32	31	
2023																															
5	35	38	35	50	61	48	53	40	39	59	75	60	56	44	49	57	42	55	53	40	56	60	71	40	42	54	63	65			
6					67	41	43	40	56	86	27	45	33	42	27	30	42	81	80	62	76	72	72	76	55	42	45	89	72	61	
7	65	53	34	71	66	40	43	53	65	62	47	40	54	56	57	50	46	46	56	53	39	54	66	57	99	49	56	72	36	34	53
8	61	73	92	55	57	48	44	50	40	58	55	47	33	39	37	55	39	51	56	56	35	57			33	44	39	51	46	40	48
9	61								38	64	30	36	40	44	63	37	42	32	31	48	48	56	57	51	46	39	23	33	45	58	
2022																															
5	30	34	31	31	39	43	50	48	50	48	53	70	70	60	51	53	23	24	60	42	24	40	37	46	23	46	31	51	59	61	48
6	35	57	59	49	53	53	46	37	45	47	52	40	50	62	51	65	58	37	66	80	65	62	42	76	45	45	46	59	74	69	
7	42	46	57	60	45	30	54	35	34	54	43	46		36	37	48	52	54	59	47	49	61	53	43	32	50	42	35	33	49	49
8	39	59	45	31	43	51	39	34	34	48	30	40	42	42	47	39	42	56	56	43	52	36	47	58	44	27	54	47	37	35	38
9	49	50	43	26	30	36	41	53	61	59	40	29	42	31	48	52	54	54	32	43	42	29	27	31	26	26	22	30	29	36	
2021																															
5	53	44	33	25	35	39	41	35	38	35	34	37	51	59	51	67	58	48	45	52	54	63	31	66	46	49	39	41	44	53	58
6	61	70	76	72	67	60	31	56	58	56	69	69	56	62	35	38	75	70	70	61	39	52	59	45	44	39	42	42	37	51	
7	28	26	50	60	55	60	39	24	33	46	42	42	47	53	54	33	38	42	42	63	32	75	74	49				71	54	30	49
8	38	42	53	63	66	54	68	54	31	49	45	39	41	46	50	51	56	47	55	60	49	41	61	52	70	75	68	53	36	61	56
9	39	43	46	41	49	42	46	39	39	50	59	48	56	47	42	63	66	49	67	35	32	29	32	55	40	51	61	40	57	58	
2020																															
5	39	53	53	42	40	42	45	34	47	35	32	46	55	41	48	39	34	34	41	50	55	40	48	63	53	53	60	46	43	33	39
6	48	65	57	71	82	37	46	67	55	45	51	36	34	40	51	63	73	80	82	60	51	64	40	41	57	36	64	56	57	60	
7	64	60	78	52	48	79	68	63	71	46	49	30	37	65	62	55	65	44	35	42	42	46	41	51	74	40		44	52	33	34
8	40	42	24	33	43	59	64	63	59	53	34	46	59	65	74	37	35	27	37	61	71	63	61	60	56	60	49	40	38	31	55
9	35	46	46	35	42	36	31	24	22	26	30	18	28	33	40	49	32	33	42	49	44	58	50	45	59	36	38				

Figure 19. Calendar view of MDA8 ozone observations from 2020-2024 from the Northbrook Water Plant (170314201) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170317002 80 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	55	53	41	55	42	50	52	56	33	40	39	57	53	29	33	43	48	67	50	54	60	50	54	55	43	41	43	45	41	41	59
6	44	56	65	65	46	43	44	44	48	38	55	79	66	49	57	66	59	39	66	29	66	49	30	49	48	60	35	41	47	31	
7	41	60	62	48	52	38	54	58	50	41	28	48	66	50	71	65	42	31	52	54	53	38	55	36	36	48	49	42	45	61	77
8	54	45	46	43	41	35	39	59	30	33	34	58	49	53	35	51	47	38	31	38	43	46	69	69	62	76	92	48	44	45	60
9	34	33	52	67	63	29	38	37	45	56	70	69	68	56	57	68	62	71	73	67	56	37	35	25	42	44	41	35	34	35	
2023																															
5	34	38	35	47	59	47	53	40	41	62	74	60	56	45	49	57	43	54	47	37	63	49	71	41	43	53	63	64	67	74	65
6	72	76	69	53	56	37	38	36	48	86	25	41	29	38	24	28	37	75	75	58	73	67	71	61	52	38	40	78	64	57	
7	68	53	34	75	62	35	44	53	66	60	45	38	54	54	56	47	47	41	52	50	36	46	70	57	92	59	55	70	32	33	51
8	62	65	81	53	55	45	40	49	37	60	52	44	34	41	33	53	37	45	49	56	33	53	50	61	36	43	39	49	47	39	48
9	61	66	59	46	49	43	20	36	36	55	35	35	40	44	63	39	43	32	26	62	50	58	55	49	43	39	22	33	42	55	
2022																															
5					41	44	50	50	53	56	53	67	68	60	50	54	27	28	59	45	34	40	38	47	30	49	30	45	56	57	48
6	34	53	58	51	51	50	45	39	48	50	51	40	51	71	50	64	60	40	62	80	68	66	46	86	53	46	48	63	73	70	
7	42	50	64	60	51	35	59	39	36	63	47	45	39	39	39	49	53	64	61	50	51	55	53	45	37	51	46	38	41	50	51
8	40	60	47	32	43	53	40	34	34	53	32	45	42	42	48	40	44	50	55	47	51	40	54	51	46	25	55	47	39	36	40
9	48	50	49	27	32	38	45	62	59	66	42	32	44	32	52	53	55	56	36	45	44	32	29	32	27	26	22	32	31	40	
2021																															
5	57	48	35					36	40	36	35	37	47	56	45	63	59	47	41	49	53	65	32	64	47	51	38	40	40	53	57
6	60	67	78	72	66	60	30	62	55	54	69	65	52	54	34	38	73	74	67	59	36	53	54	40	38	33	42	37	37	47	
7	27	21	47	68	52	60	36	24	32	44	41	40	39	53	57	33	32	42	41	64	32	68	80	56	51	64	65	80	55	30	55
8	37	42	55	64	66	56	68	50	34	47	48	40	38	46	54	51	61	48	55	63	49	41	72	58	88	77	65	53	36	57	56
9	39	44	46	35	47	41	47	37	38	39	58	52	75	45	40	56	66	46	61	30	33	28	29	50	37	47	62	39	59	59	
2020																															
5	39	52	52	42	40	42		34	47	38	32	43	53	41	53	40	35	36	42	50	57	43	47	61	58	54	58	47	51	34	41
6	48	65	62	72	83	40	49	68	56	47	53	38	38	40	50	64	73	80	84	60	47	61	40	43	51	35	74	47	51	65	
7	60	50	72	50	39	71	71	62	66	45	48	32	38	62	61	50	63	43	35	40	43		39	53	73	39	38		49	34	32
8	42	47	24	33	49	60	43	59	54	49	40	50	57	61	56	36	38	28	35	64	61	61	58	68	51	61	48	44	38	32	51
9	37	45	46	37	41	34	30	25	22	28	31	17	27	33	41	49	32	36	44	49	48	55	44	54	56	34	36	18	15	30	

Figure 20. Calendar view of MDA8 ozone observations from 2020-2024 from the Water Plant (170317002) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170436001 73 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	52	44	43	53	40	48	47	52	25	39	42	53	45	29	32	41	59	56	52	51	55	49	62	43	48	40	43	46	34	48	61
6	33	57	50	44	42	42	45	41	47	41	49	55	52	58	65	58	48	32	53	57	58		29	55	35	51	36	29	31	35	
7	40	59	41	45	46	47	45	46	34	43	38	59	56	42	45	38	40	40	57	58	57	62	45	34	40	56	57	25	38	46	54
8	41	46	44	49	43	29	37	45	27	31	35	40	55	54	29	40	36	32	32	37	46	57	61	53	55	54	52	43	53	37	49
9	36	39	49	55	54	28	36	36	41	46	56	68	62	54	51	53	60	69	62	48	52	25	32	19	42	41	36	30	28	34	
2023																															
5	34	39	36	50	55	50	55	31	40	59	63	42	55	36	46	56	39	52	48	43	59	67	76	50	41	53	60	63	71	72	48
6	61	82	72	57	62	46	50	52	56	66	19	39	33	43	38	33	72	72		70	78	70	71	86	52	43	73	82	63	60	
7	60	47	56	62	61	50	65	52	58	56	51	38	56	52	53	49	43	57	64	50	47	51	57	70	88	51	88	50	49	38	53
8	55	62	75	61	54	46	45	46	38	50	49	47	39	32	36	47						62		47	39	43	42	62	45	36	49
9	58	59	54	46	47	36	19	30	42	53	25	36	42	40	59	38	39	34	30	47	27	39	58	47	33	30	21	28	41	52	
2022																															
5	31	33	29	30	34	36	50	46	43	49	56	62	63	64	46	53	21	16	56	40	30	39	39	44	27	39	24	48	55	58	40
6	32	56	55	41	65	47	48	33	45	45	46	45	51	54	45	60	57	40	62	68	60	58	62	79	54	44	51	55	68	61	
7	41	59	69	54	55	48	61	34	42	63	43	43	49	47	28	48	48	55	50	47	48	51	48	40	40	51	39	36	35	41	46
8	39	51	42	40	44	42	37	32	42	51	32	37	41	39	49	43	50	52	53	37	51	42	48	55	36	40	53	43	35	34	37
9	44	48	44	24	29	38	49	52	52	54	35	20	40	42	45	48	53	48	43	46	45	29	27	33	27	27	25	28	21	32	
2021																															
5	54	44	32		39	35	43	38	41	36	35	39	49	59	44	57	47	43	39	47	47	58	39	57	43	47	34				
6				68	64	59	21	57	63	69	64	61	62	58	40	54	67	69	67	54	38	48	56	39	34	29	40	27	31	41	
7	35	35	47	53	48	53	53	22	43	37	38	36	42	46	46	39	48	55	62	63	42	55	53	48	53	72	57	52	51	34	46
8	44	38	48	71	61	47	53	48	34	36	39	32	44	56	59	60	61	46	48	56	38	50	48	41	53	51	57	40	34	68	54
9	43	48	36	34	49	52	44	39	42	45	53	52	53	45	44	54	61	52	59	31	30	28	32	50	39	48	57	41	56	50	
2020																															
5	46	51	52	38	36	45	49	34	48	31	36	47	50	38	46	44	32	30	34	45	35	35	45	53	46	46	46	41	42	34	41
6	43	53	43	67	55	45	63	66	43	39	50	51	40	50	55	63	77	87	68	52	50	50	39	41	54	35	49	58	35	46	
7	73	69	77	61	60	65	64	70	59	44	49	34	49	53	53	56	51	39	34	39	35	41	44	65	60	34	33	43	48	37	40
8	41	40	20	35	38	51	65	54	52									32	49	51	59	53	54	54	64	56	41	36	40	41	49
9	27	44	45	38	43	33	38	22	19	26	22	19	32	27	37	48	32	34	44	46	42	49	49	42	54	37	39	22	17	34	

Figure 21. Calendar view of MDA8 ozone observations from 2020-2024 from the Morton Arboretum (170436001) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170890005 78 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	52	52	48	55	42	52	55	54	26	40	44	55	50	29	39	46	61	58	52	53	59	49	63	50	45	44	43	46	37	47	66
6	36	50	54	51	45	42	44	40	47	43	52	57	58	58	68	60	50	37	58	67	64	44	29	57	42	52	37	30	41	37	
7	44	59	41	44	47	45	43	47	51	43	34	60	57	43	48	42	38	44	48	56	49	52	47	40	40	53	62	33	42	51	54
8	41	44	44	51	46	30	39	45	26	32	35	44	54	63	34	45	40	32	34	38	47	62	60	58	57	55	50	50	59	39	49
9	36	40	53	63	55	29	36	37	41	51	61	70	65	64	59	54	65	72	65	48	53	29	33	22	40	41	38	33	32	39	
2023																															
5	36	42	42	54	61	53	57	35	46	68	72	44	64	41	55	58	42	55	52	45	64	75	82	56	48	57	65	70	78	79	68
6	71	87	76	60	68	54	53	54	58	73	22	42	33	49	44	41	76	78	81	72	76	70	73	82	50	41	70	84	72	61	
7	50	48	55	59	64	50	68	53	58	54	51	37	51	50	53	46	39	52	59	49	49	47	57	64	86	49	95	59	46	35	51
8	52	64	64	57	49	48	44	45	36	53	51	44	37	31	37	48	37	47	54	54	47	71	47	48	43	44	41	58	44	40	51
9	54	58	54	46	48	39	21	30	42	52	25	35	40	47	59	38	33	35	34	50	36	47	59	50	40	34	25	29	41	55	
2022																															
5						39	51	46	45	50	64	68	70	60	50	53	26	19	58	38	24	40	41	46	28	41	26	48	56	59	46
6	37	56	57	39	60	53	51	35	45	45	46	44	57	53		63	57	43	47	73	62	58	63	79	53	44	51	56	70	65	
7	48	55	69	54	57	48	71	38	43	59	43	43	48	44	35	49	54	51	47	44	47	47	51	41	36	58	40	35	34	41	44
8	38	55	43	39	60	42	34	34	44	43	31	37	41	37	49	43	40	51	53	37	50	35	43	51	36	38	61	41	34	33	37
9	42	50	38	24	34	41	45	60	61	54	27	20	37	39	45	49	53	46	49	49	42	28	25	29	28	25	23	30	22	33	
2021																															
5	53	43	33	24	39	36	40	35	41	36	34	41	50	60	48	57	50	46	42	48	47	56	37	59	41	46	33	37	45	57	55
6	65	69	70	68	63	54	31	62	65	66	65	64	59	53	40	50	64	68	68	54	35	47			36	39	38	30	32	46	
7	36	36	44	51	51	53	50	21	42	40	41	36	44	44	47	37	49	40	60	61	42	56	50	48	52	61	53	50	54	38	45
8	38	41	44	58	56	47	52	43	31	39	37	35	41	52	55	58	64	48	56	64	40	48	45	42	56	64	55	42	36	58	53
9	42	48	37	34	46	49	43	36	38	45	54	50	56	44	41	59	54	48	61	30	28	27	30	49	37	48		41	53	50	
2020																															
5	48	51	51	41	39	45	51	37	46	31	37	49	52	38	48	44	30	31	38	47	42	36	50	55	47	50	49	40	39	39	45
6	46	62	53	65	59	46	51	73	46	42	49	47	40	47	55	73	81	90	70	52	59	55	40	42	56	39	53	63	41	58	
7	77	70	73	52	53	69	60	73					52	59	57	57	48	36		40	38	39	39	59	54	34		40	45	33	37
8	39	38	17	31	36	52	68	53	52		47	61	64	68	59	41	43	32	46	49	52	52	52	53	69	52	40	34	36	38	51
9	29	40	44	36	40	34	34	23	20							48	30	32	43	45	44	52	48	43	56	38	37	21	14	32	

Figure 22. Calendar view of MDA8 ozone observations from 2020-2024 from the Larsen Junior High (170890005) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 170971007 79 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	54	54	43	49	40	47	48	54	32	41	38	56	57	28	34	44	49	67	49	50	59	47	49	57	42	43	40	48	39	39	65
6	43	54	64	65	42	39	44	38	46	37	56	82	59	47	62	64	56	44	67	29	37	42	31	49	44	54	32	36	42	28	
7	37	60	52	48	45	38	47	52	51	38	19	40	67	47	79	43	37	32	49	55	39	32	48	35	30	47	59	48	40	62	78
8	54	45	44	37	38	34	39	43	25	29	32	48	48	52	41	47	42	38	33	33	38	61	66	69	64	78	80	39	35	40	53
9	33	32	45	59	55	27	36	35	42	54	60	65	65	55	54	62	59	67	69	63	51	33	33	25	41	45	38	34	34	32	
2023																															
5	35	40	37	50	65	54	53	42	42	57	75	65	57	44	50	59	43	55	49	38	62	60	63	40	43	53	62	63	70	75	70
6	73	78	70	54	63	37	36	35	49	84	22	41	29	34	24	26	37	77	77	57	76	70	63	73	52	36	40	77	75	61	
7	62	41	30	70	65	33	40	50	69	55	40	40	51	56	50	46	40	42	48	49	38	45	64	51	97	47	54	65	30	34	49
8	65	70	85	47	55	45	37	39	40	64	53	45	30	38	33	49	34	47	52	51	31	46		50	31	40	34	48	39	39	45
9	59	55	56	49	53	42	15	34	34	54	30	30	35	36	60	37	33	30	30	42	45	55	53	48	44	39	22	30	42	53	
2022																															
5	32	37	33	31	42	45	51	53	54	62	53	70	70	62	52	54	27	35	59	41	30	41	41	46	34	41	33	49	61	63	49
6	37	55	58	44	51	48	43	45	48	53	50	32	58	80	55	63	55	38	64	89	66	61	48	81	53	46	48	64	59	70	
7	43	46	59	62	46	33	60	37	35	56	50	52	37	34	42	50	54	62	59	48	53	53	57	44	36	47	41	36	36	46	55
8	40	55	47	32	39	60	39	30	36	52	30	39	45	44	48	39	39	61	61	48	49	41	51	55	43	25	48	52	32	36	39
9	52	58	38	29	32	37	44	59	61	62	40	33	42	33	53	57	54	56	34	48	39	30	33	29	28	27	21	33	34	36	
2021																															
5	60	50	41	30	38	43	43	38	43	37	38	40	45	59	50	65	63	53	48	54	53	71	27	61	46	48	39	40	41	54	59
6	61	68	81	74	70	69	34	65	56	52	66	65	58	60	36	40	75	69	67	53	36	52	59	48	46	45	40	40	46		
7	26	24	45	62	57	58	28	25	32	48	42	44	43	56	55	34	33	42	41	58	31	77	80	57	59	62	63	79	53	28	46
8	34	43	56	68	66	55	71	53	33	59	44	43	35	45	54	51	58	48	50	57	55	39	62	58	70	64	71	59	39	58	51
9	37	42	49	40	45	41	42	36	37	46	55	41	39	44	38	59	60	43	57	29	29	26	29	53	37	48	53	38	52	53	
2020																															
5	41	53	52	42	40	44	45	33	48	39	34	43	58	43	51	39	37	37	42	51	58	44	49	64	59	59	63	45	40	35	41
6	50	70	62	67	73	36	40	68	60	45	49	35	32	36	49	66	74	78	99	58	47	52	38	43	51	38	71	51	51	61	
7	63	50	73	45	41	76	73	63	76	44	44	31	37	67	66	53	72	44	33	41	49	43	36	46	78	41	34	42	45	30	32
8	39	37	22	28	48	61	64	61	59	52	35	50	56	60	59	34	34	26	34	65	70	62	58	48	51	49	46	49			
9		37	42	33	35	35	26	23	20	31	32	15	24	31	39	43	30	31	39	49	41	51	45	51	59	36	35	16	12	27	

Figure 23. Calendar view of MDA8 ozone observations from 2020-2024 from the Camp Logan Trailer (170971007) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 171110001 79 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	52	51	46	54	42	50	53	52	26	40	43	55	52	25	37	47	58	57	50	48	58	48	63	51	44	40	41	46	36	45	66
6	36	48	51	51	42	40	43	39	46	41	49	56	57	55	67	58	48	36	57	53	63	42	28	56	39	51	35	32	39	35	
7	41	58	42	41	43	41	40	48	48	40	30	50	55	46	48	43	36	41	48	55	46	47	45	36	34	53	62	30	44	49	53
8	44	42	39	50	40	29	37	43	22	29	31	35	43	56	33	46	37	31	31	35	44	60	59	62	54	54	45	43	51	38	47
9	34	35	47	64	53	26	34	34	40	50	59	65	61	52	52	49	61	73	63	46	55	25	31	23	39	39	36	32	30	35	
2023																															
5	35	40	40	51	59	50	55	34	45	66	71	46	62	39	53	56	41	51	47	43	60	71	79	49	47	56	64	69	74	74	68
6	79	83	73	56	66	47	48	50	56	71	21	41	32	49	38	39	64	79	79	67	72	67	70	86	48	41	66	90	76	63	
7	57	43	49	56	60	46	55	52	55	53	49	35	48	51	53	46	36	46	59	48	48	46	55	61	84	44	86	65	45	34	48
8	50	64	65	52	52	47	43	44	37	52	51	42	33	29	36	47	35	44	53	53	43	74	52	53	41	41	39	50	41	37	51
9	52	54	53	45	48	38	19	30	41	55	28	34	39	45	58	39		33	34	45	36	48	57	51	40	36	23	28	42	57	
2022																															
5	32	38	33	34	38	42	51	47	46	50	63	69	73	60	51	54	28	24	60	38	26	40	40	46	29	43	27	48	57	59	45
6	38	57	56	41	57	52	50	36	45	47	48	45	55	55	47	61	55	42	59	70	63	56	55	78	48	43	49	56	73	67	
7	46	54	61	54	49	46	58	38	42	58	45	45	45	40	33	47	54				48	47	50	41	36	59	38	33	31	40	44
8	36	56	44	41	56	42	36	31	44	42	30	39	41		49	41	39	51	52	39	49	36	41	51	37	37	58	40	31	33	36
9	44	50	38	22	32	40	46	59	62	51	27	25	37	41	44	49	51	44	47	42	41	28	23	28	31	27	24	30	27	35	
2021																															
5	55	44	38	28	41	41	42	38	43	37	36	42	52	60	49	59	50	49	43	49	45	58	36	57	41	45	37	37	45	53	55
6	64	67	72	69	65	54	35	57		62	65	62	59	50	37	48	63	66	69	55	34	47	56	44	42	38	37	35	34	47	
7	33	34	45	52	53	53	48	22	37	42	40	35	44	45	49	37	48	39	57	60	38	56	50	51	55	60	55	54	57	38	47
8	38	41	47	58	56	49	53	46	31	42	44	36	40	47	51	52	61	48	53	64	42	46	45	42	50	72	54	43	40	56	52
9	42	50	37	36	46	50	41	36	36	45	53	49	51	44	40	60	55	49	66	31	30	29	30	51	39	49	58	41	55	56	
2020																															
5	50	53	54	42	42	48	52	40	49	35	39	53	53	37	50	46	32	34	39	49	52	37	53	56	48	53	55	41	39	41	44
6	49	66	57	68	61	46	54	82	56	45	51	45	42	49	57	76	79	84	70	53	60	53	39	41	57	42	54	62	44	57	
7	70	68	73	49	54	73	62	71	68	45	50	33	43	60	53	54	47	37	33	39	44	41	40	55	53	39	34	43	50	33	37
8	41	39	19	32	38	58	72	54	53	47	40	57	61	68	56	40	41	33	41	47	51	52	52	52	65	51	43	36	36	33	50
9	34	43	44	36	39	33	32	24	20	28	21	17	27	34	37	44	29	32	42	46	42	51	45	40	53	37	35	18	14	30	

Figure 24. Calendar view of MDA8 ozone observations from 2020-2024 from the Cary Grove Hs (171110001) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 171971011 73 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	53	48	41	52	48	50	50	53	40	40	44	53	42	37	43	42	54	56	54	54	56	50	57	47	54	52	48	47	36	52	57
6	35	55	52	45	45	45	48	43	47	45	51	54	49	59	65	57	47	31	52	53	55	46	34	51	42	44	39	38	38	38	
7	37	59	40	34	44	42	50	45	32	39	44	47	49	41			37	38	44	42	50	49	44	35	43	41	48	26	42	40	45
8	37	43	39	40	40	30	47	45	27	30	31	33	48	45	33	41	28	29	35	40	44	42	51	44	50	47	49	38	44	41	45
9	40	36	38	45	52	29	35	35	38	41	52	59	44	39	39	45	62	60	63	47	45	27	32	14	42	44	36	26	29	34	
2023																															
5				53	60	51	60	33	50	62	66	42	49	36	55	60	45	60	47	47	61	71	79	73	49	59	64	70	75	72	50
6	62	86	80	64	70	63	64	64	63	74	26	43	44	54	54	43	60	66	78	75	74	70	82	71	47	41	80	76	46	46	
7	38	45	52	52	49	43	54	46	50	48	53	42	46	47	45	50	37	53	45	46	52	49	53	60	67	46	56		49	36	40
8	50	50	50	61	46	43	42	40	33	43	41	41	33	29	37	40	36	38	47	55	53	45			40	42	44	51	43	38	44
9	47	53	45	38	43	33	15	25	48	48	29	35	43	44	55	33	37	35	34	54	28	33	52	44	38	35	23	28	42	48	
2022																															
5	34	42	29	34	30	37	52	47	45	44	42	61	64	63	50	54	34	33	58	47	34	40	45	47	33	44	23	50	54	58	45
6	35	56	58	52	65	57	54	39	51	46	47	51		54	46	60	56	50	58	71	60	56	71	64	53	43	51	53	63	64	
7	39	54	60	50	50	60	42	32	47	54	41	39	50	64	24	50	37	52	47	47	46	43	44	36	33	36	37	37	35	37	42
8	41	42	41	37	32	34	27	27	42	48	37	31	40	37	53	49	52	46	50	34	45	41	41	49	36	42	41	38	38	31	38
9	40	44	42	33	33	42	50	44	49	49	23	19	36	41	46	46	52	43	52	47	45	31	26	38	27	29	28	27	35	36	
2021																															
5	57	46	33	24	41	32	46	39	41	40	35	40	52	59	40	55	38	41	42	48	52	56	40	59	46	48	33	33	48	57	52
6	59	65	72	68	60	53	24	44	44	51	56	63	63	62	52	60	63	71	58	48	34	45	53	42	37	27	40	25	28	30	
7	46	41	41	44	37	44	45	16	38	24	31	28	39	39	37	41	49	41	54	51	42	44	47	44	45	64	51	43	47	36	41
8	44	34	50	52	56	45	43	42	32	28	34	29	42	56	39	45	40	36	48	40	30	50	39	35	39	35	40	31	29	64	54
9	47	38	41	27	47	51	48	35	36	38	51	53	51	46	46	52	56	63	52	26	23	25	33	49	37	46	57	47	58	61	
2020																															
5	48	52	50	34	40	45	52	36	47	30	35	48	47	47	46	52	39	32	36	39	33	42	47	50	43	42	41	47	44	38	45
6	48	60	46	57	52	54	54	62	34	44	47	57	45	51	56	58	69	73	66	50	48	47	38	41	54	51	46	42	30	35	
7	47	64	79	67	67	64	60	54	56	41	53	40	50	50	50	53	44	34	35	39	26	38	36	60	48	32	31	37	50	37	38
8	33	33	18	31	32	41	47	48	46				55	62	58	40	34	34	45	44	43	45	45	48	52	54	35	30	34	32	43
9	25	36	42	36	41	31	41	16	15	25	23	18	32	29	36	46	31	33	40	41	42	50	50	47	52	38	37	22	20	32	

Figure 25. Calendar view of MDA8 ozone observations from 2020-2024 from the Com Ed Training Center (171971011) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 180890022 74 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	58	53	37	56	42	47	49	55	31	36	42	54	46	31	32	43	56	56	49	55	57	52	56	47	42	42	45	46	41	43	60
6	46	53	53	54	47	43	44	44	46	40	48	63	52	53	58	64	54	37	56	48	62	49	29	53	46	61	31	34	48	31	
7	38	60	56	42	51	43	52	54	53		34		55	43	44	51	42	32	50	52	57	50	47	37	32	48	50	30	52	72	58
8	40	43	44	53	47	32	37	75	33	33	41	41	45	52	37	46	34	34	29	34	41	53	58	55	54	50	64	56	44	53	61
9	33	32	46	54	55	30	39	40	47	46	56	69	61	51	54	67	62	66	70	53	65	32	34	17	41	43	39	31	32	36	
2023																															
5	31	37	36	48	58	54	55	37	38	53	72	51	48	41	49	58	44	59	44	36	58	58	72	46	42	52	64	59	67	75	52
6	64	74	70	51	65	41	48	46	49	76	24	40	28	41	33	26	44	77	74	60	76	67	68	65	48	35	38	66	50	54	
7	51	36	39	73	51	36	46	50	58	52	48	41	58	49	45	53	45	40	53	49	36	54	71	56	78	46	57	46	29	33	45
8	49	53	75	59	45	38	39	49	40	47	43	47	34	38	31	46	35	41	40	64	42	43		43	31	37	37		45	33	47
9	45	47	46	34	45	37	22	34	36	52	32	32	42	43	54	47	40	27	21	50	41	41	52	44	43	33	20	27	36	47	
2022																															
5	31	35	32	31	36	43	50	46	52	44	59	62	60	57	51	53	24	21	57	46	36	42	39	49	30	48	29	46	55	56	47
6	33	55	63	48	53	47	43	40	52	49	48	43	47	63	49	61	60	37	59	71	64	67	42	83	47	47	45	55	81		
7	38	44	64	53	73	46	54	45	35	56	44	57	42	44	24	49	46	54	57	54	56	53	47	41	32	50	43	46	48	44	44
8	46	46	36		53	42	30	29	30	48	30	41	38	38	48	37	52	44	48	36	47	31	42	49	41		50			37	41
9				26				55	48	50	36	24	38	35	41	43	52	45	30	42		32	26	42	20	22	24	30	28	40	
2021																															
5	53	46	28	27	32	35	40	34	38	35	33	35	46	53	42	63	44	44	34	44	51	56	46	61	44	57	35	37	38	52	49
6	59	64	76	65	57	54	20	49	57	52	65	55	49	55	34	39	62	75	61	51	34	44	43	40	34	24	41	31	33	31	
7	30	22	50	57	42	52	45	23	28	30	34	36	37	40	44	37	33	41	41	72	34	55	56	47	50	45	59	56	56	29	53
8	36	36	61	70	56	44	45	41	37	32	39	32	35	44	47	50	52	46	47	48	40	36		36	66	41	46	33	29	52	54
9	36	39	35	33	48	39	44	36	34	36	48	50	43	44	38	52	50	47	51	22	33	27	26	42	35	42	60	37	57	50	
2020																															
5	40	53	49	41	42	43	45	33	46	37	34	45	52	36	44	40	36	33	38	43	47	35	47	52	50	46	50	48	56	30	38
6	47	62	49	65	80	39	49			44	48	38	36	41	49	64	74	77	80	59	43	44	47	42	57	48	54	48		48	
7	60	61	71	49	42	67	60	65	59	53	56	32	35	54	52	53	47	36	35	41	26	45	45	51	58	35	39	52	60	37	36
8	44	39	23	32	41	53	56	52	47		33	50	59	62	64	36	35	29	31	46	61	49	49	59	56	57	40	34	39	32	45
9	32	44	42	40	43	33	31	21	23	26	28	20	31	34	35	46	31	34	40	43	40	49	47	44	55	32	40	16	16	26	

Figure 26. Calendar view of MDA8 ozone observations from 2020-2024 from the Gary-IITRI (180890022) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

monitor 180892008 71 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	57	55	38	57	41	42	52	52	31	38	40	55	47	31	32	46	54	59	47	56	59	52	56	48	42	46	45	45	42	46	63
6	46	53	54	54	49	45	47	47	50	39		63	59	52	64	65	55	38	59	40	62	51	31	56	49	62	32	38	49	31	
7	38	61	55	48	54	45	53	57	49	48	34	44	62	50	53	59	45	33	54	65	58	53	52	37	30	53	54	31	56	71	64
8	50	47	42	57	47	33	37	78	33	35	42	42	40	59	39	52	35	35	29	34	40	53	60	57	57	54	67	54	43	55	62
9	34	31	47	56	61	29	37	40	46	51	60	62	56	46	51	56	58	65	71	61	61	33	35	18	40	40	37	31	31	67	
2023																															
5	30	34	30	45	56	53	52	35	34	52	66	52	43	36	44	57	41	54	41	34	57	56	72	42	40	47	55	52	59	64	53
6	65	68	66	48	58	37	47	45	46	70	23	39	32	35	31	27	42	77	69	56	69	61	64	70	51	38	41	75	52	64	
7	53	40	36	73	54	37	43	50	61	53	49	38	53	53	50	52	45	40	54	52	36	58	69	60	78	55	59		35	33	47
8	52	55	81	56	50	40	41	49	39	48	44	45	34	35	32	44		40	43	61	36	50			30	40	36	44	49	32	47
9	49	49	49	37	45	37	19	33	34	50	29	33	40	41	54	44	43	27	27	51	32	40	52	43	37	31	20	27	35	45	
2022																															
5	30	34	32	30	24	41	46	47	48	42	61	64	60	53	49	55	22	18	58	45	34	41	38			44	30	45	53	57	46
6	30	56	60	46	51	56	37	40	50	50	49	43	33	59	47	62	56	37	62	72	65	67	39	81	54	48	44	56	78	67	
7	40	44	63	57	69	46	59	45	36	59	48	53	44	43	29	50	50	59	56	52	53	57	48	42	32	50	42	44	47	42	46
8	47	49	37	41	53	45	36	31	34	53	29	41	41	40	49	40	51	52	51							29	52	46	39	38	
9	48	44	62	26	34	36	38	53	51	55	40	22	39		46	44	53	47	30	42	48	30	28	39	23	25	23	29	26	37	
2021																															
5	56	47	30	26	30	38	42	35	41	35	34	35	42	53	38	59	47	46	39	44	51	58	42	58	45	52	36	37	41	51	54
6	59	59	76	67	60	55	21	53	52	51	66	54	49	56	31	37	63	70	64	52	37	45	49	39	35	27	43	33	37	33	
7	31	23	48	58	46	51	49	23	29	35	33	31	37	41	46				43	74	35	58	57	49	51	45	63	54	53	29	53
8	37	38	64	53	56	46	49	43	37	38	40	32	35	45	45	49	51	40	41	47	40	36	54	38	68	46	48	36	31	56	55
9	37	37	39	34	48	43	46	38	34	38	50	52	49	45	37	54	54	46	56	26	33	29	27	46	36	44	61	35	57	51	
2020																															
5	36	51	48	40	39	40	43	32	44	31	31	44							35	39	45	35	47	53	50	43	50	46	50	26	33
6	47	63	46	69	71	36	46	64	42	43	50	36	36	40	46	63	68	76	81	58	45	44	44	42	59	49	57	51	40	53	
7	61	60	65	51	45	76	68	57	56	52	55	33	33	52	53	54	48	36	37	43	27	45	46	50	56	34	40	47	52	40	31
8	38	39	23	31	38	47	54	50	47	38	30	50	54	64	69	35	32	25	29	44	57	48	49	55	53	55	39	33	38	30	42
9	29	40	40	36	41	32	31	20	24	25				31	32	44	30	32	37	42	40	43	42	40	52	30	38	16	13	29	

Figure 27. Calendar view of MDA8 ozone observations from 2020-2024 from the Hammond Caap (180892008) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 181270024 75 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	60	53	37	57	43	47	52	55	31	34	42	54	49	34	34	42	57	58	49	56	59	54	55	50	42	44	47	51	42	44	60
6	49	54	56	55	48	47	47	46	52	41	52	67	53	56	59	65	55	38	55	53	66	49	30	53	44	60	31	35	53	31	
7	39	62	61	44	51	43	52	54	50	45	34	45	55	45	47	56	43	33	51	55	61	51	47	38	33	47	49	32	54	74	60
8	49	46	47	56	52	32	34	71	39	37	46	43	50	51	35	46	40	34	30	35	41	55	57	56	53	49	70	56	45	53	64
9	34	32	46	50	56	31	41	39	46	48	54	68	59	45	52	66	62	60	68	63	70	37	40	38	46	47	40	30	33	36	
2023																															
5	35	38	35	47	59	55	53	38	39	55	70	51	48	42	50	63	45	59	43	37	57	58	73	48	43	54	64	61	69	74	53
6	64	77	71	53	64	43	51	46	48	77	24	42	31	41	33	27	45	75	76	58	78	65	71	68	51	40	38	61	58	59	
7	48	44	40	81	55	38	47	53	61	54	49	42	57	51	47	59	45	42	54	56	39	56	75	60	76	55	65	53	33	37	48
8	52	55	81	63	45	40	41	55	41	48	44	49	37	46	34	47	41	42	42	73	46	47	47	51	34	40	38	45	48	35	50
9	49	50	48	35	49	40	25	37	39	55	35	31	44	45	54	50	40	28	24	51	38	42	53	42	44	33	19	28	35	45	
2022																															
5	30	35	31	31	33	43	50	46	50	49	57	61	59	56	50	58	25	23	57	46	35	42	39	48	31	46	31	49	54	56	49
6	33	55	63	47	55	48	41	40	53	51	49	44	49	68	53	63	61	38	60	73	63	69	43	82	49	51	45	55	83	68	
7	42	47	65	55	77	51	56	50	37	59	45	59	44	46	29	52	48	55	57	57	58	55	48	45	34	50	45	52	50	44	44
8	53	46	39	51	54	41	33	30	33	50	32	41	40	36	51	43	55	45	48	37	50	30	42	52	43	28	49	44	35	42	47
9	46	47	68	26	32	40	39	51	47	56	36	24	35	34	44	43	51	44	29	41	49	32	26	44	31	29		30	28	40	
2021																															
5	53	46	30	28	33	38	42	36	40	37	35	37	49	54	43	63	47	46	38	47	54	62	51	64	46	59	35	38	40	54	51
6		66	81	68	58	55	21	55	61	54	68	61	50	57	36	42	64	79							35	28	43	35	39	31	
7	33	24	57	61	44		47	26	29	32	35	34	44	41	49	39	37	43	46	73	37	57	60	52	55	49	62	65	60	31	60
8	39	38	61	70	58	47	47	44	41	41	45	35	36	46	49	53	54	45	51	51	43	40	56	43	72	43	51	38	32	56	58
9	39	41	36	36	53	41	49	42	36	37	51	54	48	49	40	53	54	50	52	25	37	31	31	46	38	44	68	40	58	49	
2020																															
5	41	56	50	42	42	43	44	34	46	38	33	44	54	40	45	40	34	35	39	42	46	32	48			50	51	50	57	32	39
6	47	64	51	70	81	41	49	63	41	44	52	43	40	43	52	65	76	80	86	62	45	49	52	43	60	49	59	51	45	53	
7	66	67	74	52	45	72	62	69	60	56	62	34	35	54	52	53	50	38	35	43	27	48	46	52	57	35	39	53	59	38	37
8	44	41	23	32	38	54	57	51	46	38	33	51	60	62	63	34	36	28	31	49	60	48	49	59	54	56	40	35	39	30	44
9	33	46	44	42	43	34	32	21	24	24	28	21	30	33	37						40	51	46	44	54	32	43	17	16	30	

Figure 28. Calendar view of MDA8 ozone observations from 2020-2024 from the Ogden Dunes (181270024) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 181270026 68 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	57	50	38	56	43	49	48	55	32	37	41	53	48	35	32	45	55	55	48	56	58	51	61	53	46	41	42	47	35	46	60
6	39	51	57	55	46	45	47	45	50	37	53	58	51	54	57	66	52	38	54	59	65	51	30	61	44	54	32	40	47	30	
7	43	59	51	41	48	52	49	53	44	40	42	50	52	49	41	47	40	30	50	59	56	58	46	37	33	44	48	32	49	65	50
8	41	46	38	48	45	28	36	73	38	36	43	40	48	47	35	45	34	30	28	31	40	46	55	48	52	48	53	57	47	51	55
9	33	32	39	48	52	28	35	40	46	47	50	62	54	39	38	54	62	64	63	52	48	28	25	22	36	40	35	25	28	31	
2023																															
5	30	35	36	49	58	54	60	29	39	58	63	43	51	41	47	58	43	59	42	36	62	62	72	55	41	54	63	63	71	70	53
6	44	79	71	52	61	46	55	47	49	62	28	42	32	38	41	29	62	76	76	63	72	65	67	65	50	37	39	58	57	60	
7	45	39	40	60	54	40	49	47	67	52	49	39	59	50	46	53	48	46	55	51	36	51	63	57	71	52	57	47	32	36	44
8	51	53	60	59	44	31	39	44	42	47	42	46	38	38	30	45	37	39	41	57	44	43	40	47	31	35	34	44	43	29	42
9	41	46	44	33	47	38	19	28	36	43	27	27	37	39	50	47	38	25	18	52	38	44	52	37	42	33	17	24	36	43	
2022																															
5	31	38	28	30	32	40	49	45	47	48	53	58	59	52	48	54	29	21	56	45	34	41	40	47	30	48	27	50	53	55	48
6	32	56	61	53	63	51	44	36	50	50	50	41	53	67	53	61	56	36	61	74	62	68	41	72	50	50	45	54	67	67	
7	43	44	62	56	61	51	46	40	39	57	47	57	45	44	33	46	43	53	55	54	51	54	47	41	34	40	45	48	46	39	45
8	49	46	40	50	38	42	29	29	32	49	31	38	41	30	49	42	52	51	50	40	48	31	37	55	38	29	43	44	38	40	45
9	47	48	44	20	29	36	36	42	45	48	31	19	25	35	44	45	51	44	31	43	45	28	28	37	23	26	22	24	26	36	
2021																															
5	53	46	31	25	34	34	41	37	37	36	33	35	45	56	49	60	45	44	36	48	55	56	43	57	48	55	34	32	40	55	51
6	63	59	80	66	58	54	25	47	51	51	63	66	50	52	32	46	65	74	58	52	37	47	43	46	38	28	41	32	34	29	
7	32	24	51	59	40	48	45	24	30	34	30	36	40	43	46	36	34	49	49	73	41	52	58	48	53	49	63	56	57	30	57
8	38	37	60	54	59	47	45	44	42	38	45	36	34	45	40	49	43	40	46	48	46	39	51	41	55	41	48	36	31	55	53
9	40	40	42			49	51	40	34	38	52	52	51	48	39	49	52	58	52	28	30	30	28	47	39	44	62	40	51	50	
2020																															
5	44	51	47	37	40	43	47	32	45	34	35	47	51	41	47	46	30	37	39	40	36	33	45	51	47	44	43	42	51	33	35
6	46	59	47	56	55	42	52	60	38	45	50	51	39	44	52	59	71	78	76	61	47	49	49	41	65	53	47	45	43	49	
7	63	61	66	49	49	64	58	66	58	50	56	37	33	53	52	52	47	37	34	53	30	42	50	52	54	34	38	50	49	29	34
8	37	34	21	25	35	42	53	52	45	36	32	49	54	62	67	36	36	26	28	44	54	47	48	54	55	54	35	32	36	30	45
9	31	43	43	39	42	35	31	19	17	20	29	22	31	28	35	43	29	33	38	42	41	49	49	45	54	32	38	20	19	29	

Figure 29. Calendar view of MDA8 ozone observations from 2020-2024 from the Valparaiso (181270026) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 550590019 81 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	55	55	43	50	41	48	53	56	32	43	39	58	58	28	34	45	49	69	50	53	59	48	51	60	42	46	41	48	41	41	66
6	46	56	65	68	44	39	44	41	46	38	57	**83**	59	47	63	66	57	44	71	30	32	43	33	51	45	57	34	40	42	30	
7	40	61	52	45	45	38	49	53	53	38	17	41	66	49	80	42	37	32	50	56	39	33	46	36	33	49	59	49	47	62	81
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9	34	32	47	63	55	27	37	34	43	57	66	68	70	57	56	65	61	70	74	69	54		35	27	44	47	39	35	36	34	
2023																															
5	35	40	37	50	65	56	54	43	43	58	76	66	58	44	51	59	44	59	50	39	62	61	63	41	44	56	64	65	69	77	72
6	76	80	72	57	66	39	37	37	51	**85**	24	42		36	26	28	40	79	79	61	79	72	67	77	54	38	43	78	**84**	66	
7	65	46	34	72	72	36	43	54	72	57	42	42	52	58	53	47	41	44	50	50	40	48	63	56	**100**	52	57			35	52
8	68	72	**87**	49	58	47	40	43	44	69	54	47	32	40	36	50	35	49	55	54	34	50	53	54	36	44	37	50	41	41	48
9	63	57	57	53	57	45	17	37	37	55	33	33	37	39	65	41	36	34	32	46	50	62	55	50	46	40	24	33	44	57	
2022																															
5	33	37	35	32	43	44	51	53	53	63	55	70	70	63	52	53	27	36	59	40	30	40	41	46	34	41	33	49	61	63	49
6	36	55	58	44	52	49	43	46	49	52	51	30	58	**85**	57	62	56	39	64	**91**	67	63	48	**84**	55	45	48	64	58	69	
7	45	47	60	64	47	34	60	38	35	57	50	52	37	34	45	51	56	64	59	49	53	53	57	44	36	48	41	36	36	46	56
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9	53	57	37	28	32	39	46	62	62	62	40	34	42	33	56	58	54	59	35	47	39	30	33	28	28	26	20	33	34	42	
2021																															
5	56	47	39	30	37	44	42	37	42	37	37	39	45	58	50	62	62	52	47	57	51	70	26	61	45	48	42	41	40	53	58
6	61	69	80	72	67	68	32	63	60	50	63	66	55	60	36	39	74	69	65	58	34	52	57	48	47	45	38	36	45	52	
7	25	24	46	62	57	58	27	25	31		42	44	47	57	56	35	32	42	45	60	31	79	79	55	59	66	62	80	56	30	47
8	36	44	58	72	69	57	74	55	36	61		45	37	45	58	54		50	57	60	59	43	65	60	72	65	74	61	39	59	51
9	39	44	51	41	46	42	44	37	38	50			42	45	40	63	62	45	57	30	31	28	31	54	39	49	53	39	57	55	
2020																															
5	42	53	52	43	41	44	44	33	46	38	32	43	56	44	50	39	36	37	43	50	58	45	47	61	58	57	59	46	39	35	39
6	48	68	60	61	72	36	39	69	60	44	49	36	34	35	46	67	76	81	**104**	61	47	52	38	43	51	40	66	49	51	66	
7	64	50	70	43	39	75	73	62	79	43	43	30	38	68	67	53	72	42	30	38	48	44	36	48	78	40	32	43	45	31	33
8	42	39	24	30	50	64	67	63	60	54	38	55	59	62	60	34	36	28	36	67	71	64	60	50	55	51	48	49	33	31	53
9	39	40	44	35	37	39	27	27	23	35	35	17	25	33	41	44	32	34	42	51	47	54	47	55	63	37	36	18	14	30	

Figure 30. Calendar view of MDA8 ozone observations from 2020-2024 from the Chiwaukee Prairie Stateline (550590019) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

ALPINE GEOPHYSICS

monitor 550590025 77 <-- 99th %ile of 2020-2024 observations

Sum of value / Row Labels	Column L 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
2024																															
5	53	52	44	54	39	47	46	52	30	43	39	59	54	27	32	44	53	68	51	47	58	47	55	58	45	45	41	46	41	41	66
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2023																															
5	34	39	35	51	63	53	52	40	39	60	75	60	62	42	49	56	42	57	44	40	57	59	67	39	43	53	67	66	68	72	70
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2022																															
5	30	35	34	30	41	42	51	50	52	63	57	71	71	59	49	51	25	34	58	38	25	40	39	45	29	38	31	51	58	60	47
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7	41	46	57	58	43	40	53	35	36	55	48	49	38	31	40	48	55	53	53	48	52	53	57	43	38	54	41	35	32	49	52
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9	46	59	35	23	32	37	44	63	66	61	37	37	36	32	52	57	54	45	37	45	37	28	30	28	27	25	19	30	31	34	
2021																															
5	56	46	40	28	35	41	39	35	40	35	36	38	50	56	47	62	59	49	42	54	49	57	25	66	43	45	42	38	42	50	58
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2020																															
5	41	50	49	41	39	42	43	32	46	36	30	42	55	33	48	39	35	34	39	51	55	38	46	61	52	60	57	42	33	33	37
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7	62	49	71	41	46	78	62	61	79	42	43	30	37	68	62	53	55	40	31	36	45	39	35	47	76	41	30	42	47	31	33
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9	36	38	42	33	38	39	27	26	21	34	32	17	25	31	39	41	30	31	38	48	45	56	47	47	59	36	34	16	12	28	

Figure 31. Calendar view of MDA8 ozone observations from 2020-2024 from the Kenosha - Water Tower (550590025) monitor. Green cells represent MDA8 values below 70 ppb, yellow cells indicate MDA8 values greater than 70 ppb, red cells indicate MDA8 values above 75 ppb, and blue cells indicate MDA8 values greater than the 99th percentile of the five-year distribution of ozone monitoring data.

Comparison of Fire-Influenced Ozone Exceedances with Historical Concentrations

U.S. EPA's Exceptional Events Guidance indicates that a clear causal demonstration should include a comparison of the event-related exceedance with historical concentrations measured at each monitor requested for data exclusion. Examples of supporting documentation include time-series plots overlaying five years of data and five-year percentiles. The Exceptional Events Guidance indicates that if the flagged data is above the 99th or higher percentile of the five-year distribution of ozone monitoring data, or is one of the four highest ozone concentrations within one year, these data can be considered outliers and provide strong evidence for the event.

Figure 32 shows the MDA8 ozone concentrations (solid blue line) from May through August 2023 at the Village Garage (170310001) monitor in the Chicago NAA where smoke enhancements are observed. Increased ozone above the 5-year 99th percentile (red dotted line) is evident on multiple dates, as indicated within grey columns. The grey columns indicate dates when smoke was observed to be present at the monitor location using NOAA's Hazardous Mapping System (HMS) Fire Detect and Smoke Plume Data overlay. Ozone concentrations were elevated at all sites in the Chicago NAA during these dates (Figure 33 through Figure 52), demonstrating that the region was impacted by area-wide events.

All the Chicago NAA monitors recorded multiple MDA8 ozone concentrations above their 99th percentile values during the period of May through August 2023, indicating rare ozone episodes. At all monitors, the observations from many of these days were in the top five days of the five-year period between 2020 and 2024, in many locations they were the single top value.

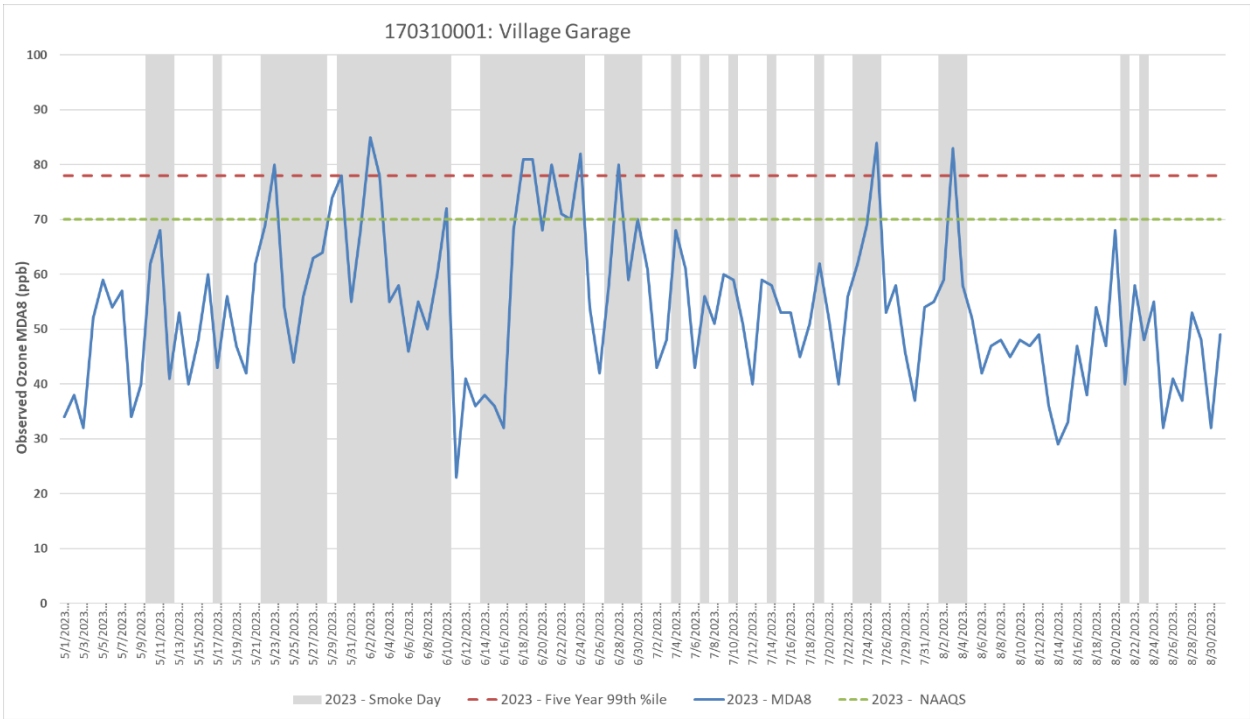


Figure 32. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Village Garage (170310001) monitor.

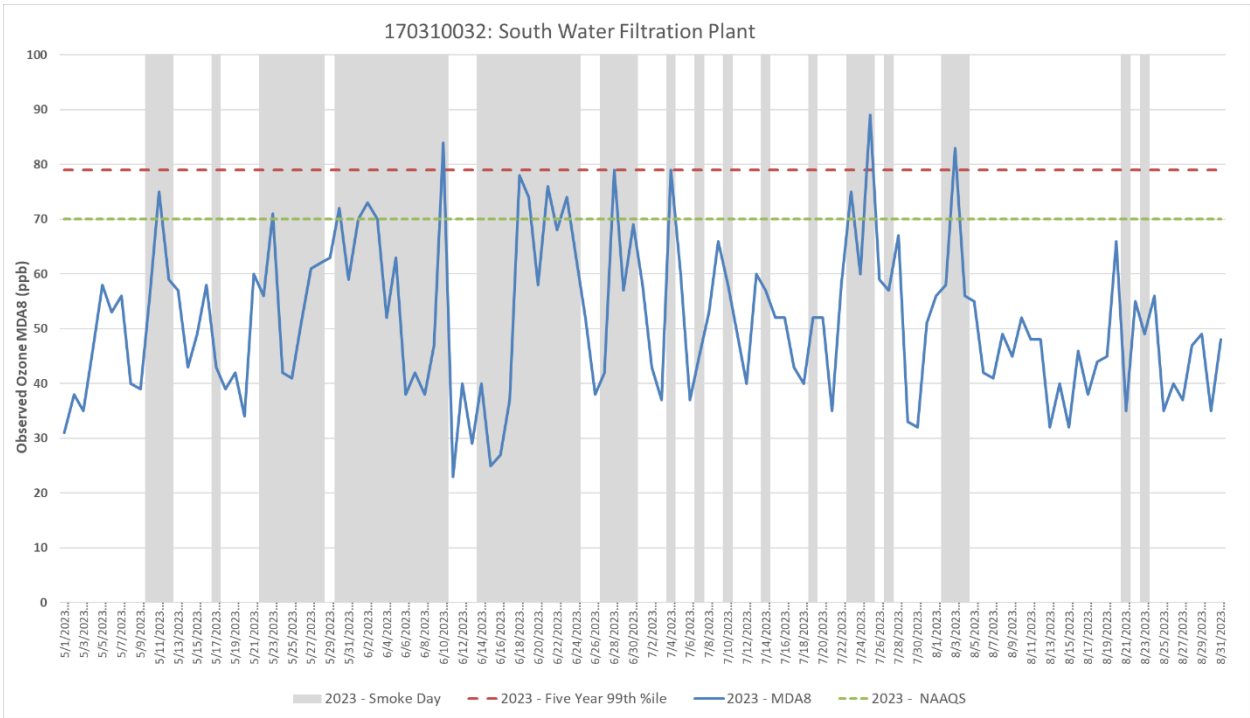


Figure 33. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the South Water Filtration Plant (170310032) monitor.

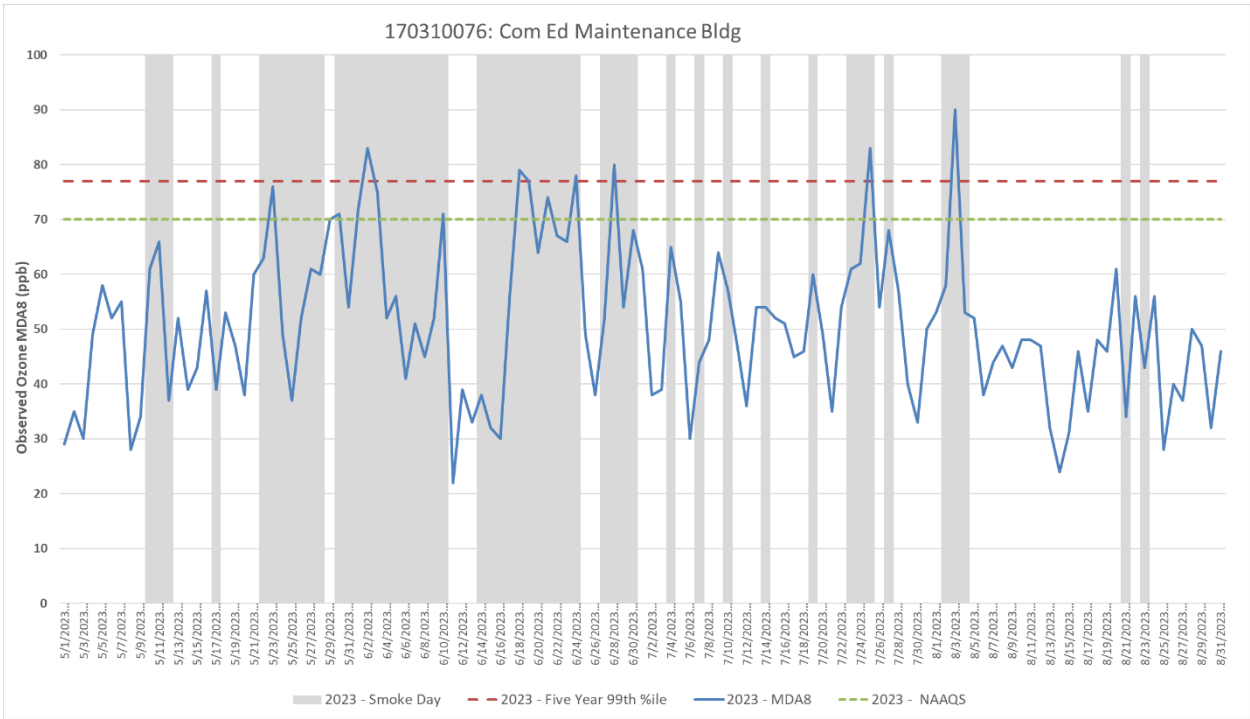


Figure 34. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Com Ed Maintenance Bldg (170310076) monitor.

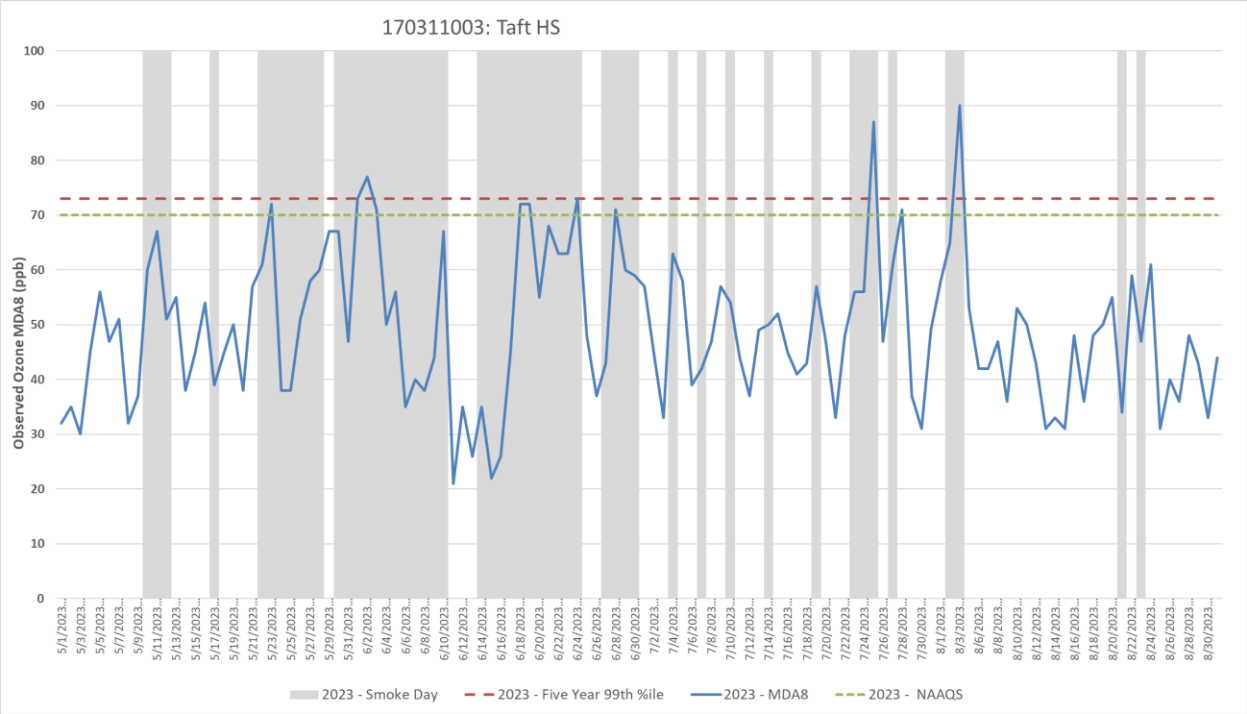


Figure 35. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Taft HS (170311003) monitor.

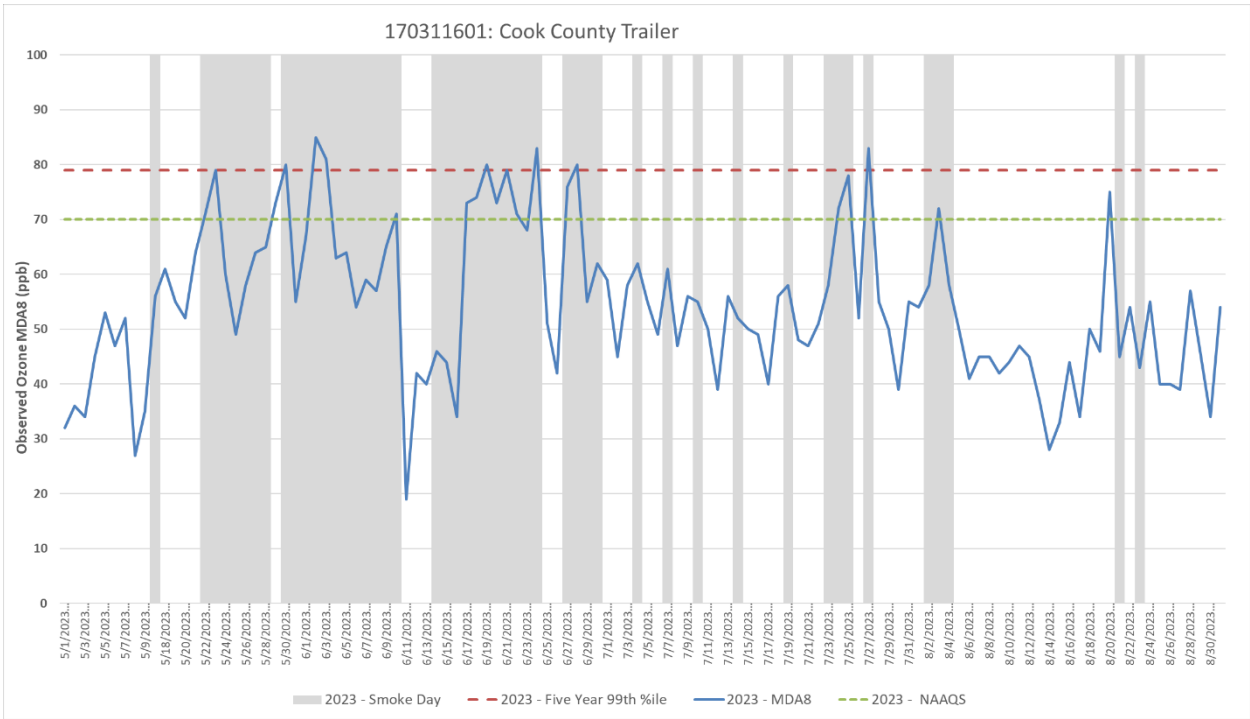


Figure 36. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Cook County Trailer (170311601) monitor.

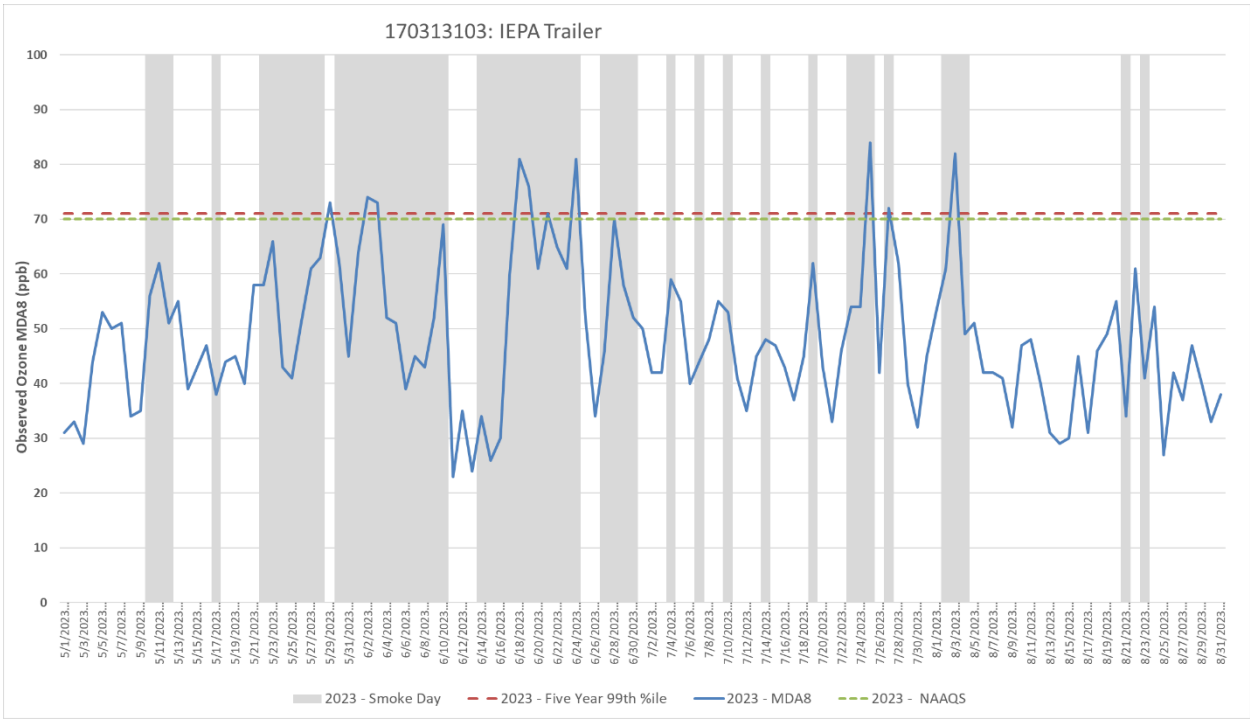


Figure 37. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the IEPA Trailer (170313103) monitor.

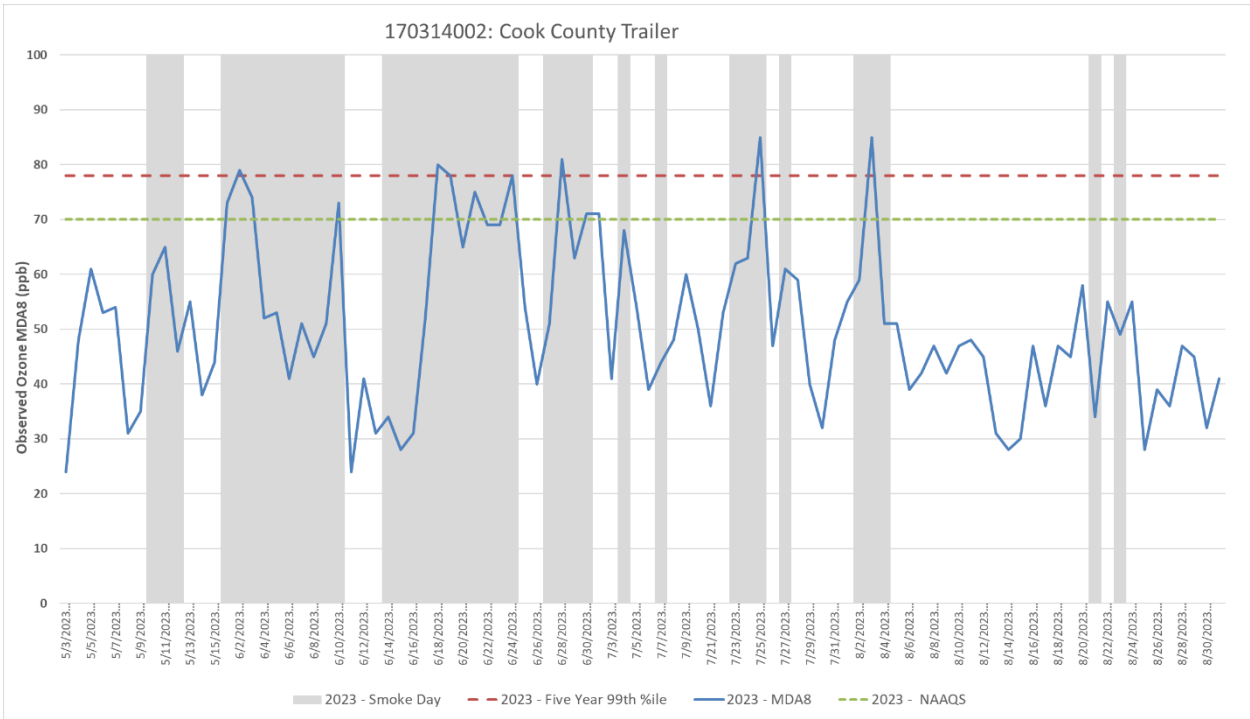


Figure 38. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Cook County Trailer (170314002) monitor.

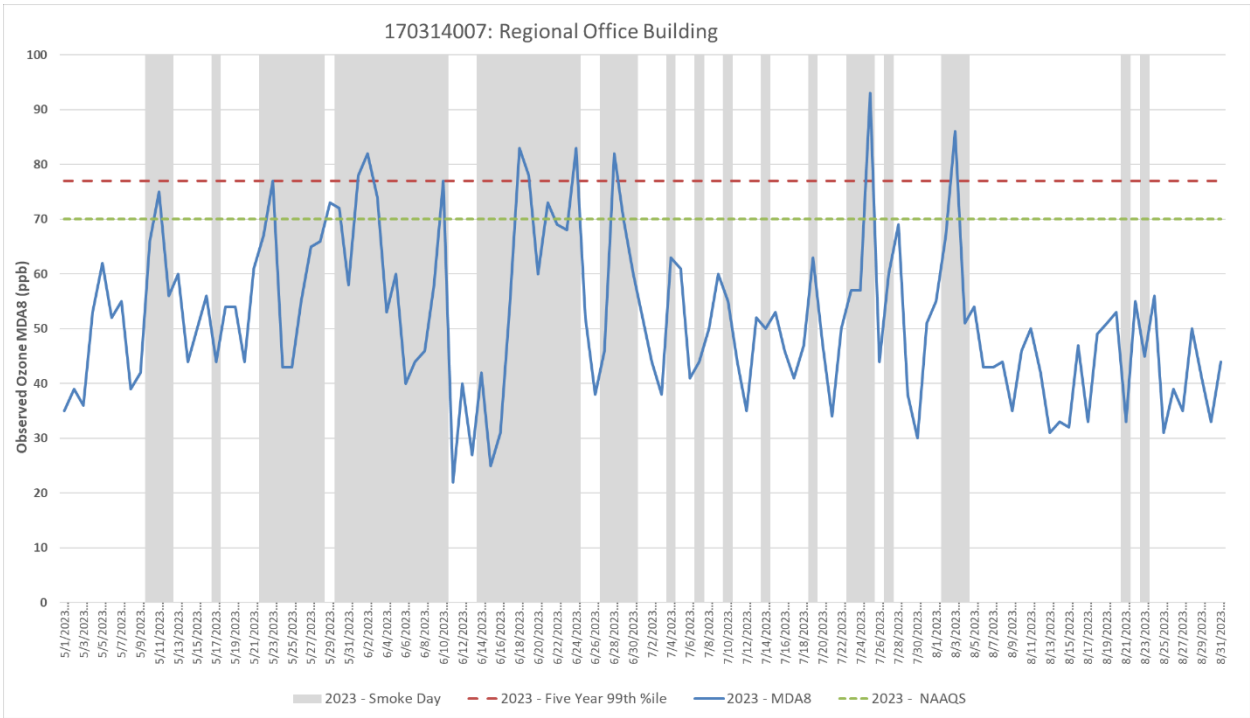


Figure 39. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Regional Office Building (170314007) monitor.

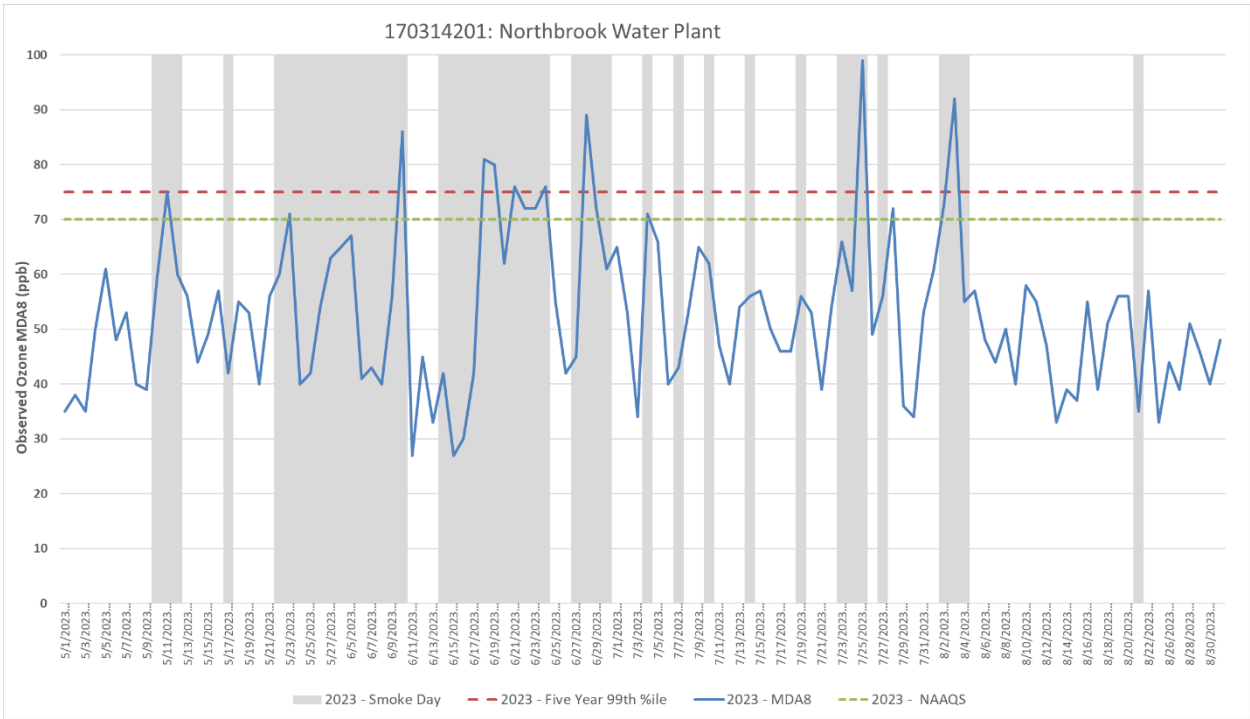


Figure 40. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Northbrook Water Plant (170314201) monitor.

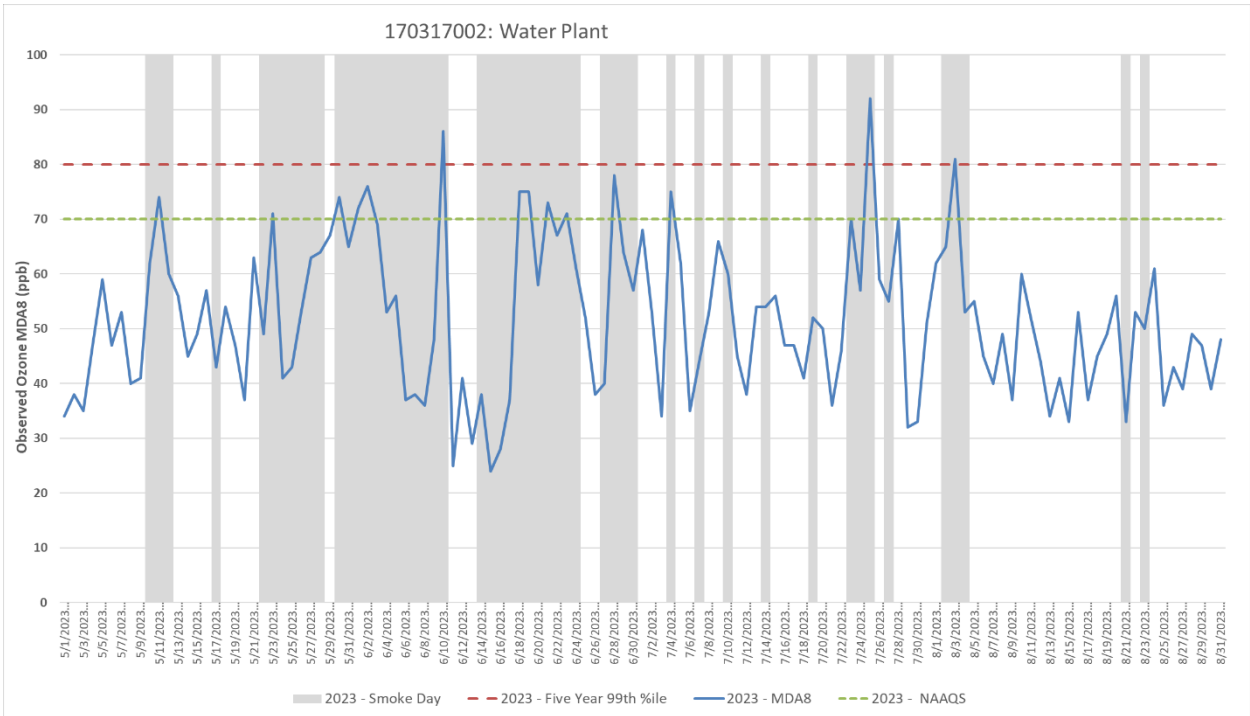


Figure 41. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Water Plant (170317002) monitor.

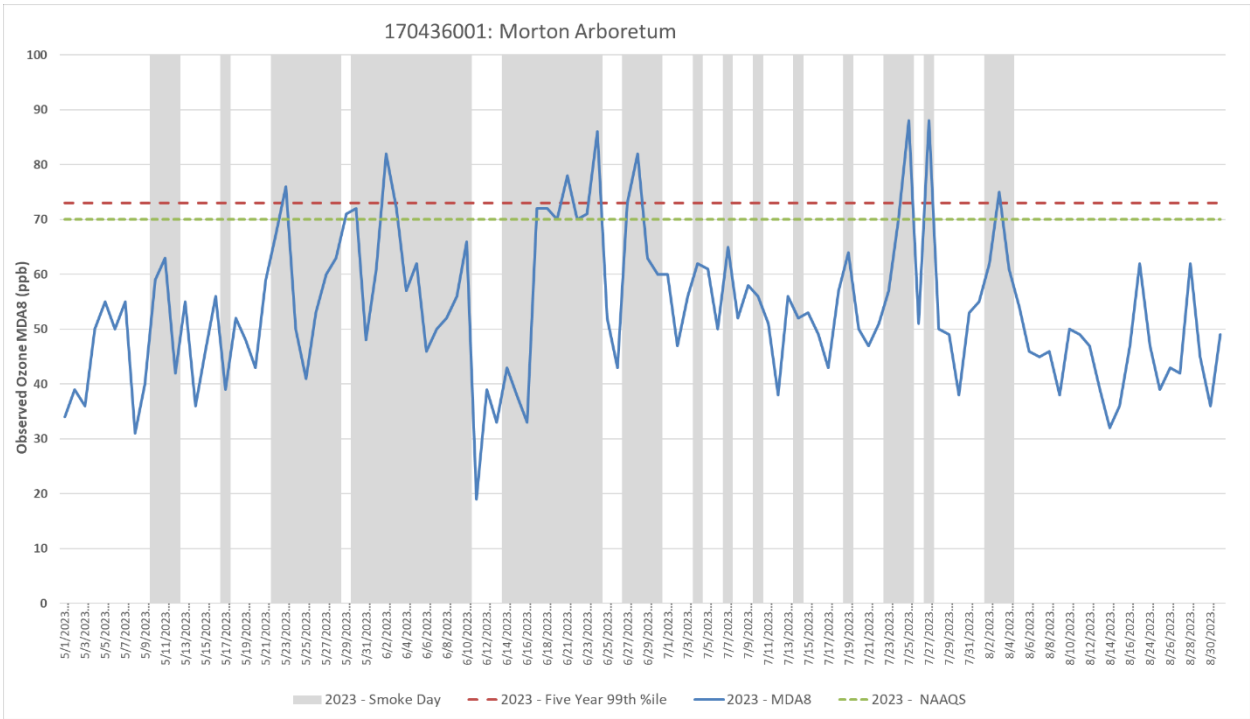


Figure 42. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Morton Arboretum (170436001) monitor.

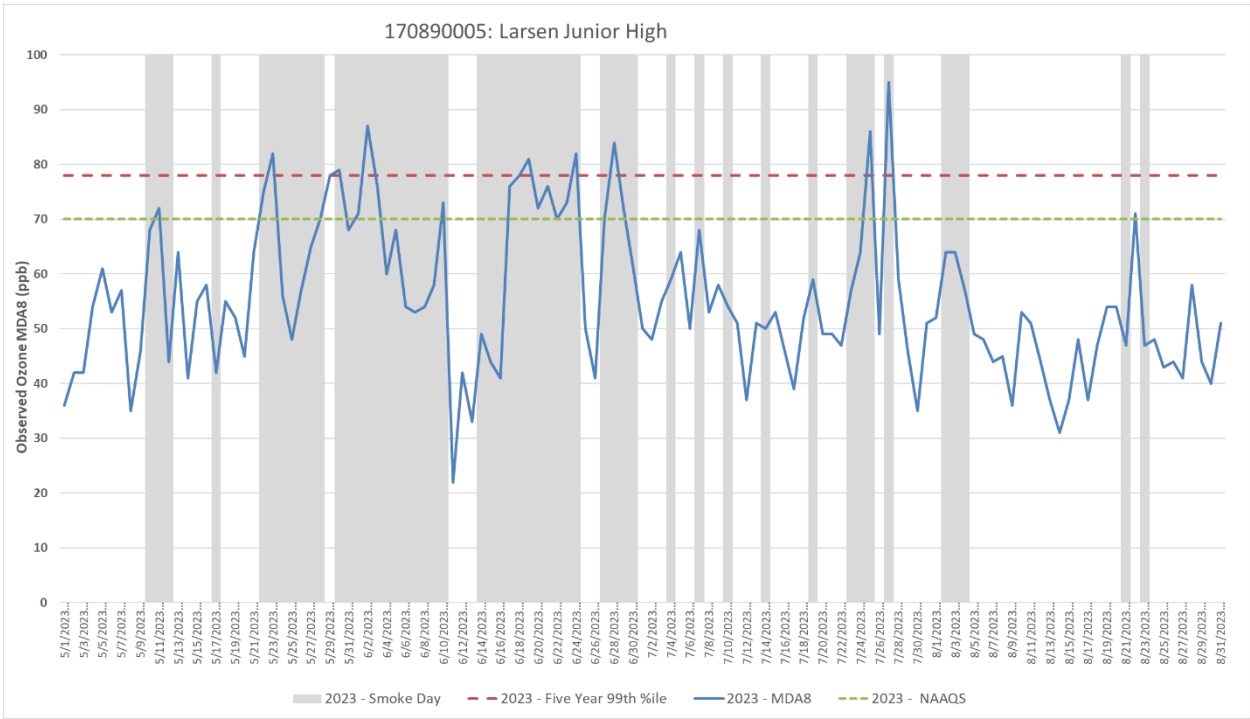


Figure 43. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Larsen Junior High (170890005) monitor.

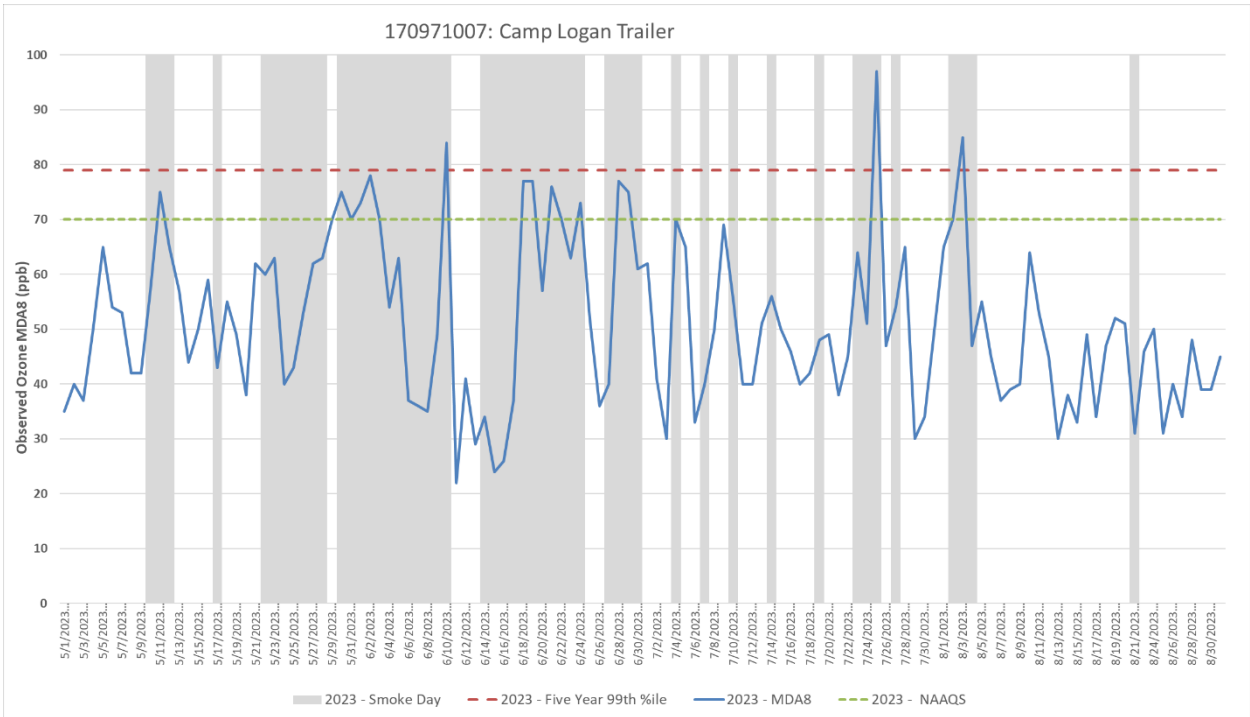


Figure 44. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Camp Logan Trailer (170971007) monitor.

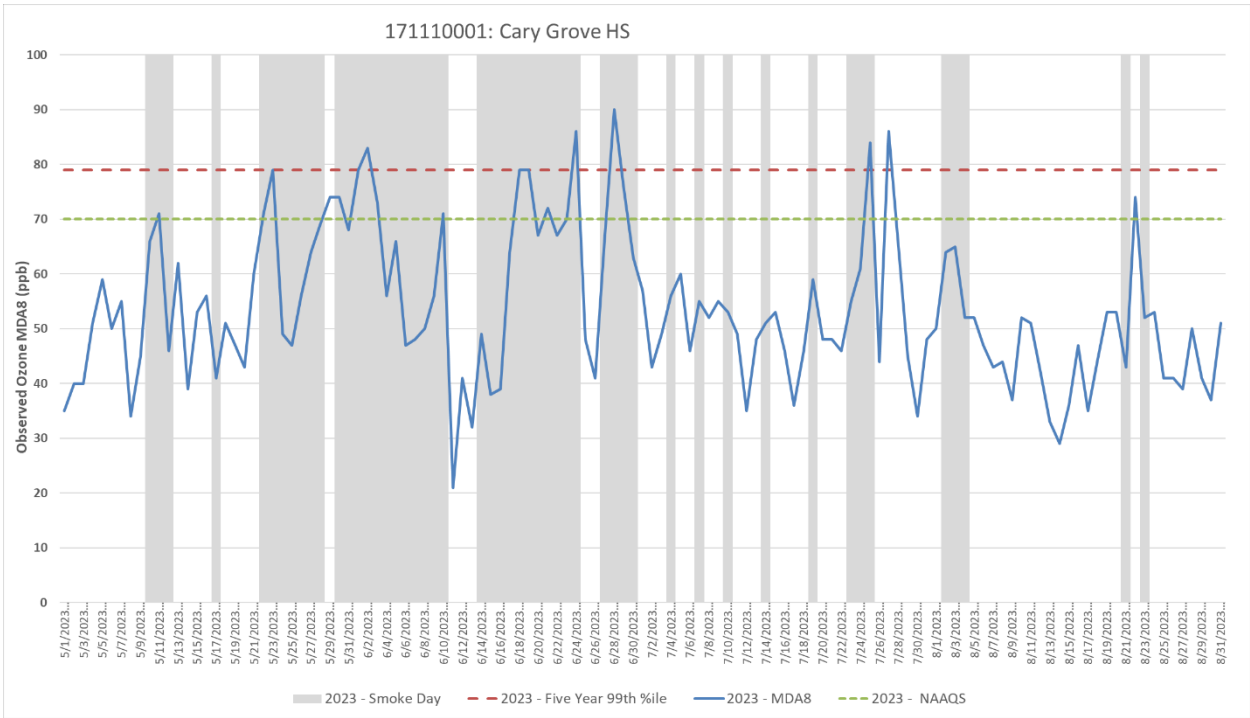


Figure 45. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Cary Grove Hs (171110001) monitor.

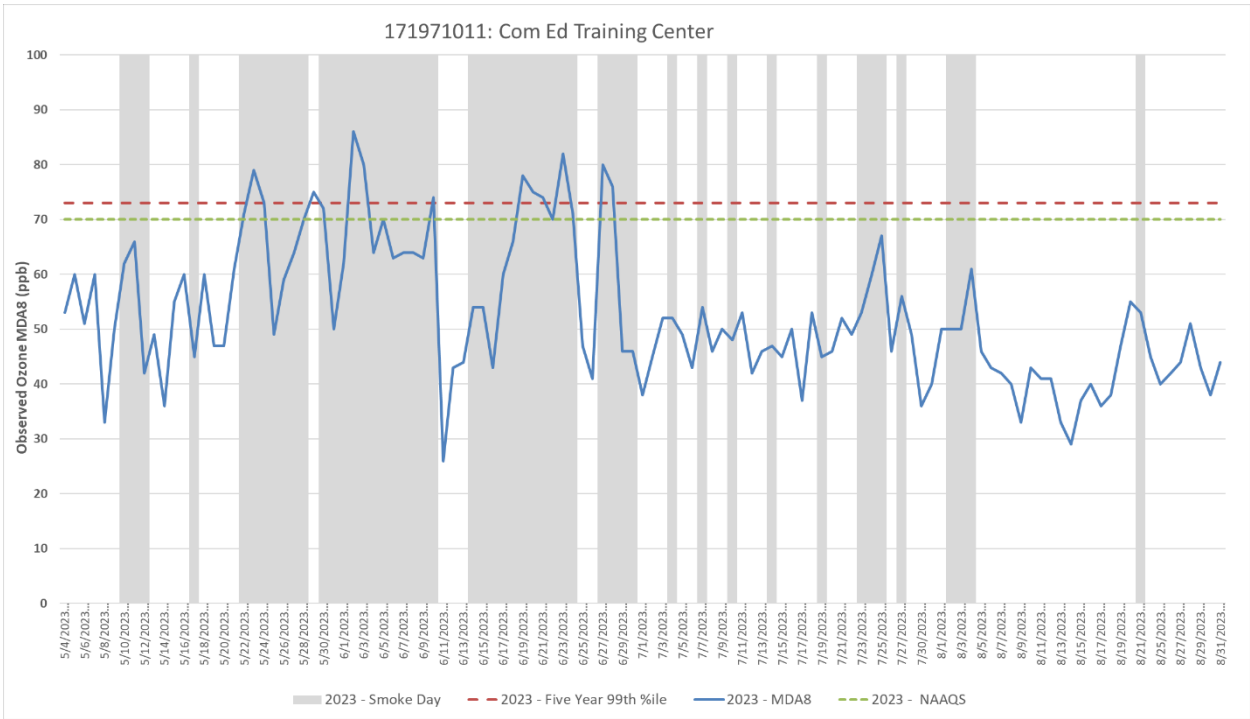


Figure 46. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Com Ed Training Center (171971011) monitor.

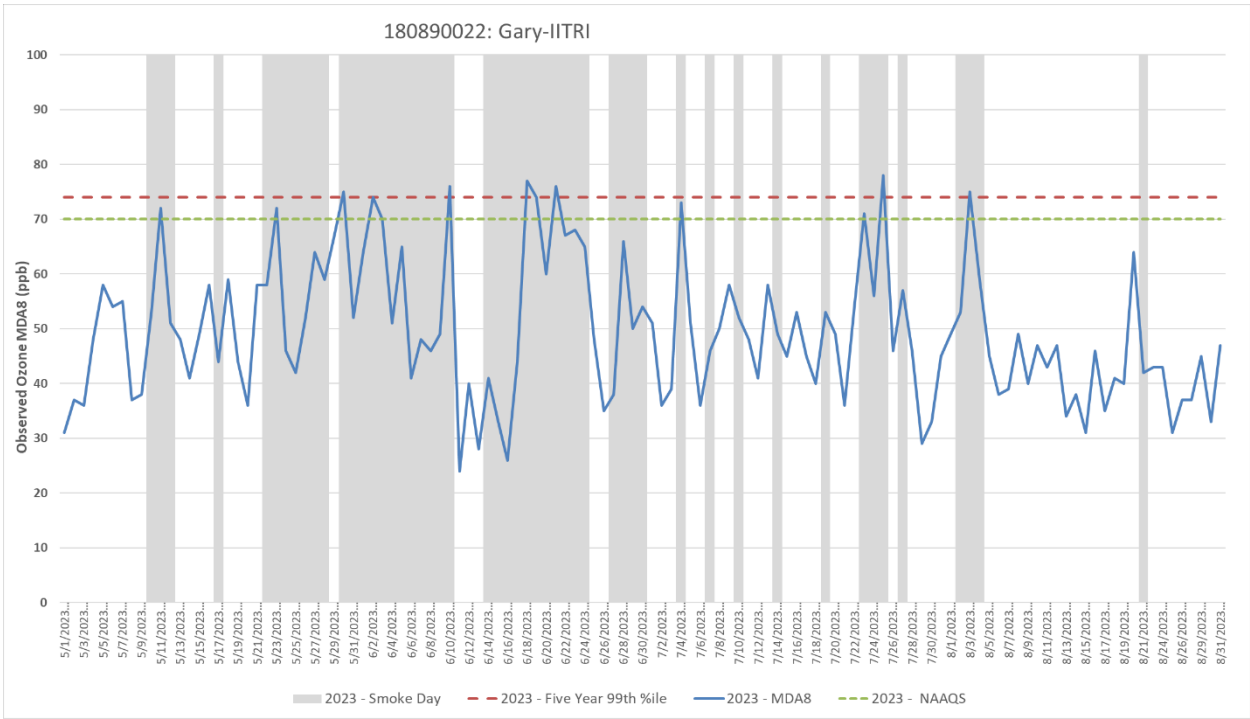


Figure 47. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Gary-IITRI (180890022) monitor.

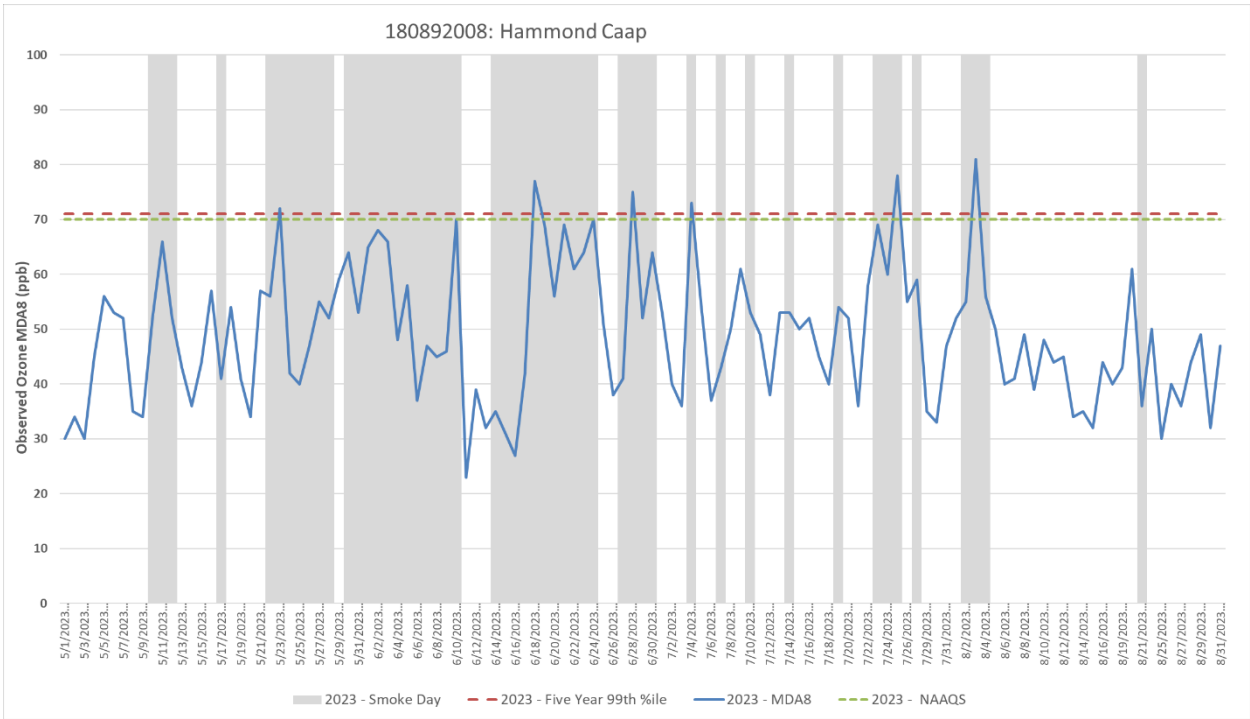


Figure 48. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Hammond Caap (180892008) monitor.

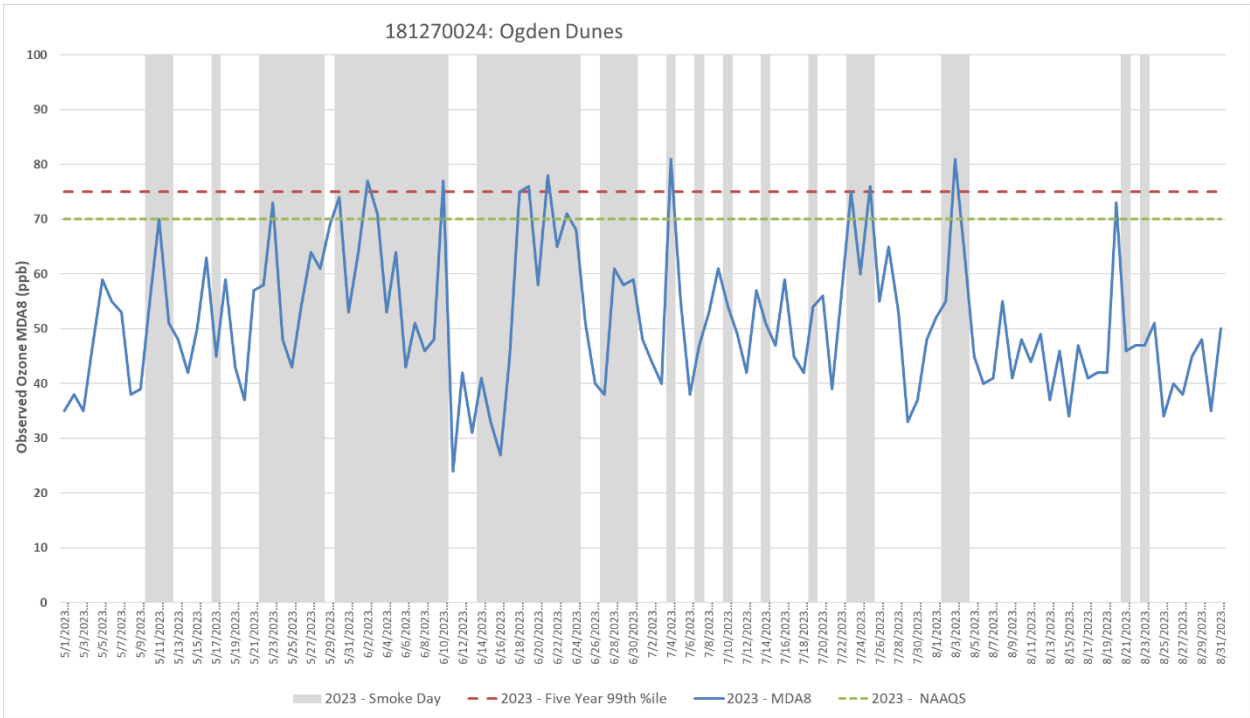


Figure 49. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Ogden Dunes (181270024) monitor.

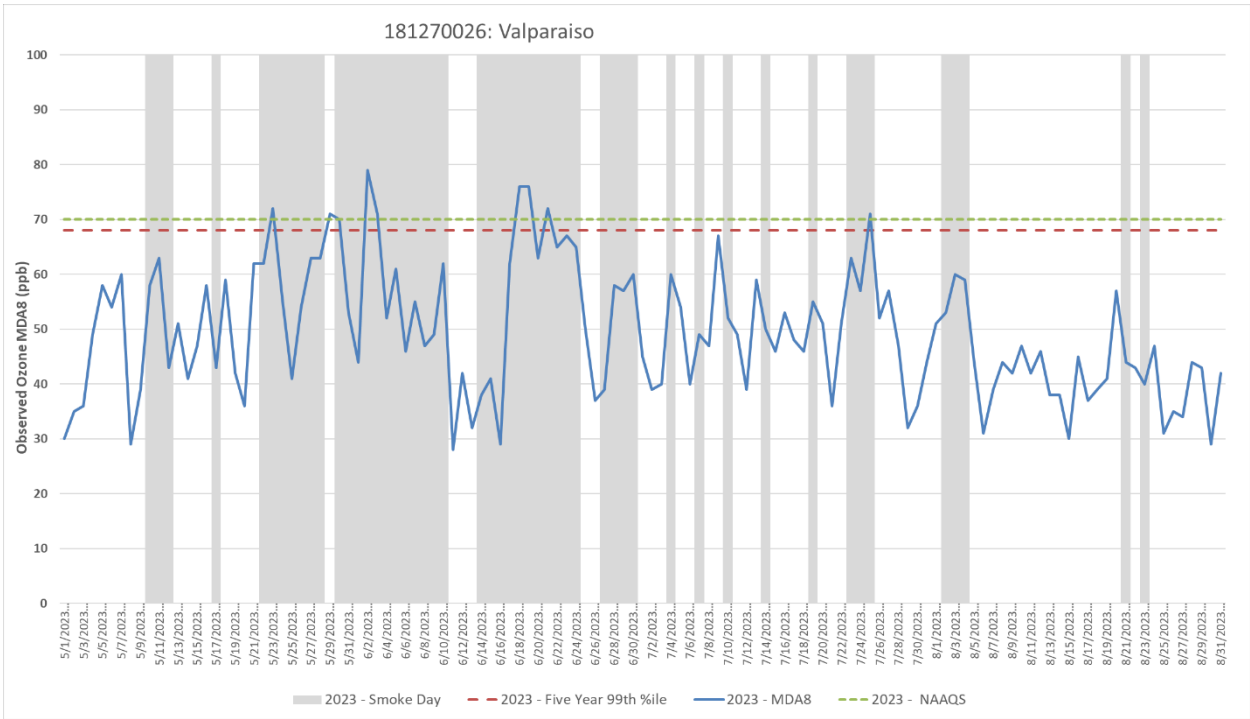


Figure 50. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Valparaiso (181270026) monitor.

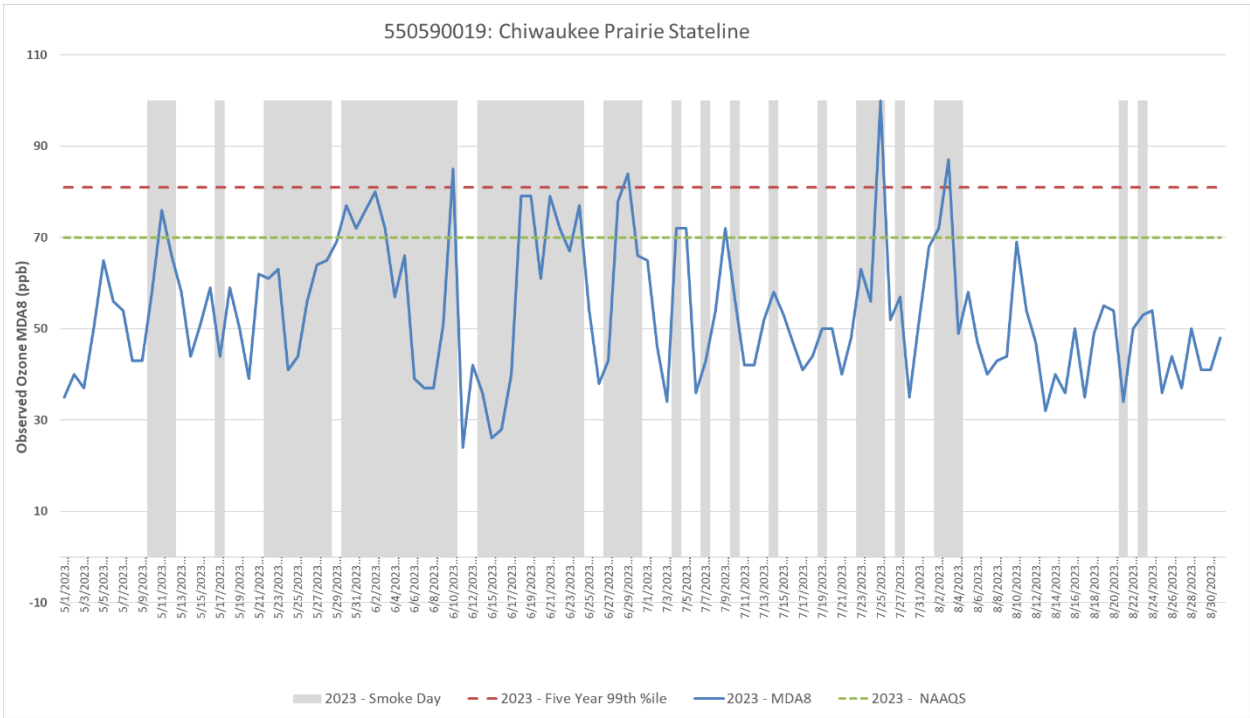


Figure 51. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Chiwaukee Prairie Stateline (550590019) monitor.

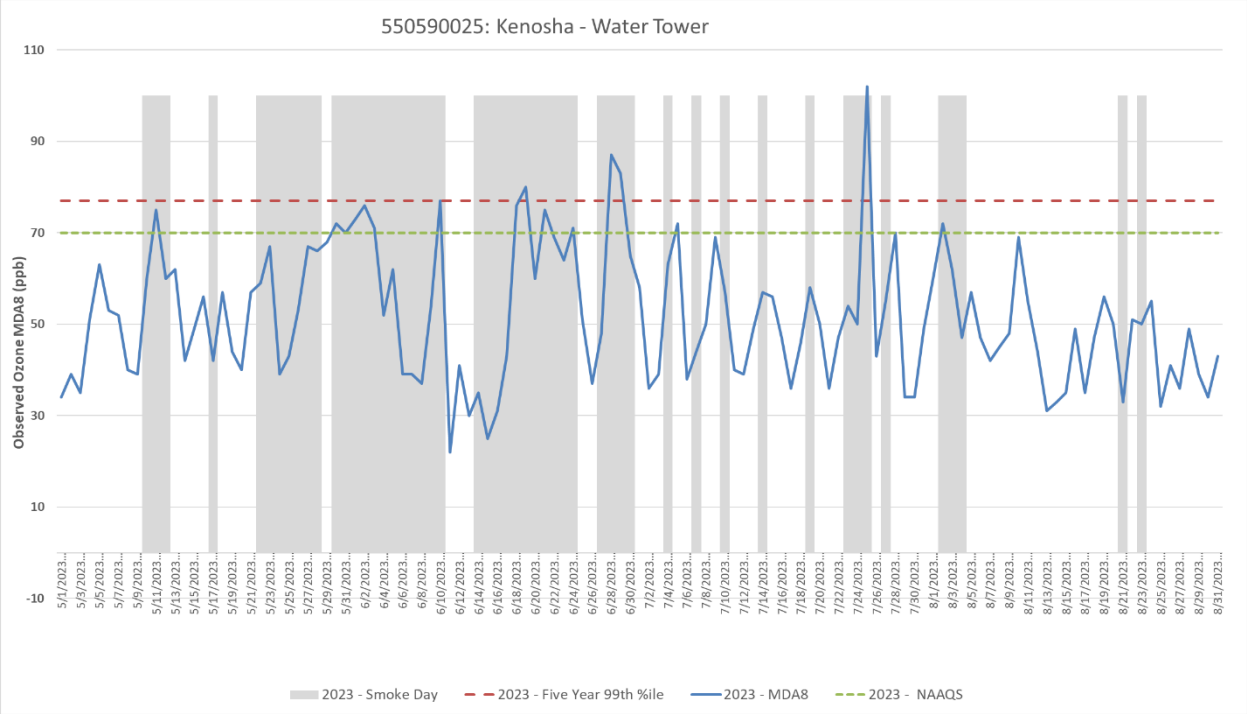


Figure 52. May-June 2023 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Kenosha - Water Tower (550590025) monitor.

The MDA8 ozone concentrations measured in the summer of 2023 at multiple Chicago area monitors were not only the top five observations for the year, but also the top five observations over the past five years (2020-2024). Figure 53 provides historical context of ozone concentrations at the Village Garage monitor (170310001) and presents the MDA8 concentrations across the past five years with the summer 2023 episode standing out in the figure. This period is among the observations that exceeded the 99th percentile threshold for the five-year period and are among the highest observations during the five years. Figure 54 through Figure 73 clearly demonstrates that summer 2023 included MDA8 observations that were unusually high across all the Chicago NAA monitors.

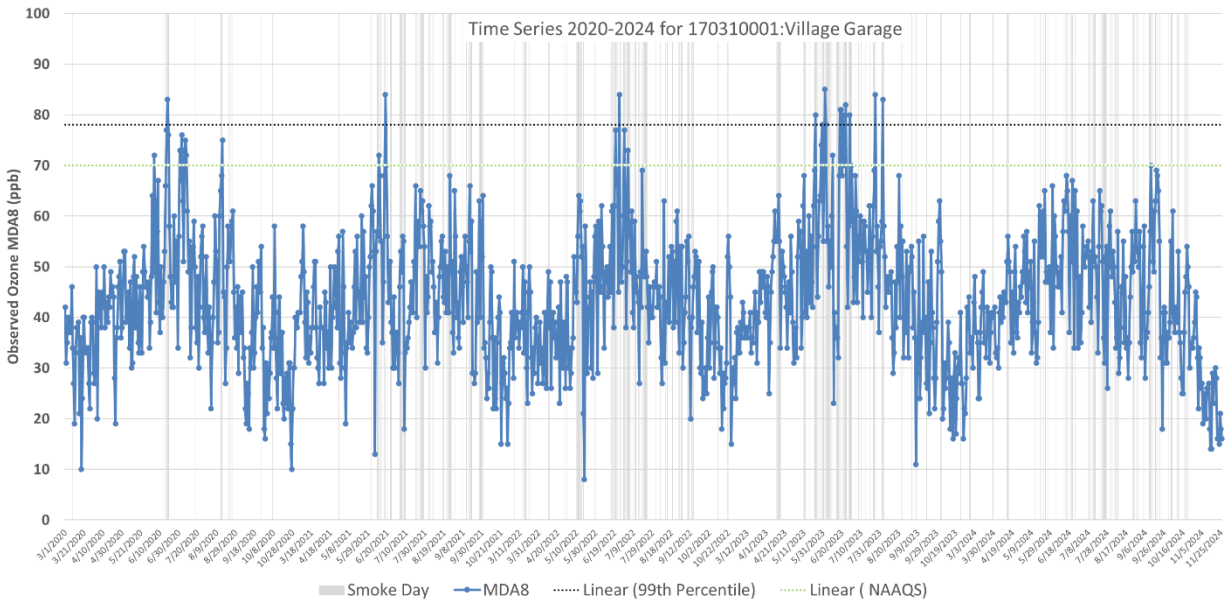


Figure 53. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Village Garage (170310001) monitor.

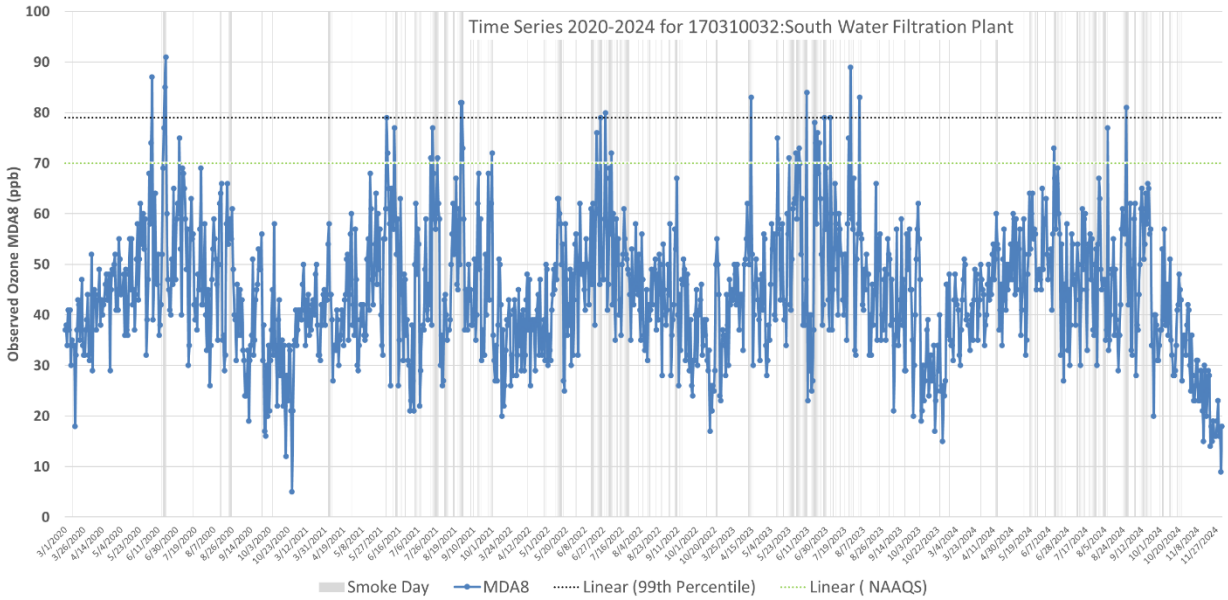


Figure 54. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the South Water Filtration Plant (170310032) monitor.

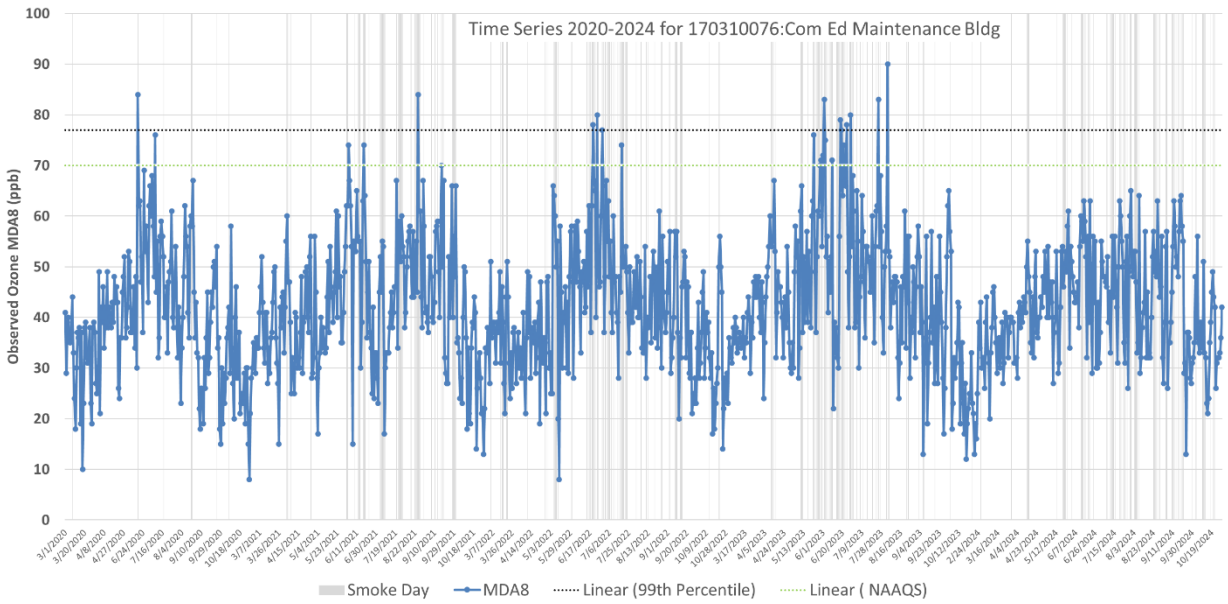


Figure 55. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Com Ed Maintenance Bldg (170310076) monitor in Chicago.

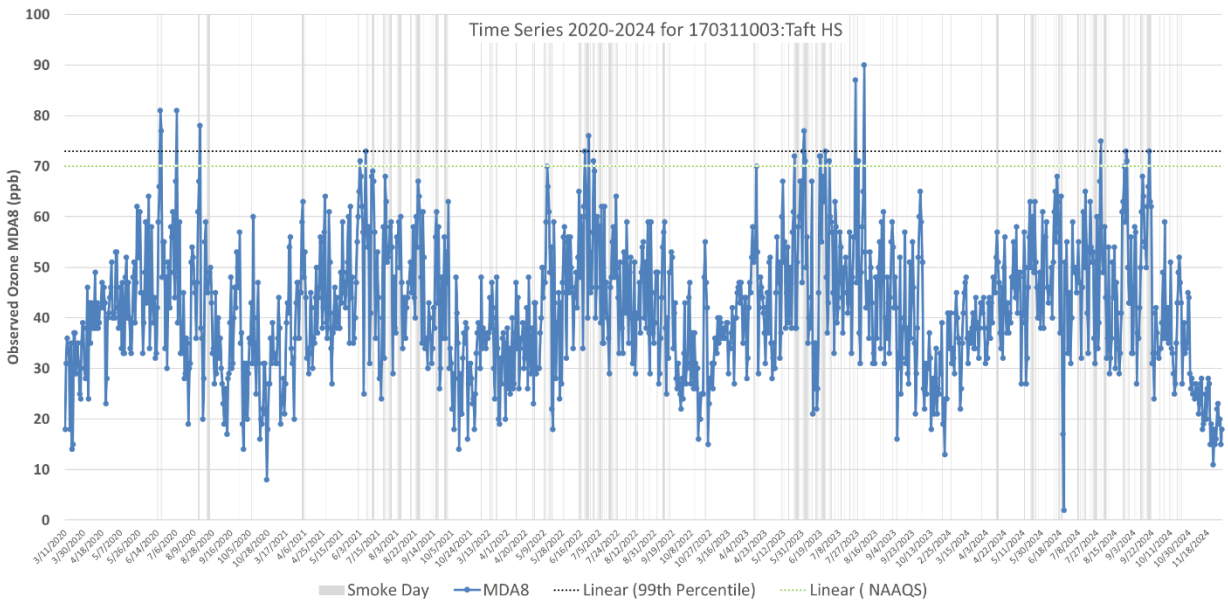


Figure 56. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Taft HS (170311003) monitor.

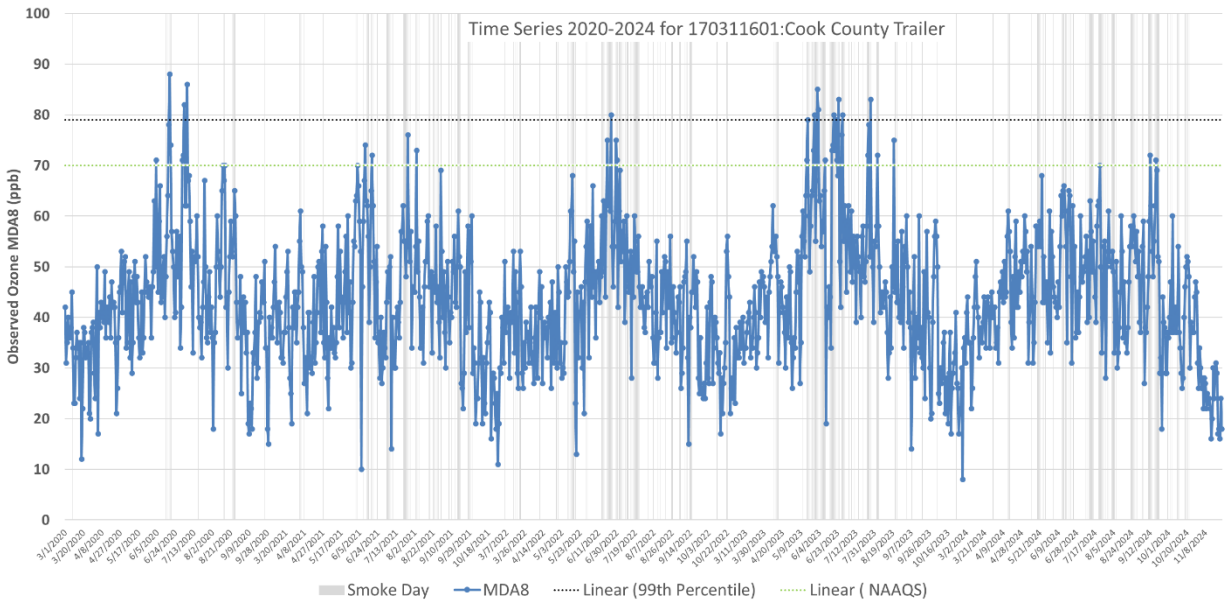


Figure 57. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Cook County Trailer (170311601) monitor.

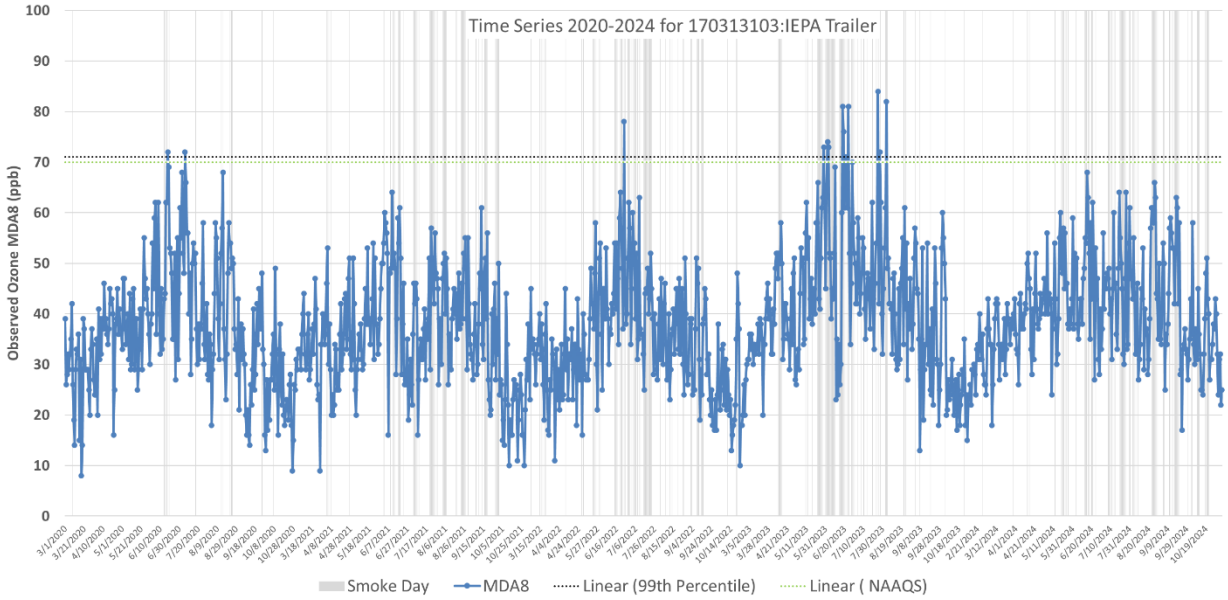


Figure 58. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the IEPA Trailer (170313103) monitor.

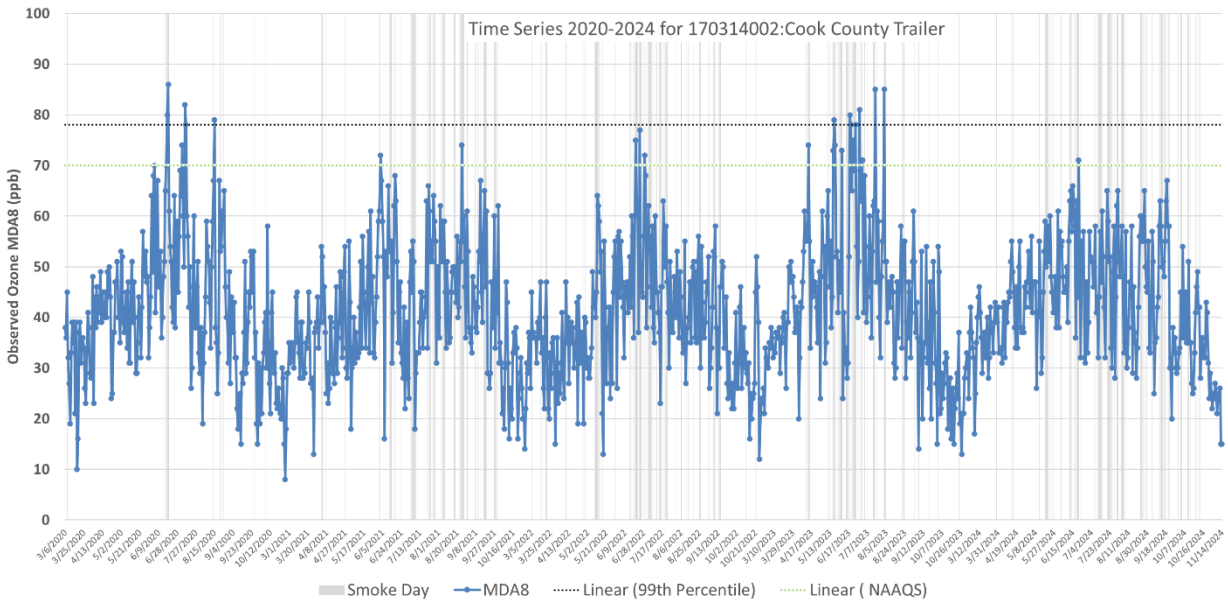


Figure 59. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Cook County Trailer (170314002) monitor.

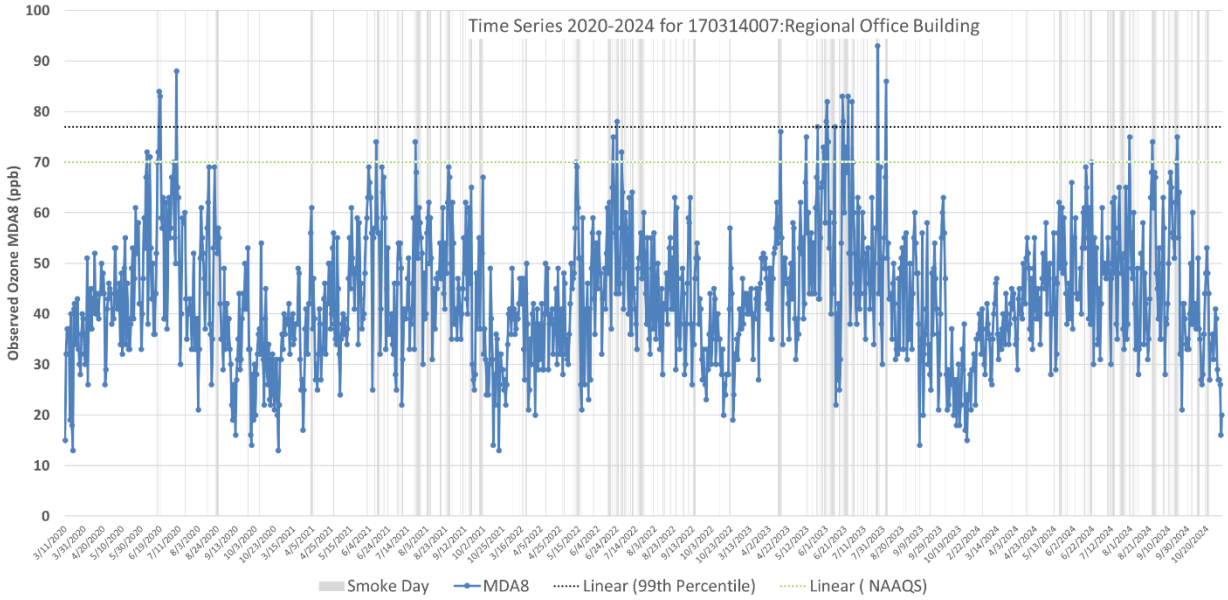


Figure 60. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Regional Office Building (170314007) monitor.

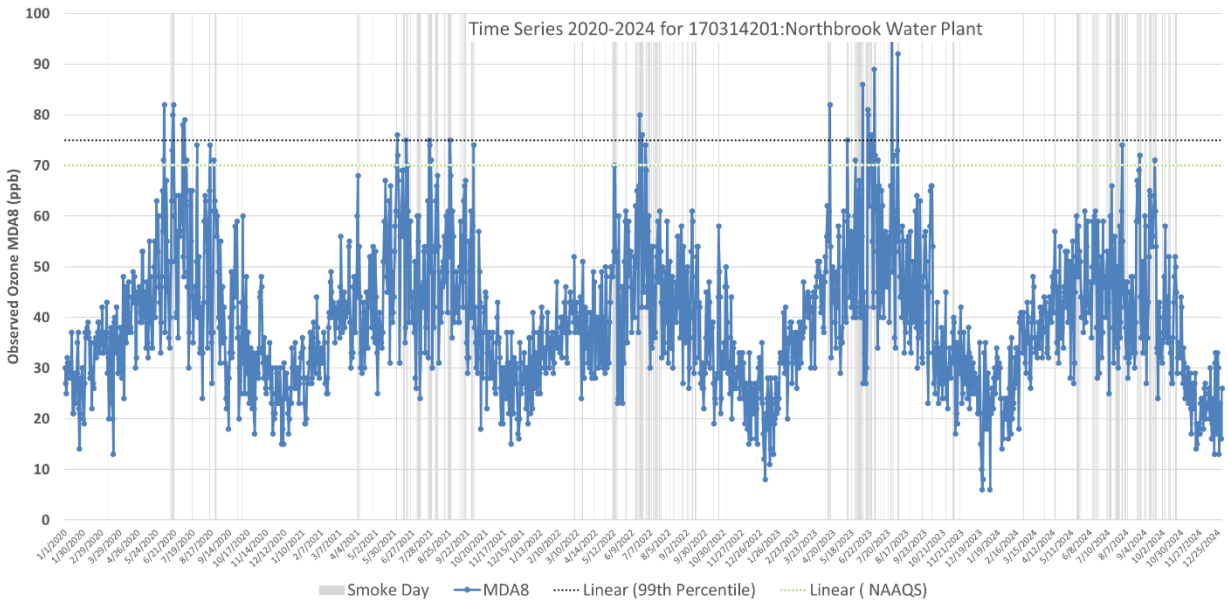


Figure 61. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Northbrook Water Plant (170314201) monitor.

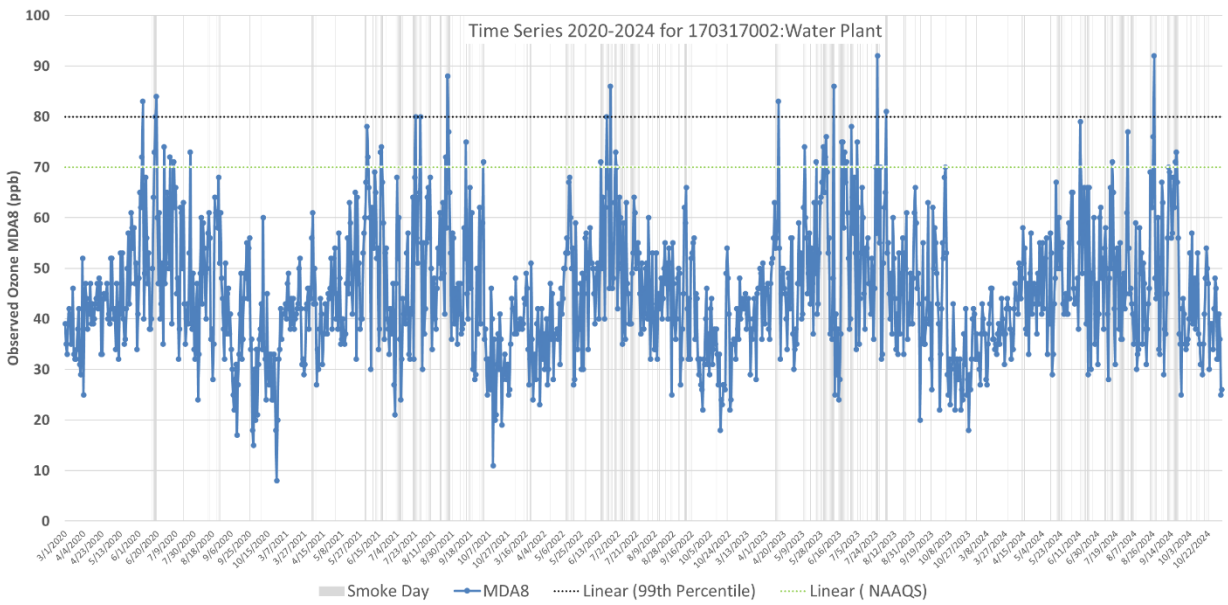


Figure 62. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Water Plant (170317002) monitor.

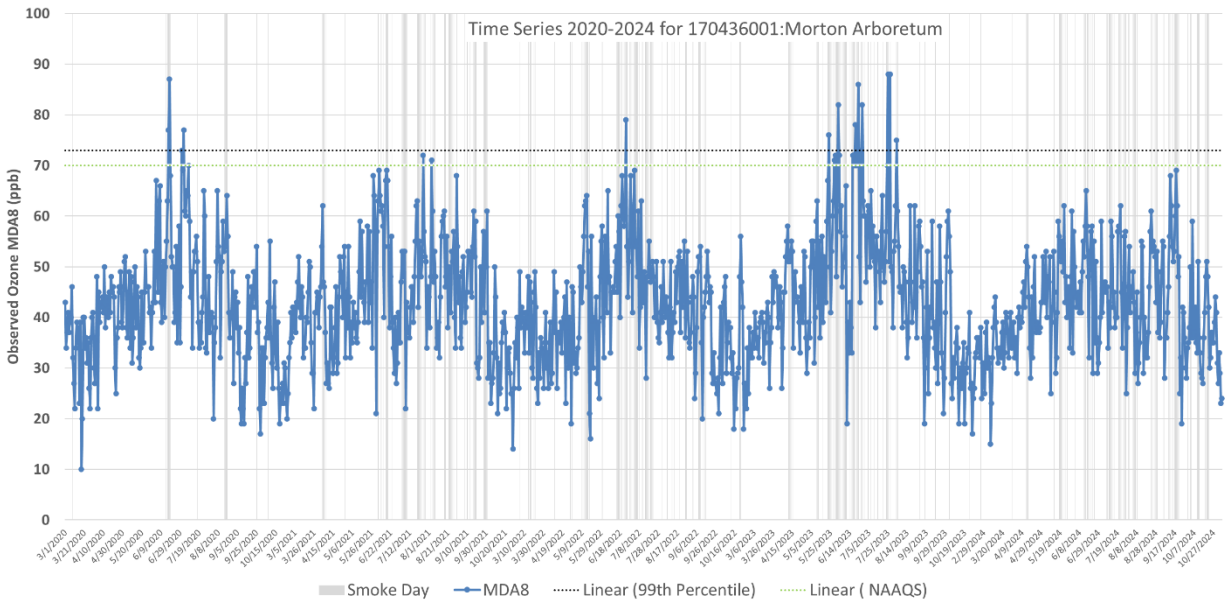


Figure 63. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Morton Arboretum (170436001) monitor.

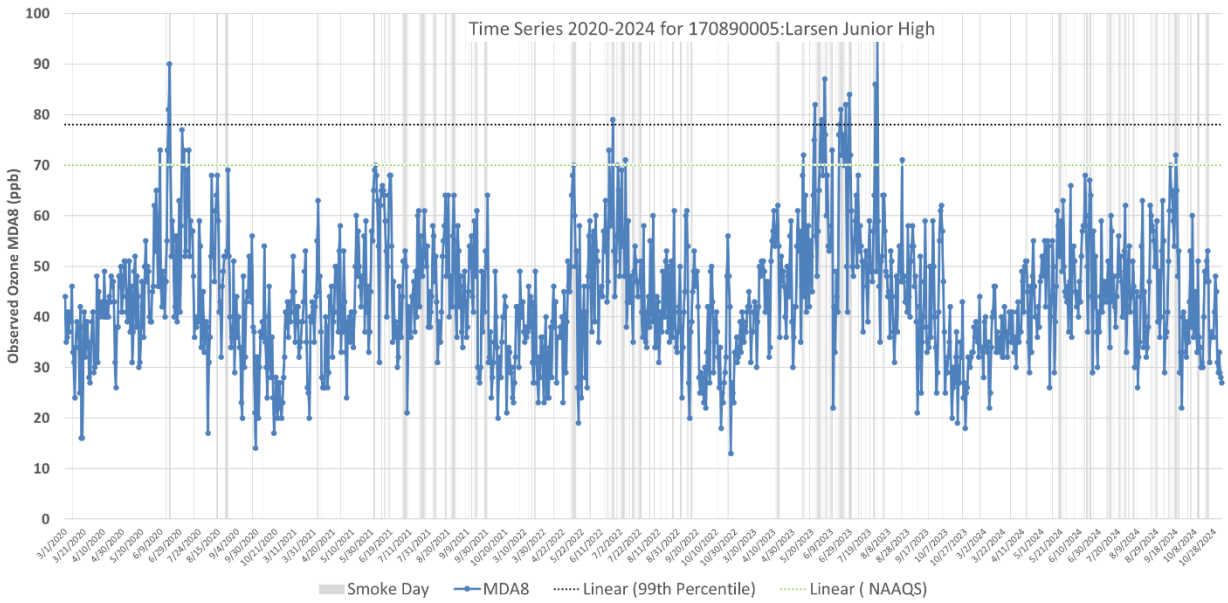


Figure 64. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Larsen Junior High (170890005) monitor.

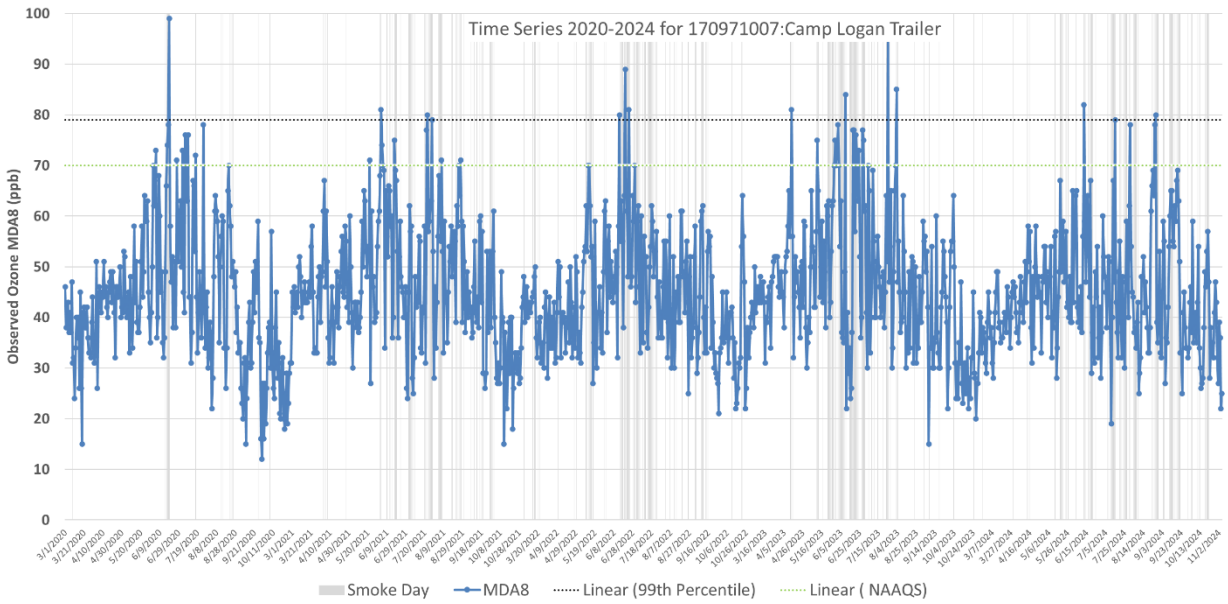


Figure 65. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Camp Logan Trailer (170971007) monitor.

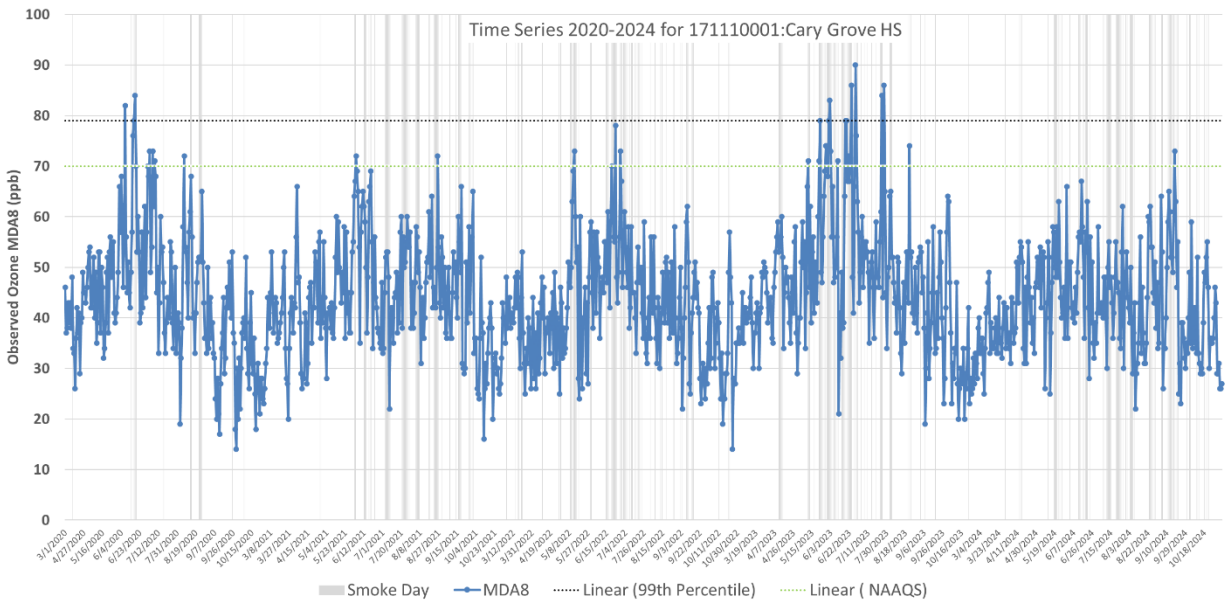


Figure 66. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Cary Grove Hs (171110001) monitor.

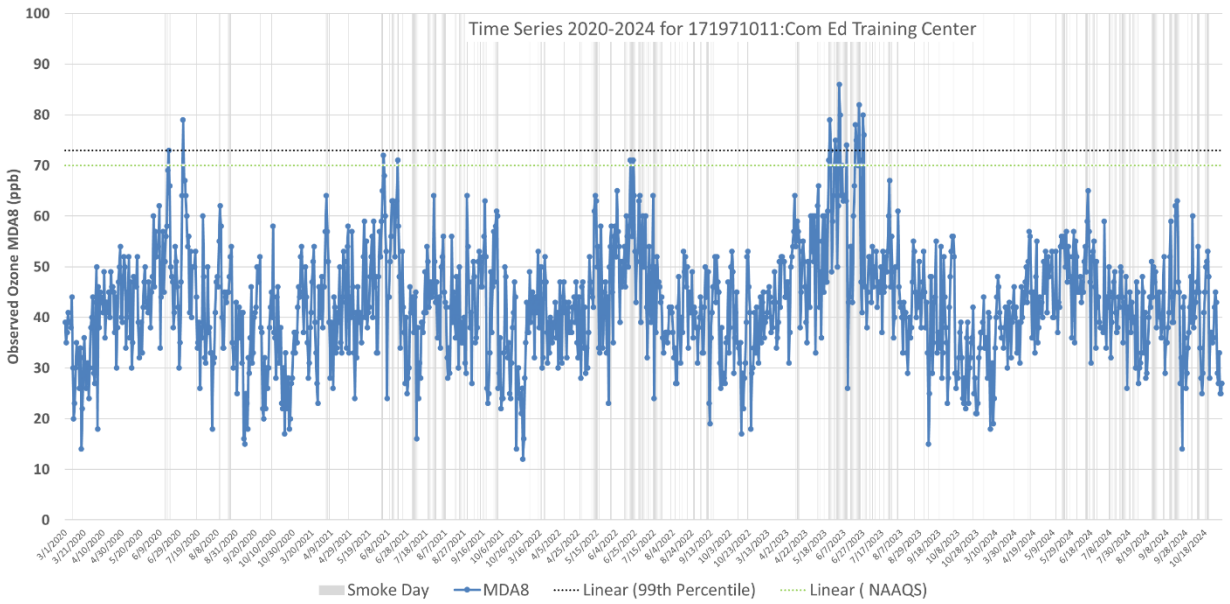


Figure 67. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Com Ed Training Center (171971011) monitor.

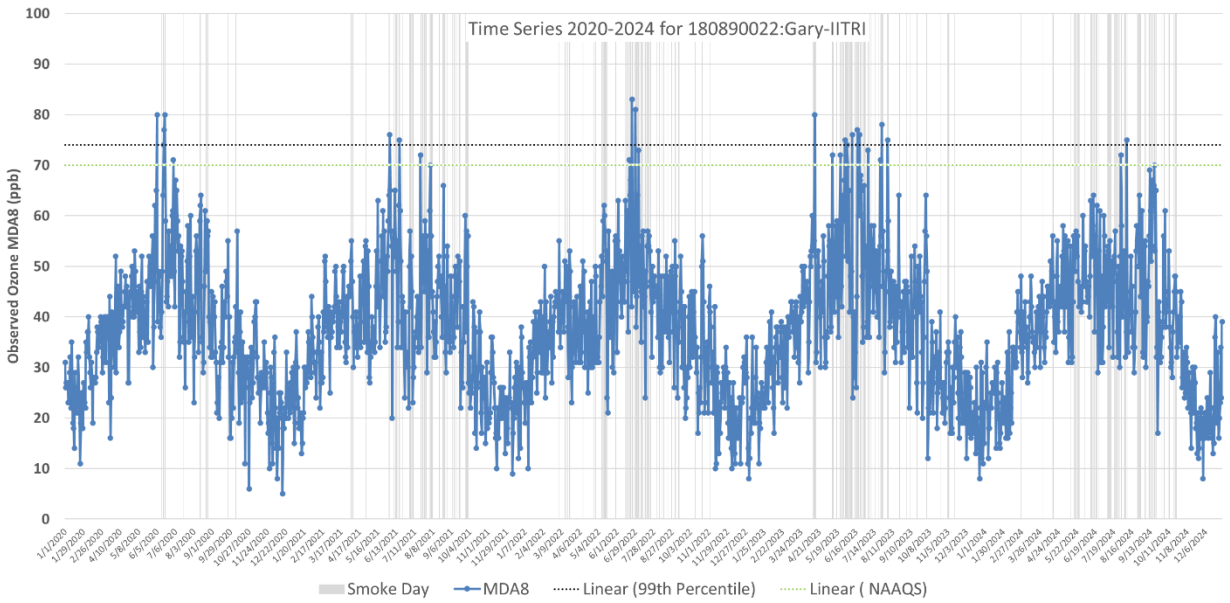


Figure 68. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Gary-IITRI (180890022) monitor.

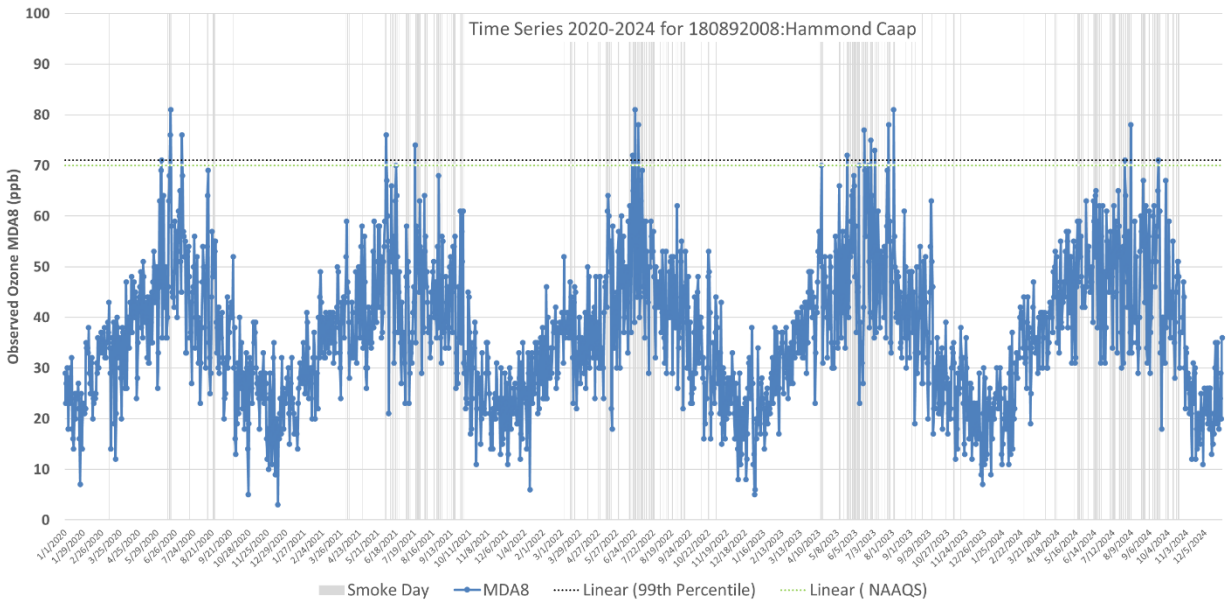


Figure 69. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Hammond Caap (180892008) monitor.

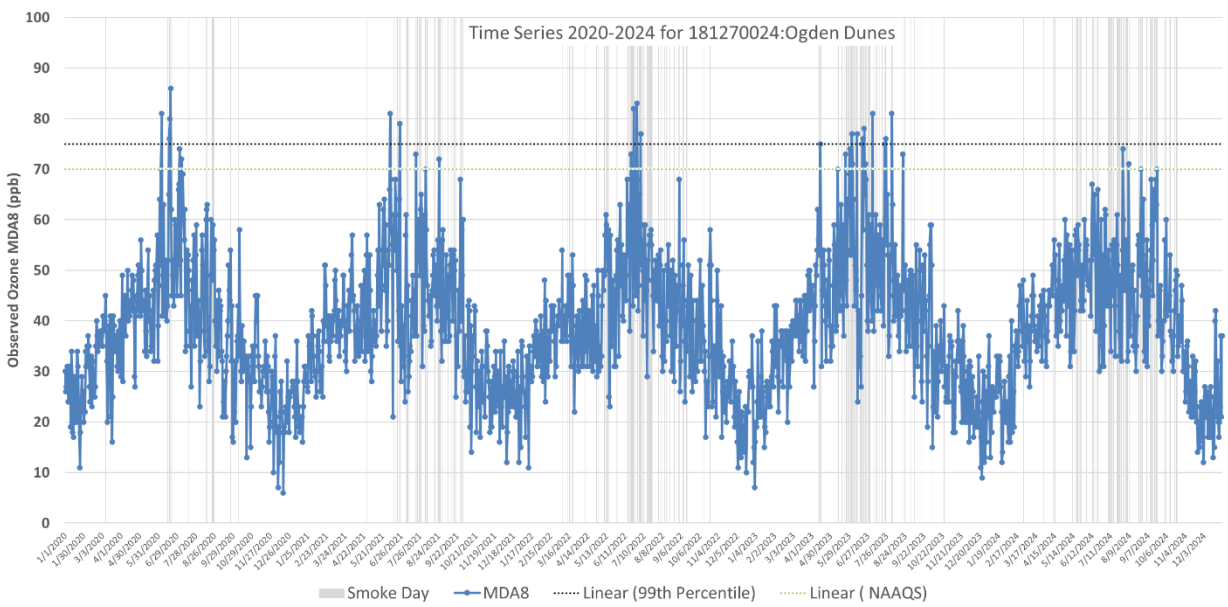


Figure 70. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Ogden Dunes (181270024) monitor.

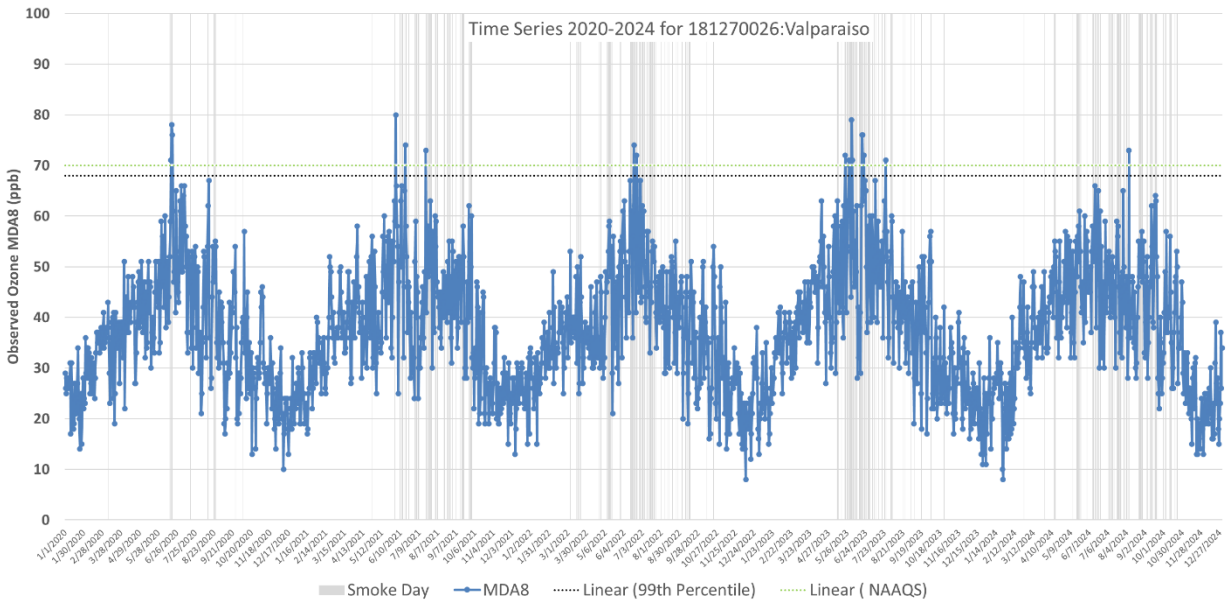


Figure 71. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Valparaiso (181270026) monitor.

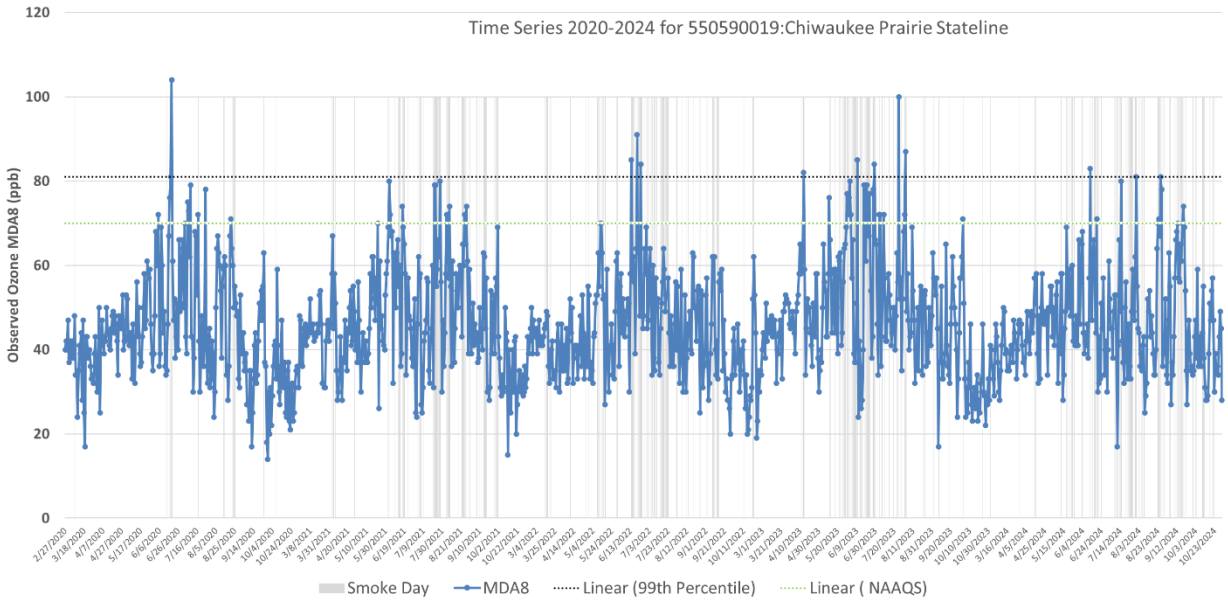


Figure 72. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Chiwaukee Prairie Stateline (550590019) monitor.

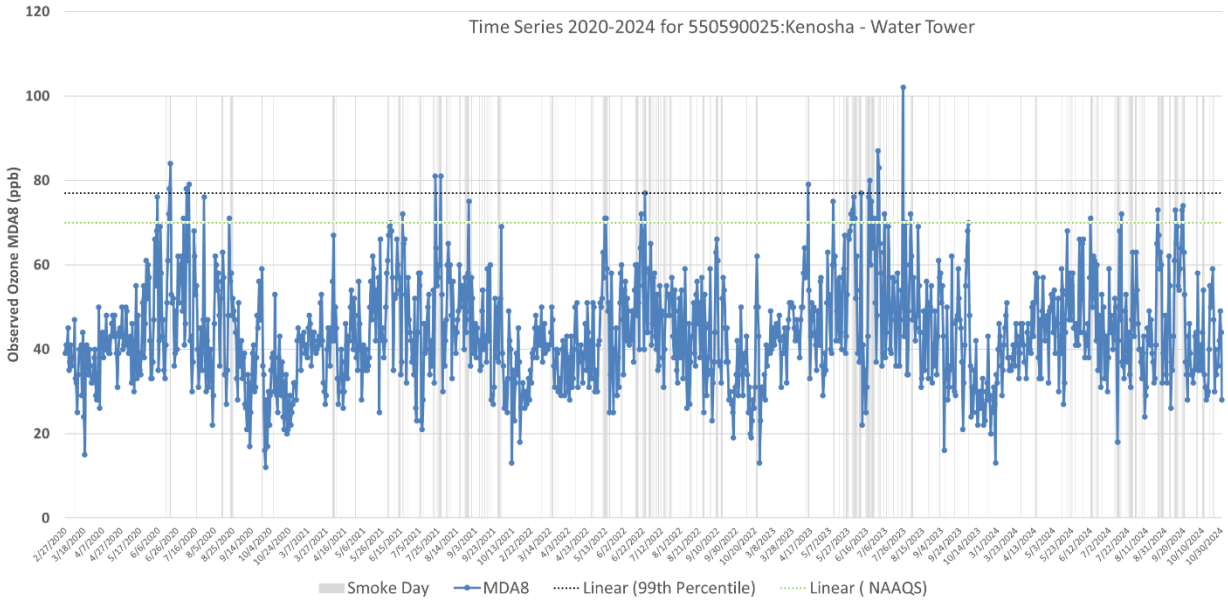


Figure 73. 2020-2024 time series of MDA8 ozone concentrations, 5-year 99th percentile values, and dates with NOAA HMS smoke indications at the Kenosha - Water Tower (550590025) monitor.

Figure 74 through Figure 94 further demonstrate that many May – August 2023 MDA8 observations (blue line) were remarkably higher than the five-year 2020-2024 average monthly MDA8 concentrations (solid orange line) and were oftentimes more than two times the standard deviation (orange dotted lines) over this period. At some monitors on certain dates, the MDA8 observation is as much as 55 ppb higher than the five-year average at that monitor for those months (delta represented with grey bars).

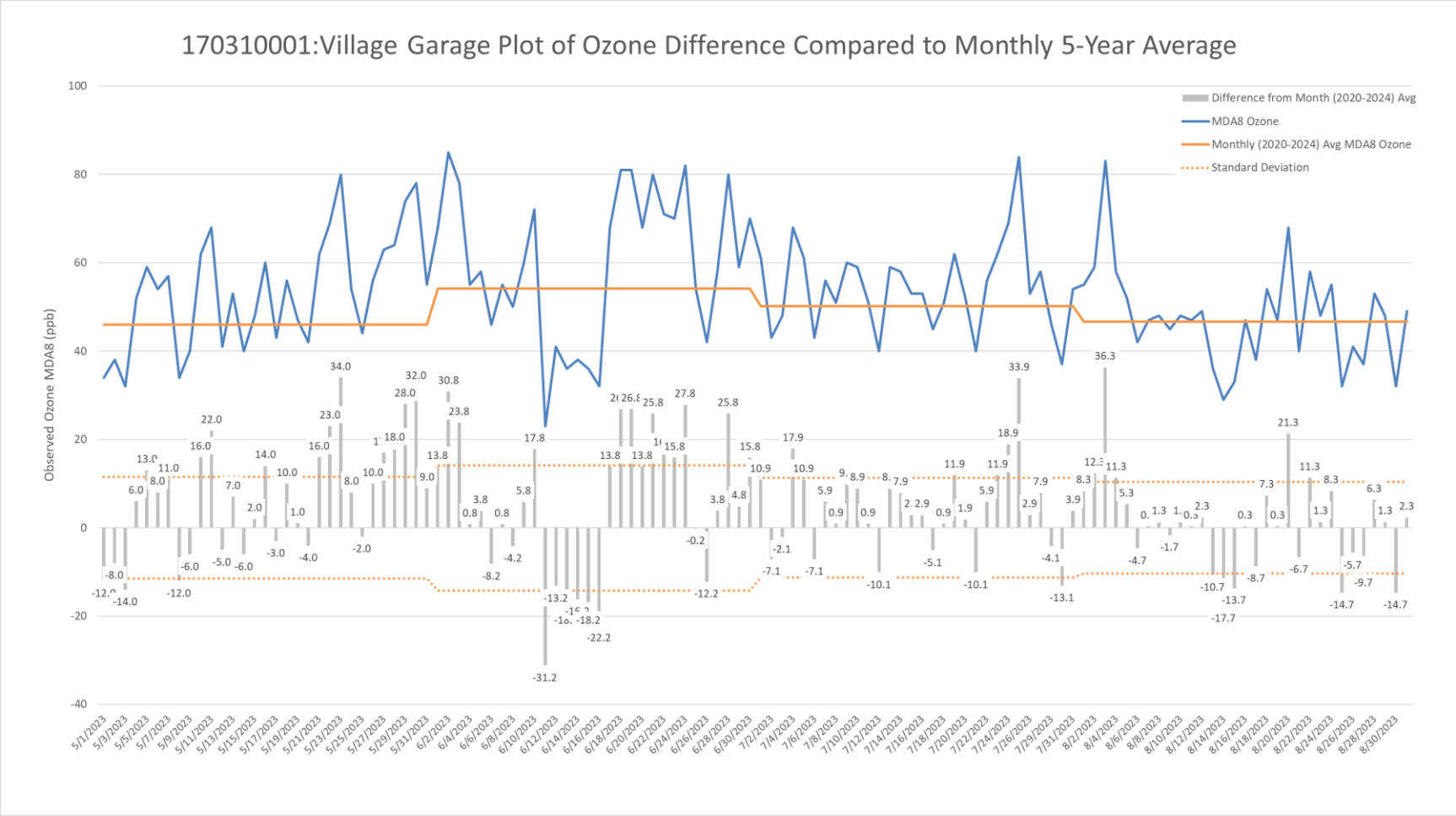


Figure 74. Village Garage (170310001) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

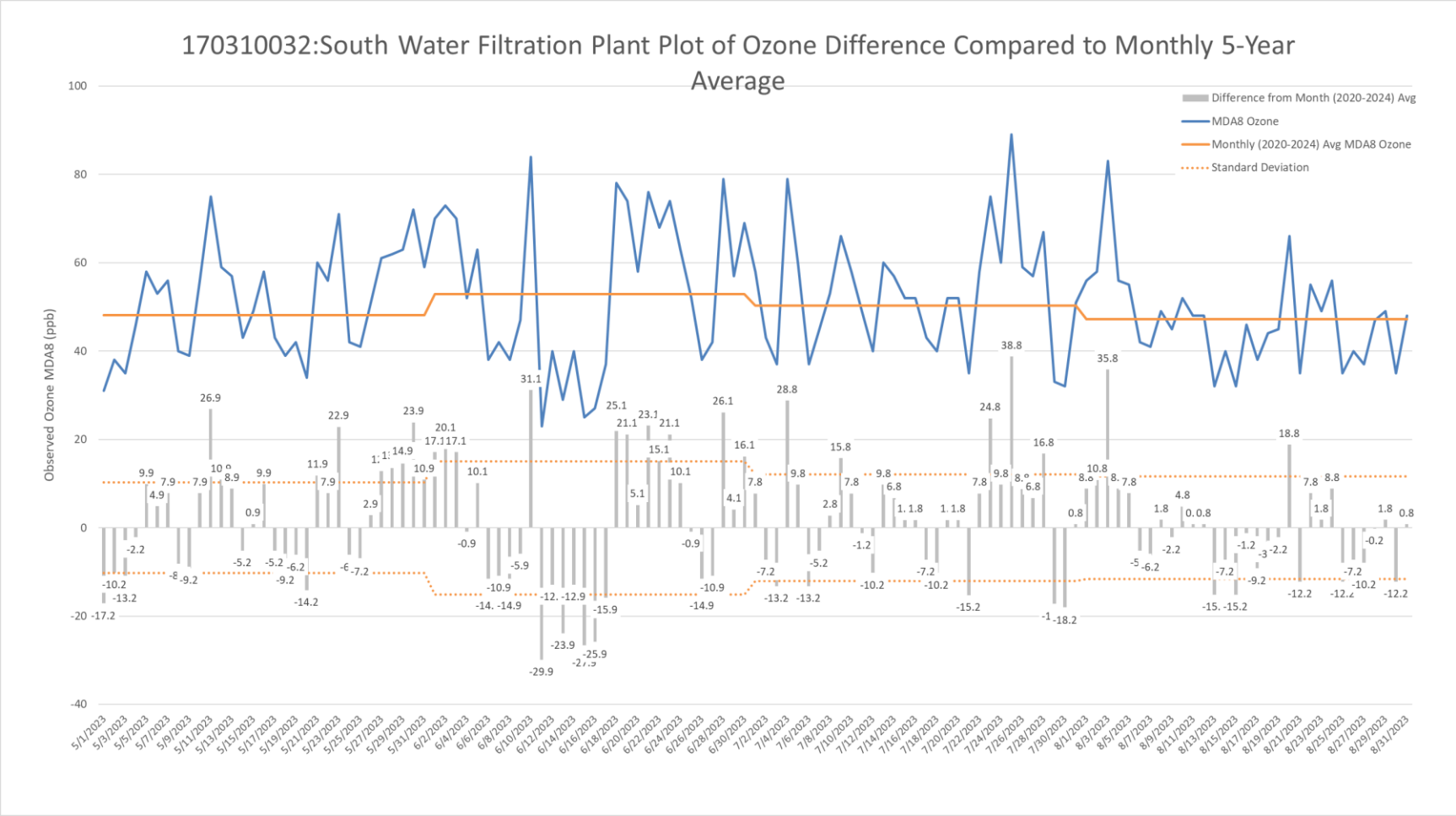


Figure 75. South Water Filtration Plant (170310032) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

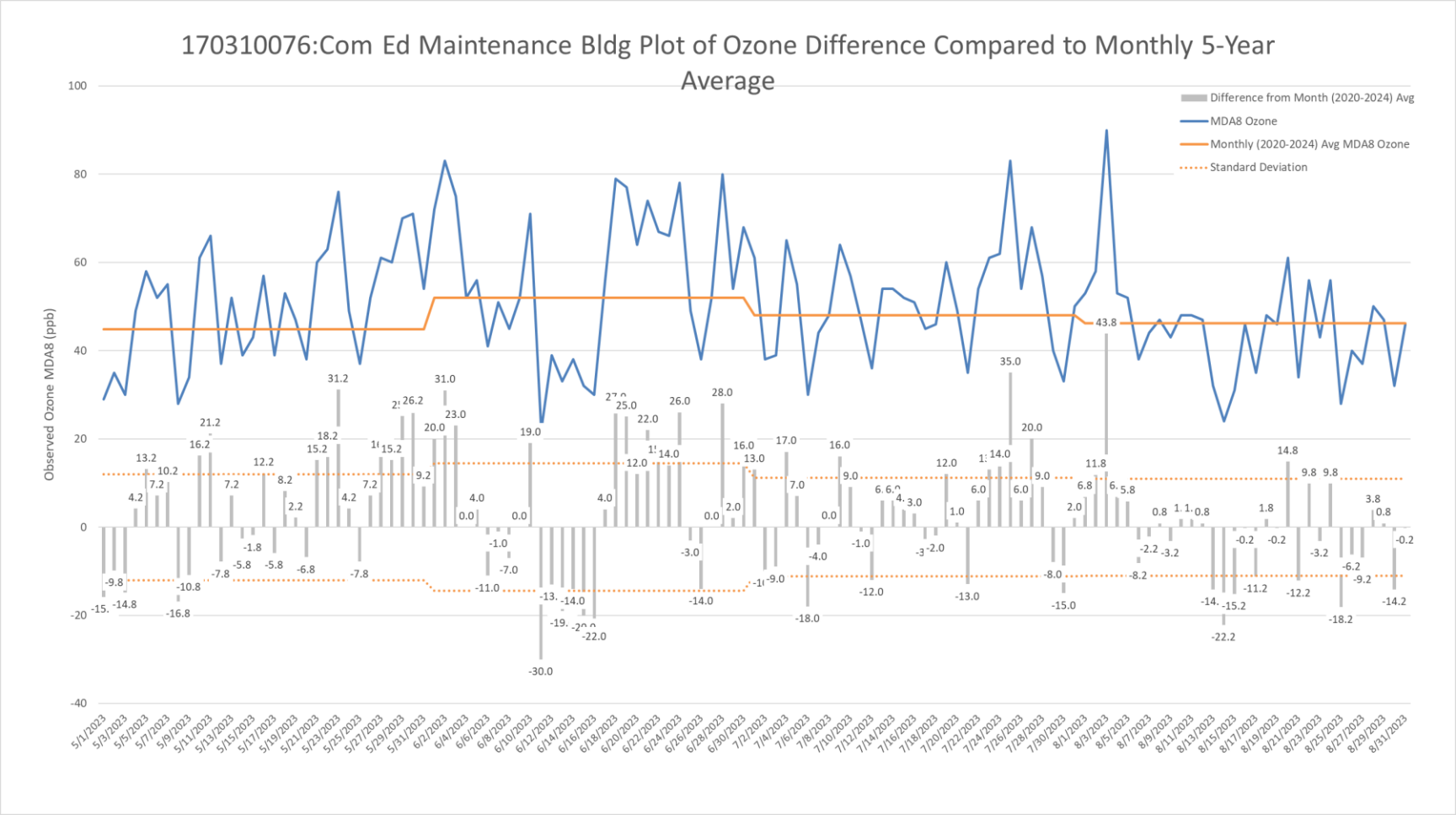


Figure 76. Com Ed Maintenance Bldg (170310076) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

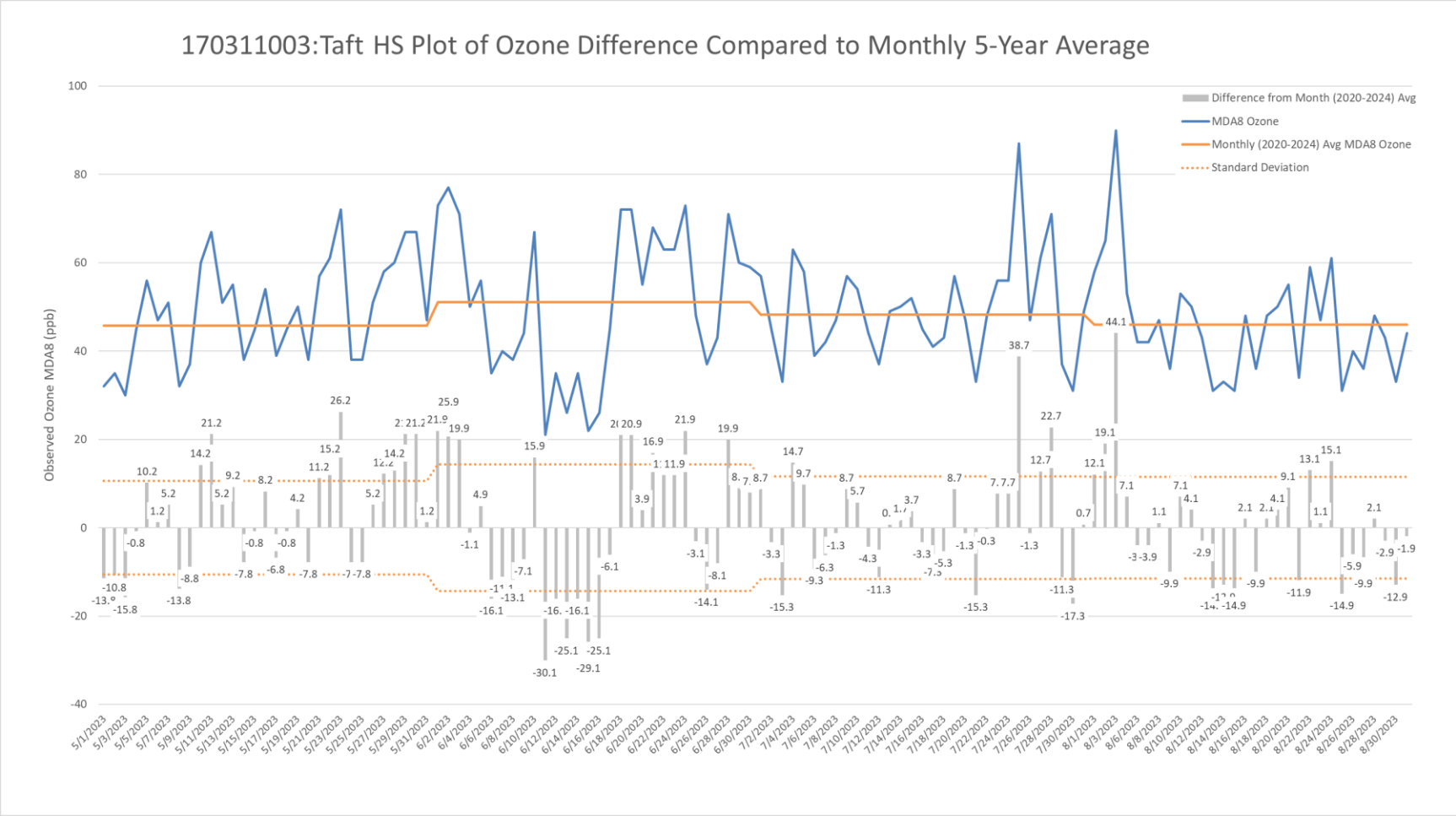


Figure 77. Taft HS (170311003) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

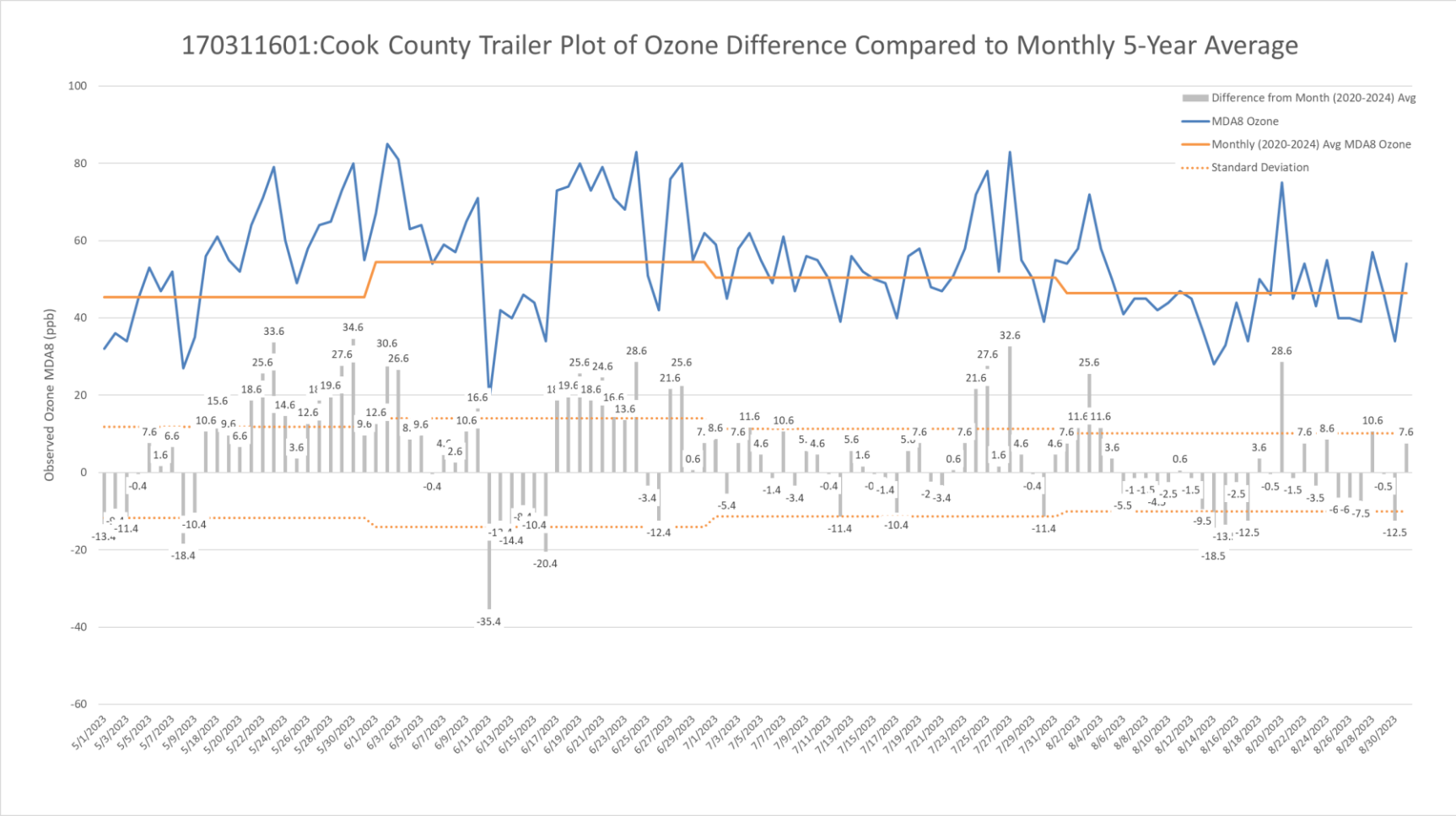


Figure 78. Cook County Trailer (170311601) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

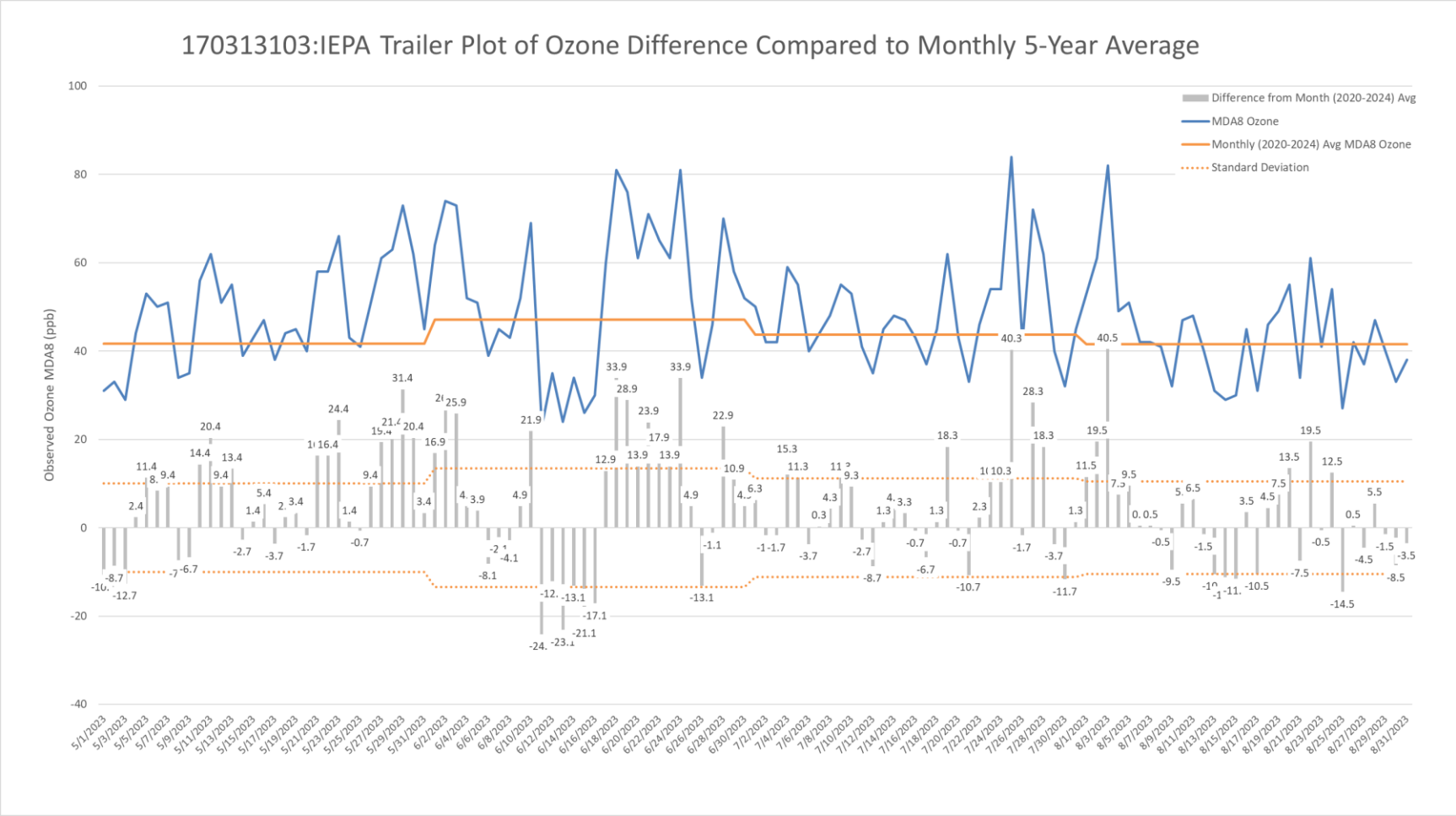


Figure 79. IEPA Trailer (170313103) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

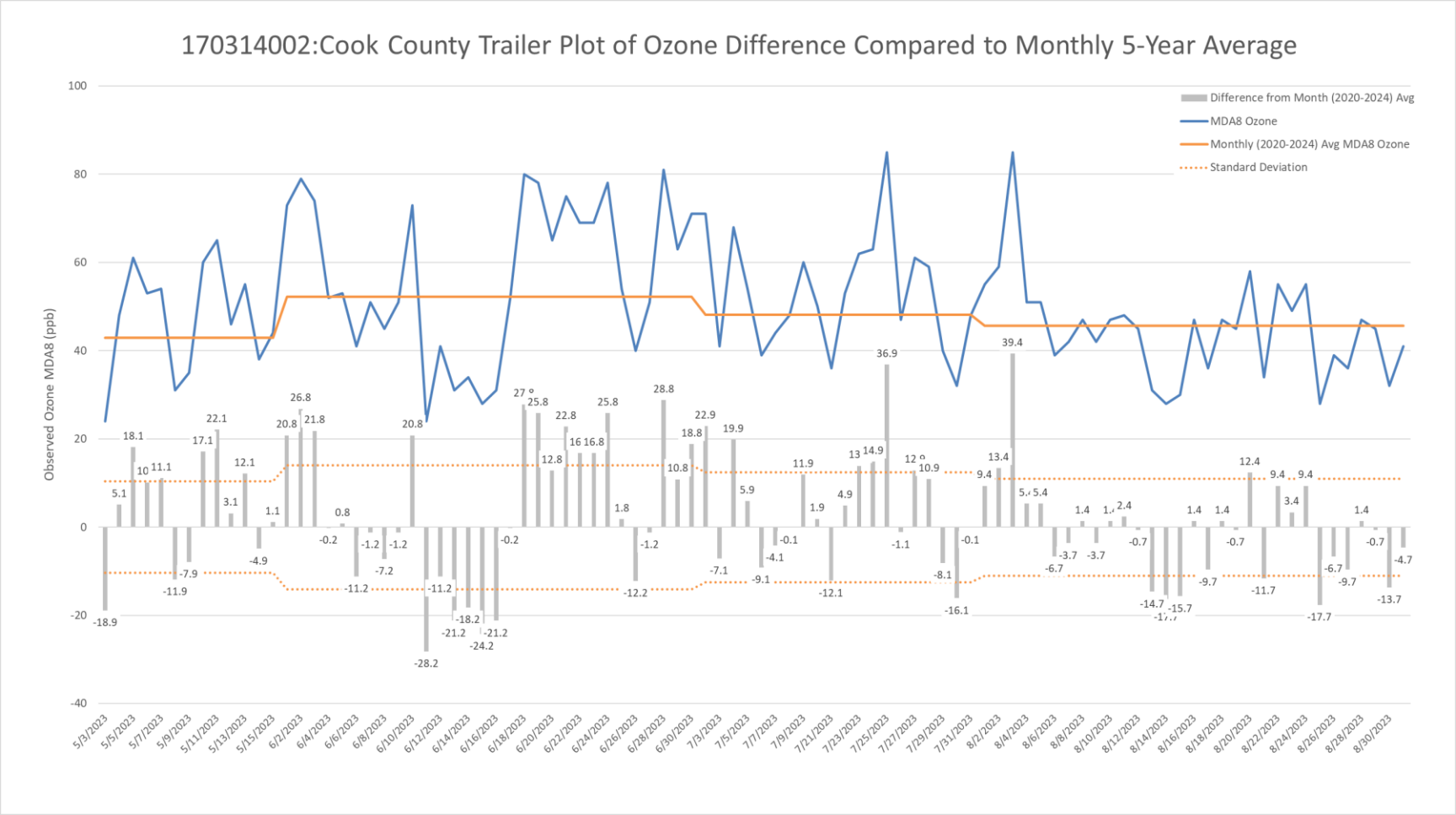


Figure 80. Cook County Trailer (170314002) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

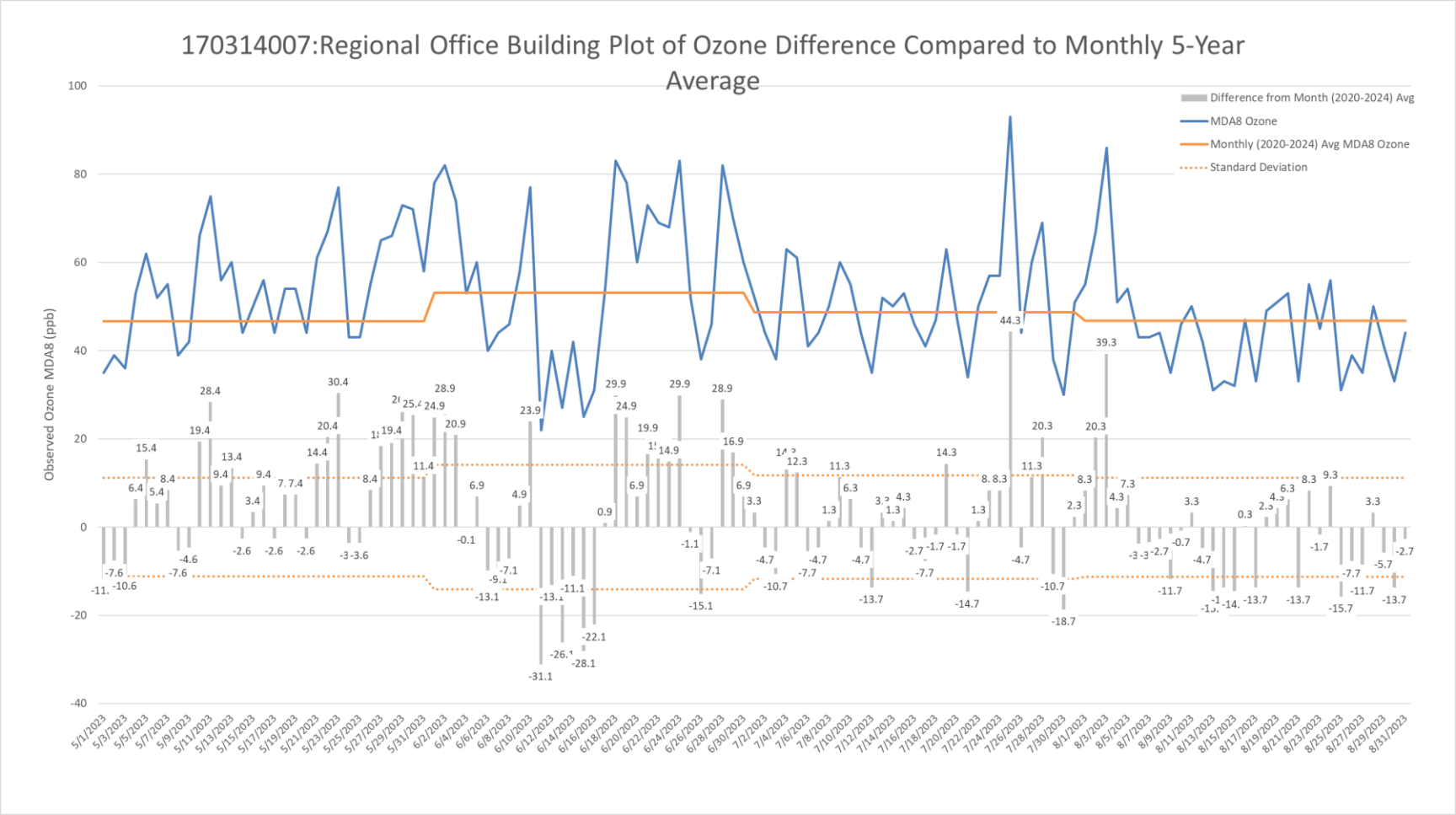


Figure 81. Regional Office Building (170314007) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

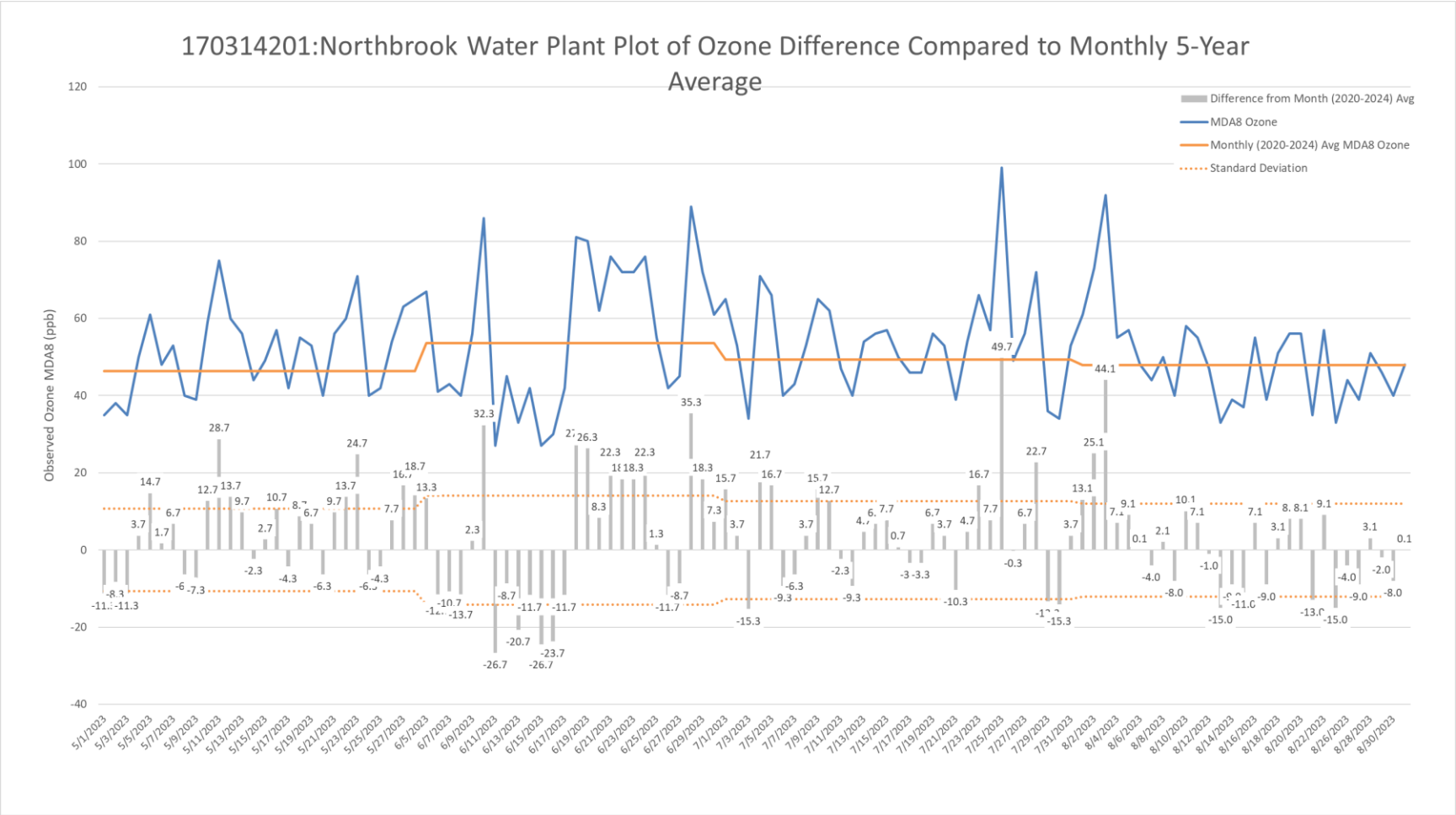


Figure 82. Northbrook Water Plant (170314201) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

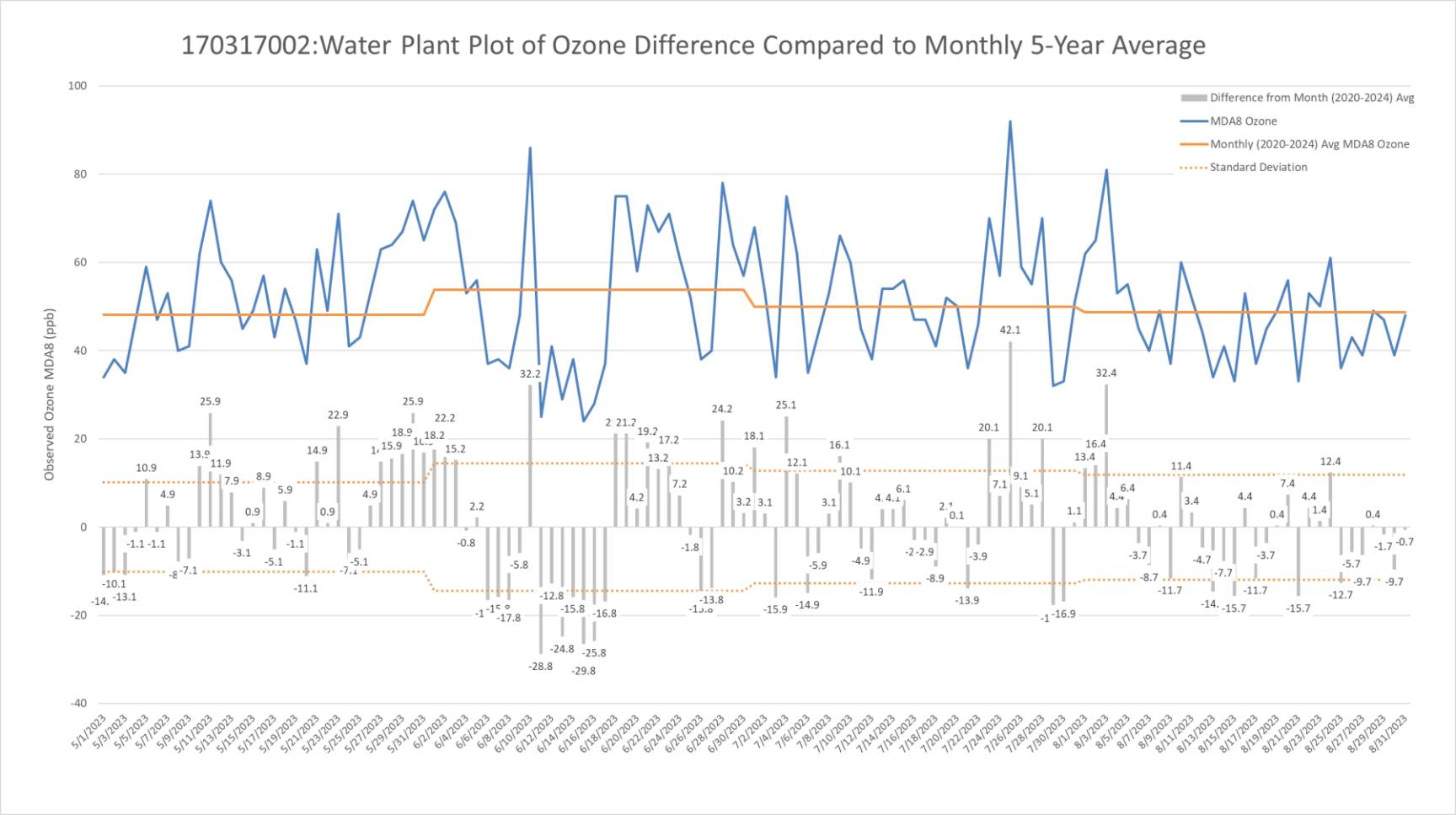


Figure 83. Water Plant (170317002) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

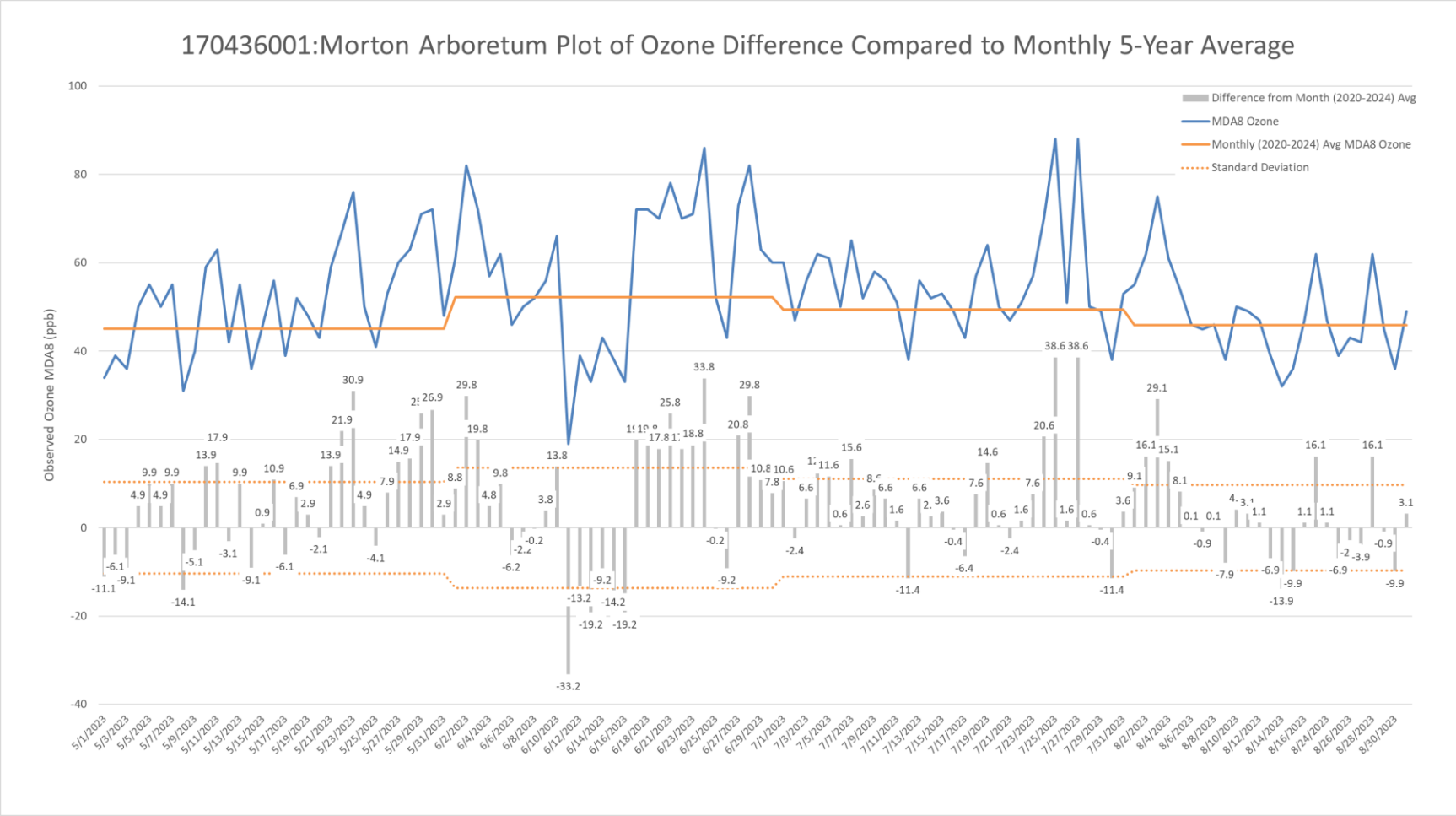


Figure 84. Morton Arboretum (170436001) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

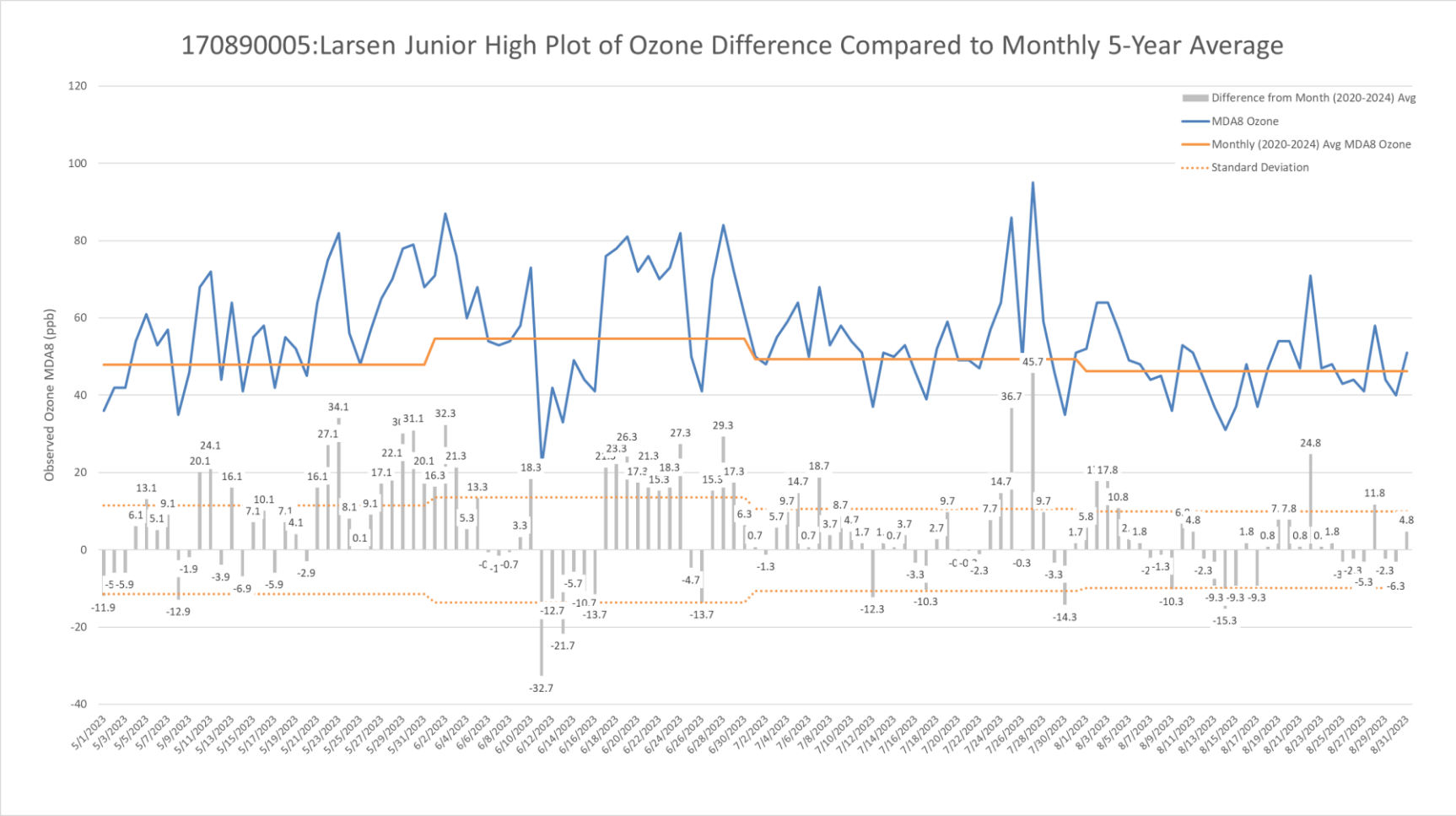


Figure 85. Larsen Junior High (170890005) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

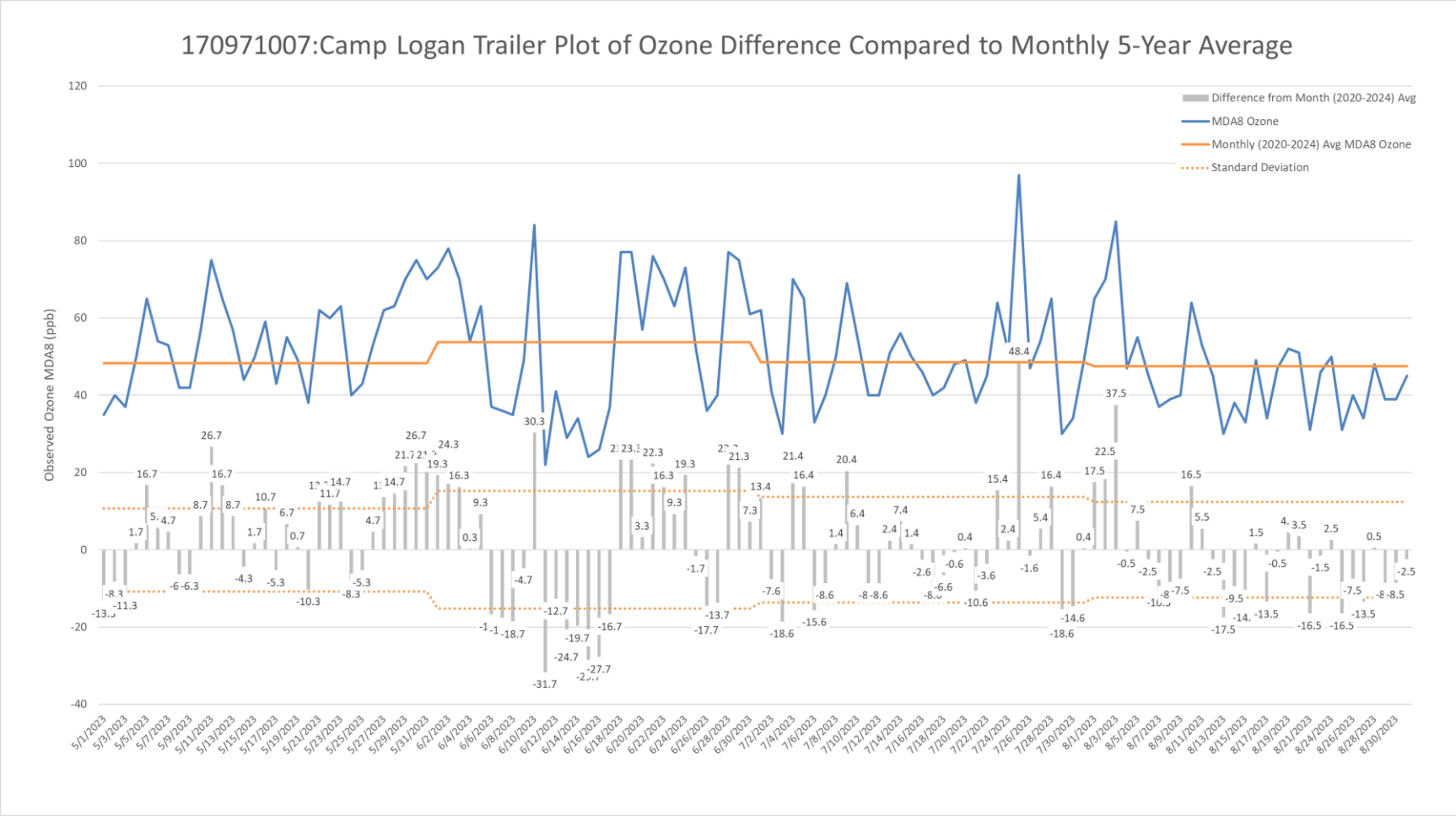


Figure 86. Camp Logan Trailer (170971007) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

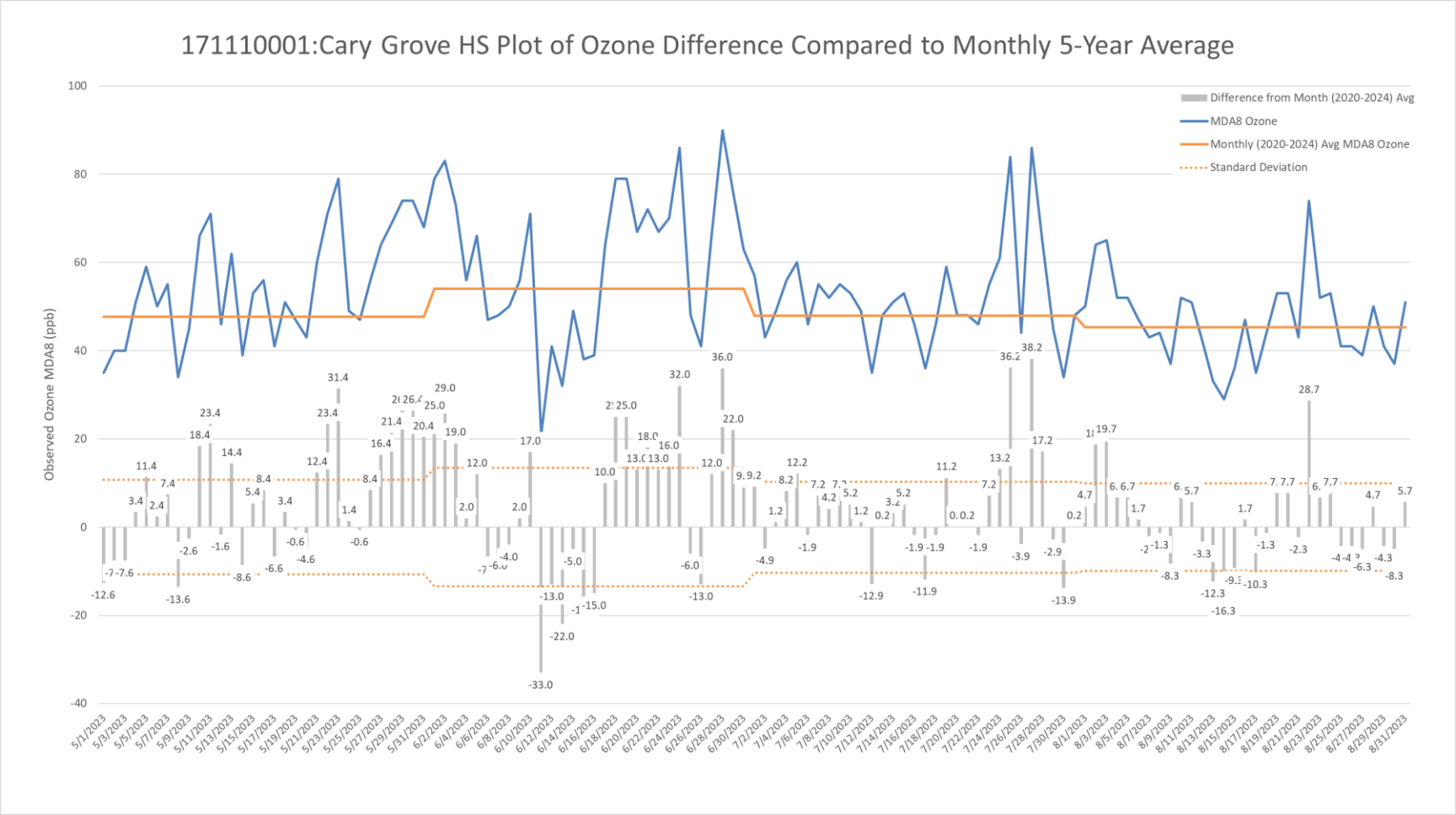


Figure 87. Cary Grove Hs (171110001) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

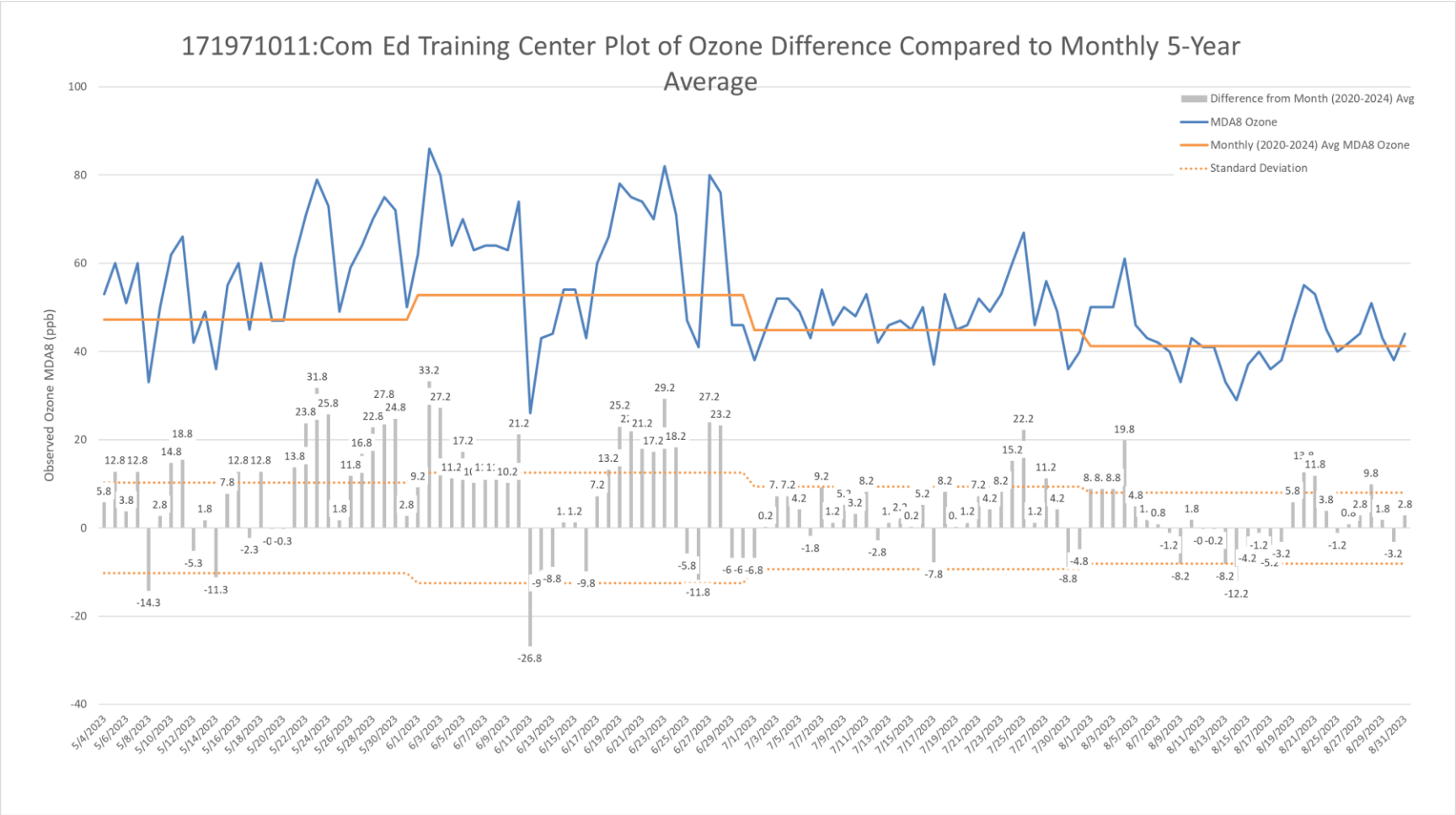


Figure 88. Com Ed Training Center (171971011) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

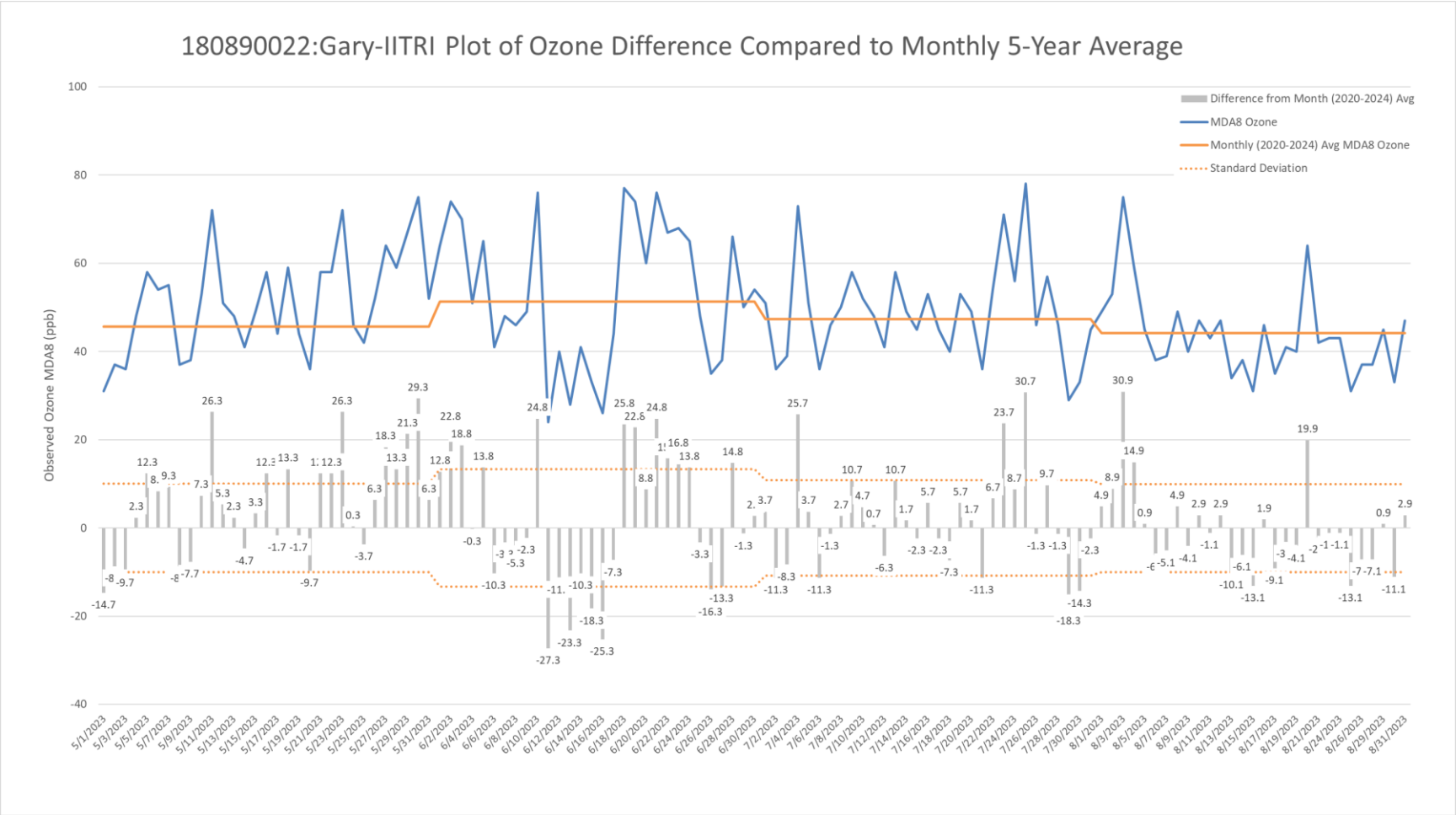


Figure 89. Gary-IITRI (180890022) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

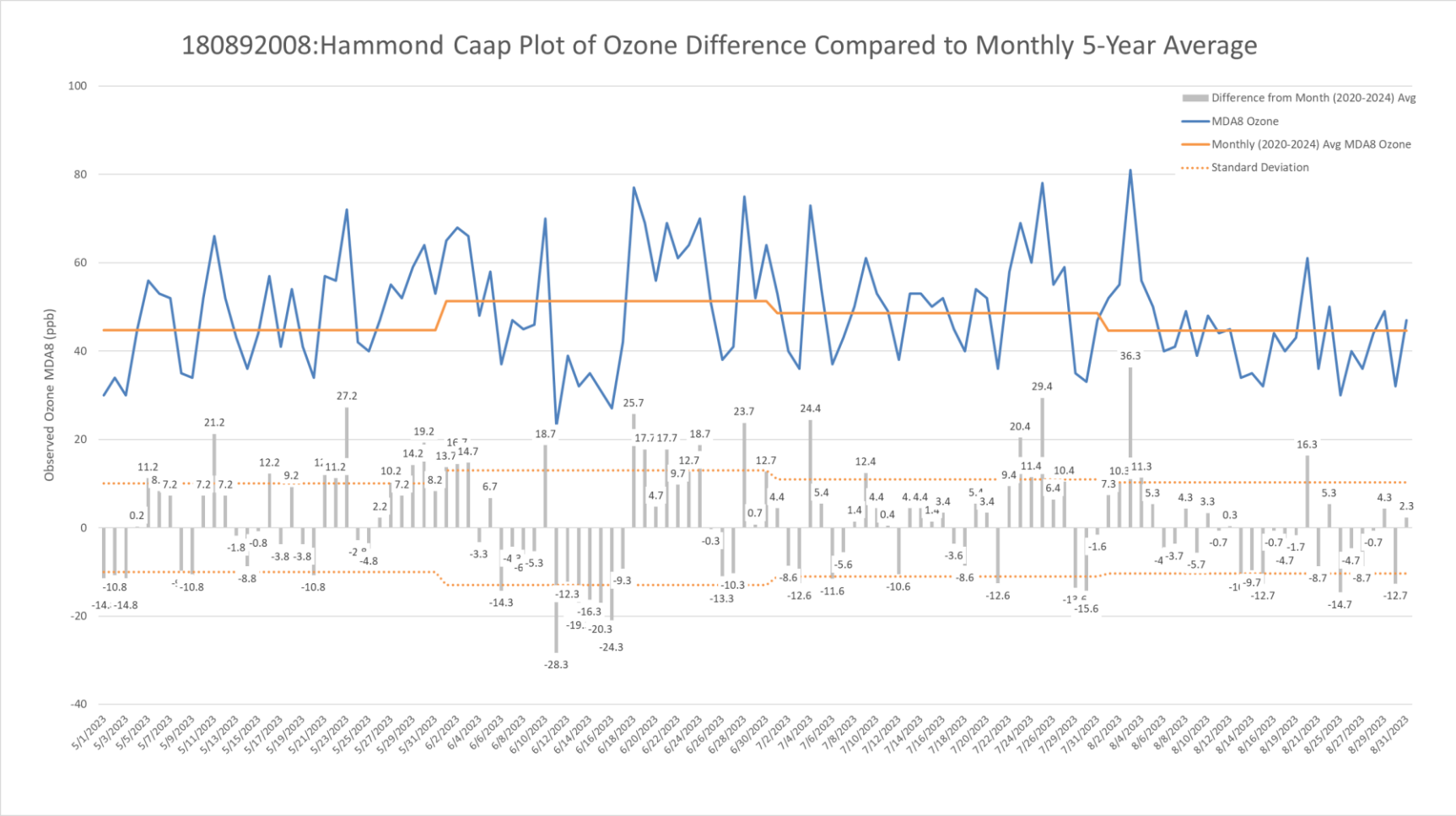


Figure 90. Hammond Caap (180892008) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

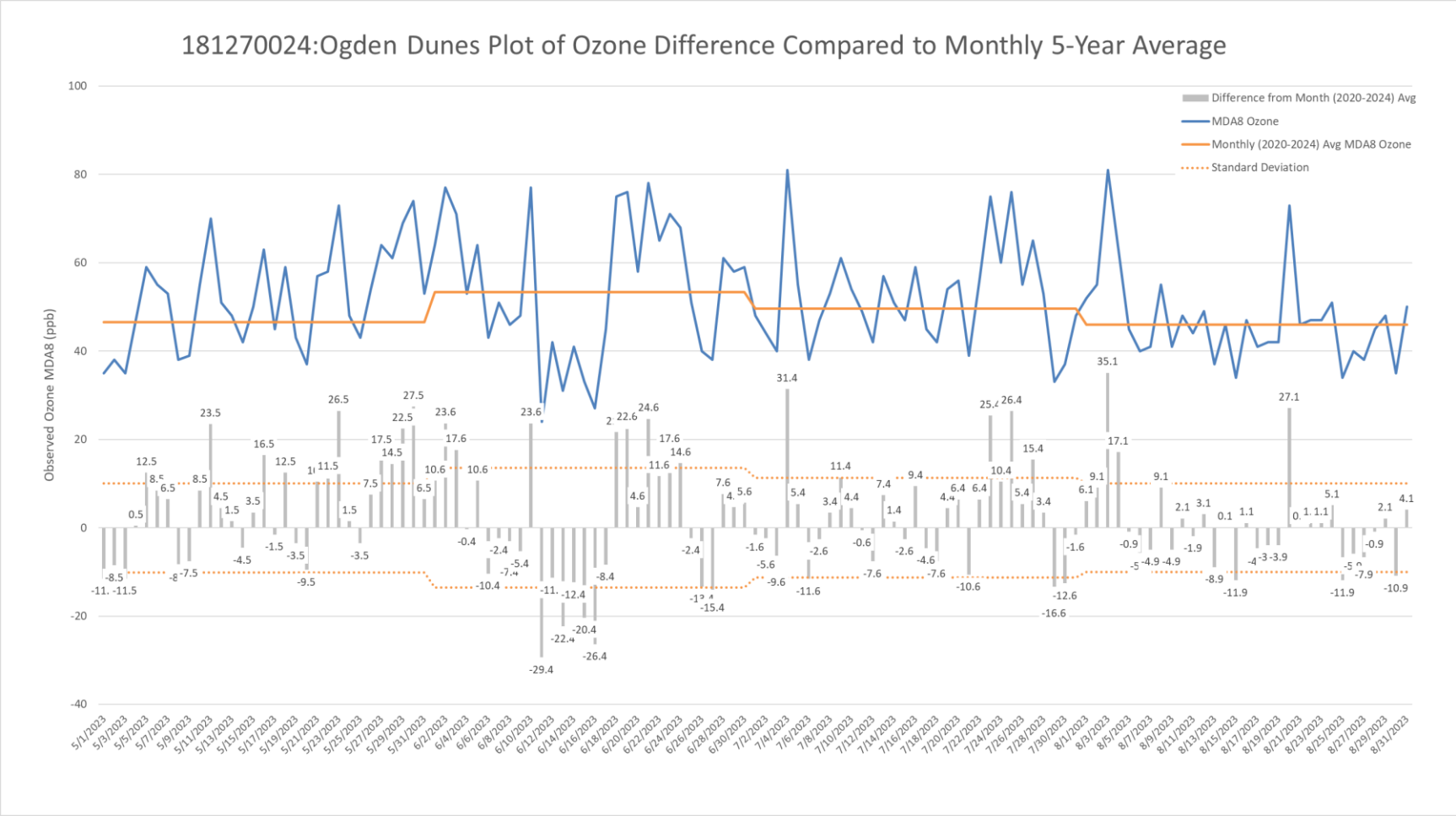


Figure 91. Ogden Dunes (181270024) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

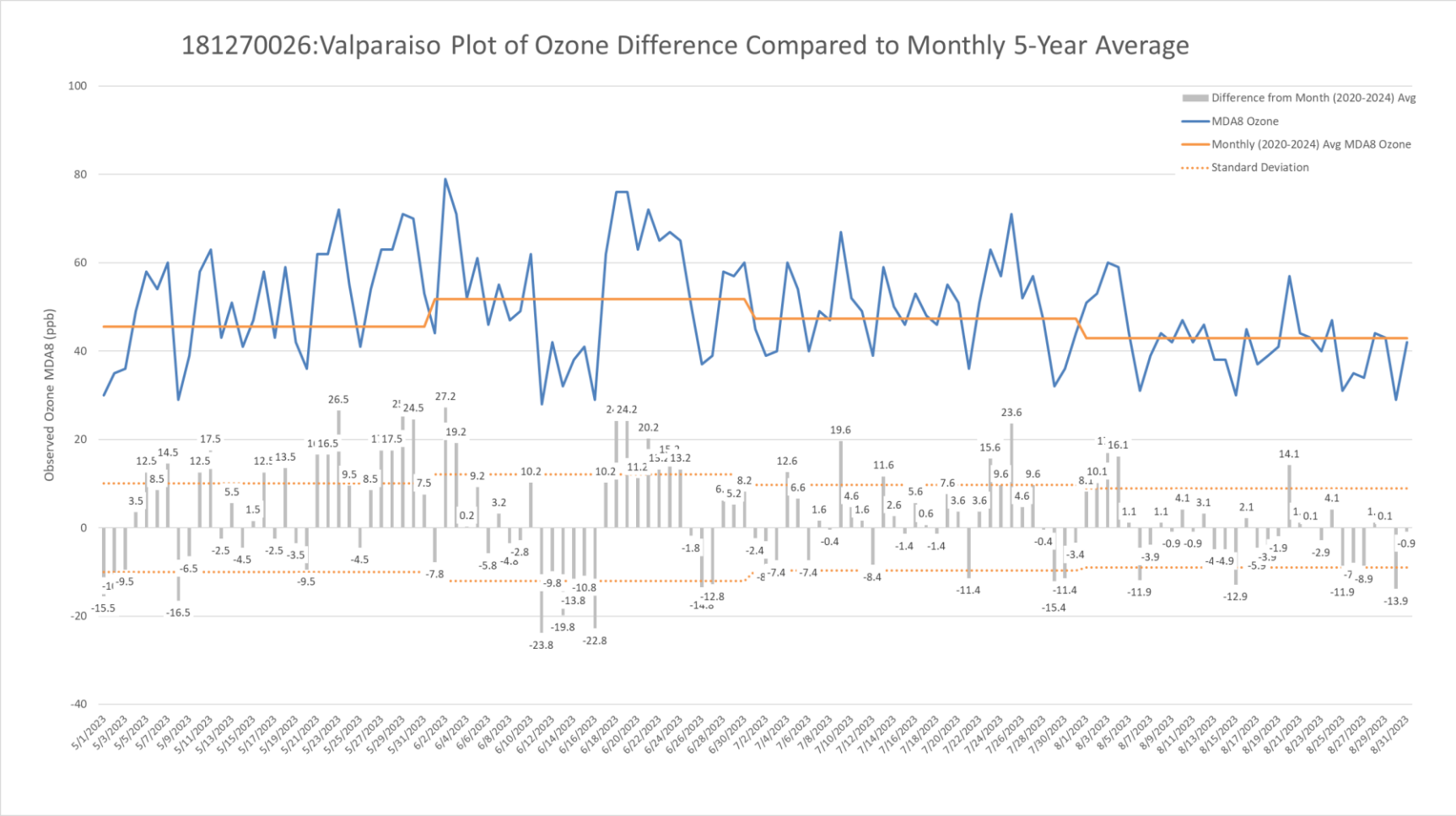


Figure 92. Valparaiso (181270026) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

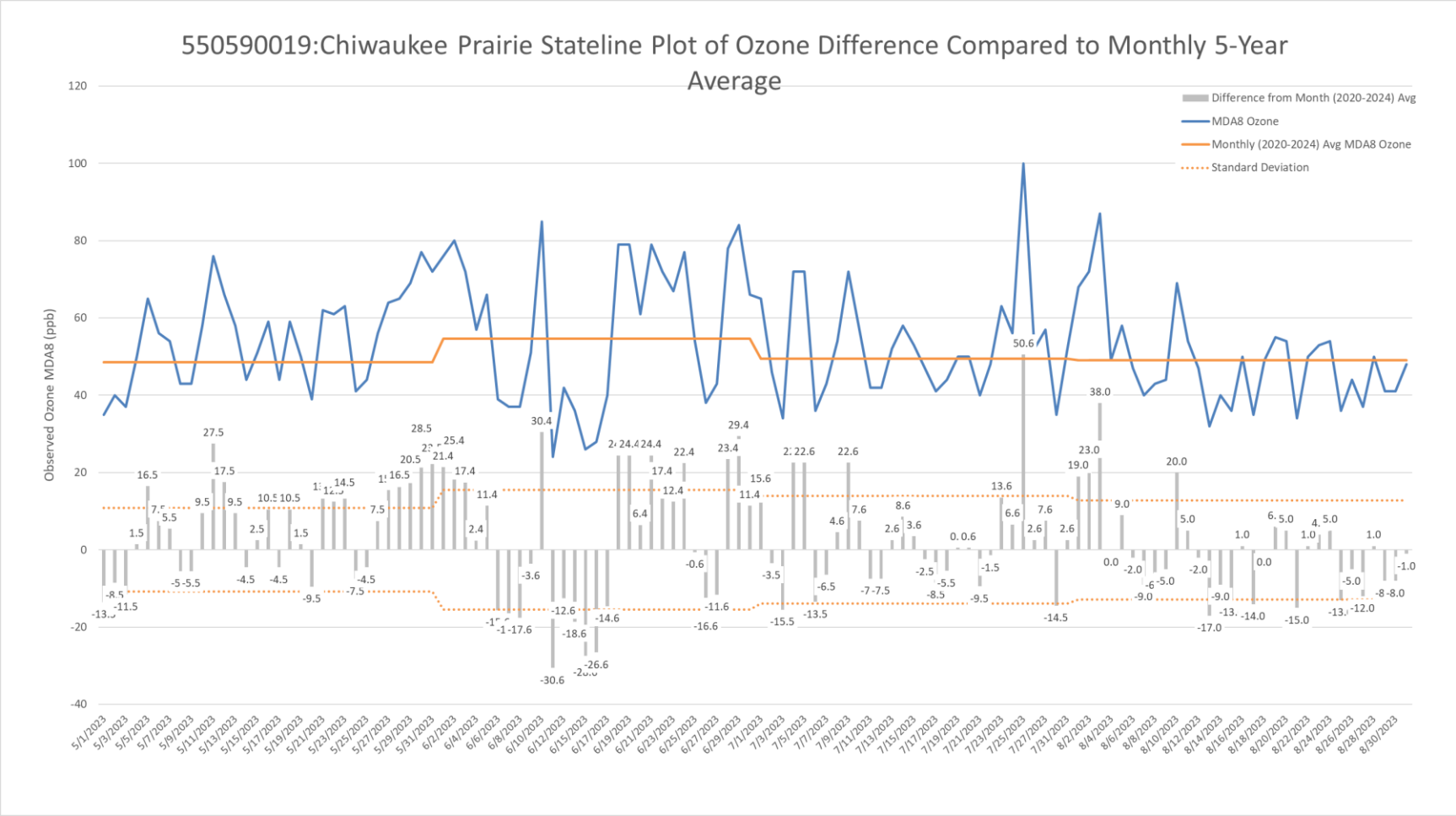


Figure 93. Chiwaukee Prairie Stateline (550590019) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

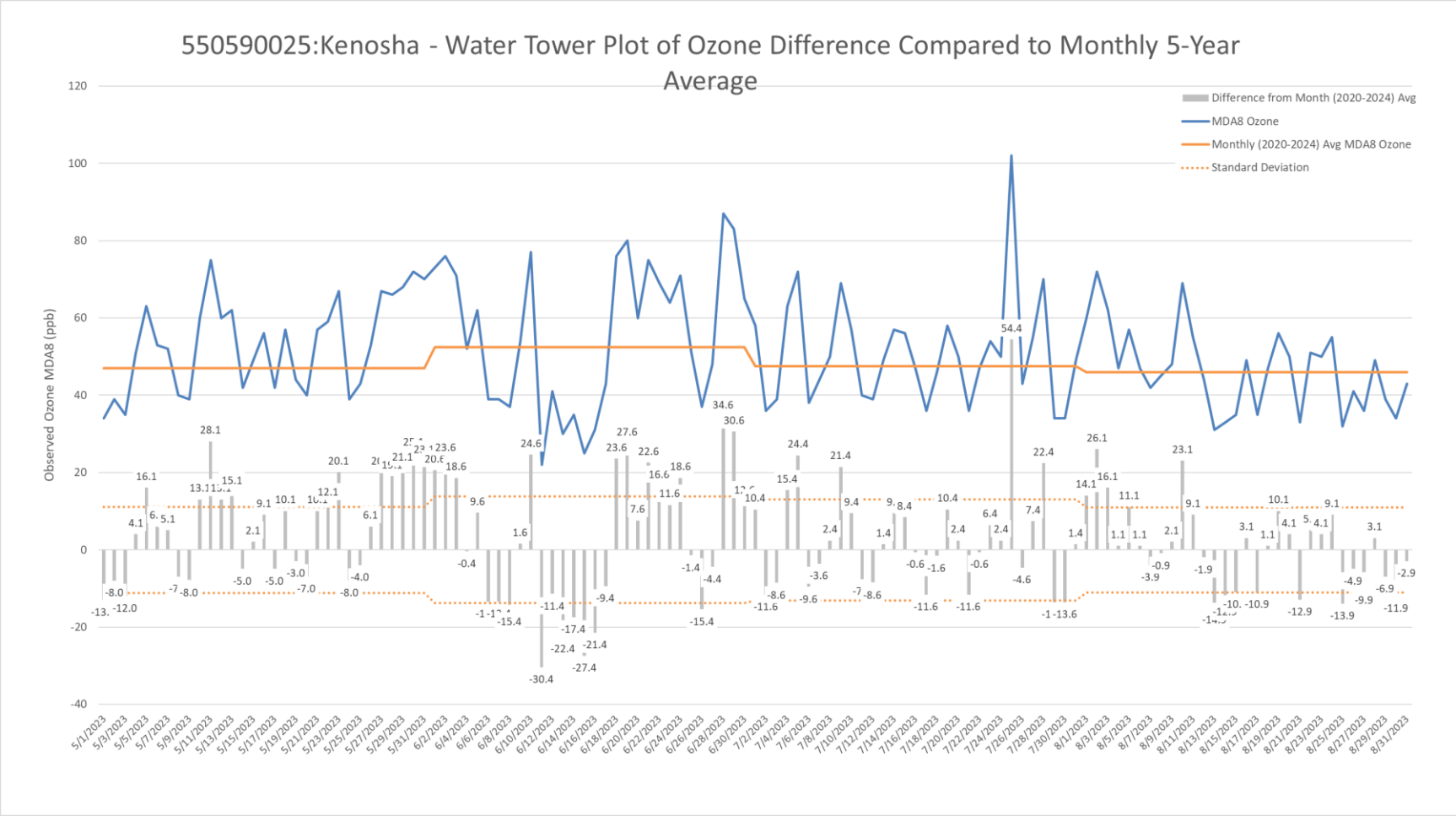


Figure 94. Kenosha - Water Tower (550590025) May-June 2023 8-hr Ozone Comparison to May-June 2020-2024 Average 8-hr.

Multi-pollutant and alternate species corroboration

Chicago's monitoring network observes both total PM2.5 mass and speciated compounds such as ionic potassium (K+) and organic carbon (OC), as well as other pollutants such as carbon monoxide (CO) and elemental or black carbon (EC) which can act as tracers of wildfire emissions.

The daily PM2.5 concentrations at Northbrook Water Plant (170314201), Ogden Dunes (181270024), and Chiwaukee Prairie Stateline (550590019) monitors and OC and K+ at the Northbrook Water Plant (170314201) and the Gary-IITRI (180890022) monitors in the Chicago area were examined.

Figure 95 through Figure 97 provide daily PM2.5 concentrations during the summer of 2023 (May through September) and show that enhanced PM2.5 concentrations correlate to dates when high ozone concentrations are also observed. It can also be seen that there is a buildup of PM2.5 as the Canadian wildfire smoke is present over the region for multiple days. In these instances, we see the gradual increase of PM2.5 concentrations, the longer the plumes reside over the region. It has also been observed in urban areas[13], that the ozone response to smoke levels can be non-linear, with the highest ozone levels not always associated with the highest PM2.5 concentrations.

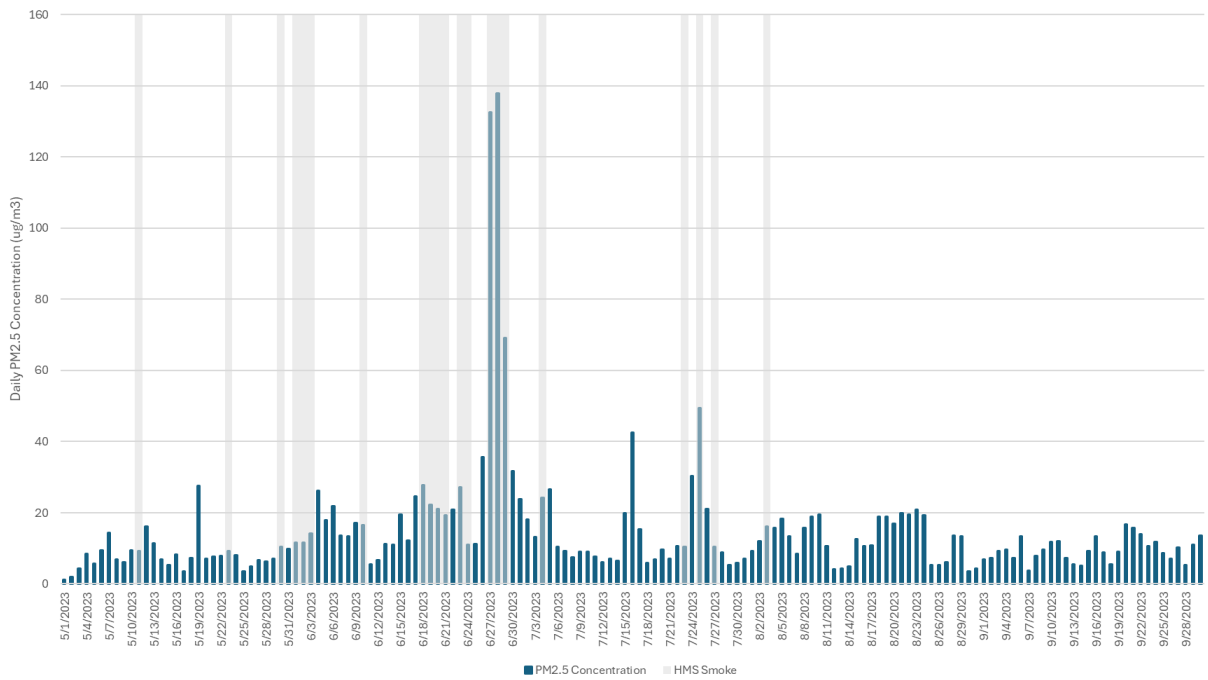


Figure 95. Daily PM2.5 concentrations at the Northbrook Water Plant (170314201) monitor; May through September 2023.

[13] https://doi.org/10.1021/acs.est.9b05241

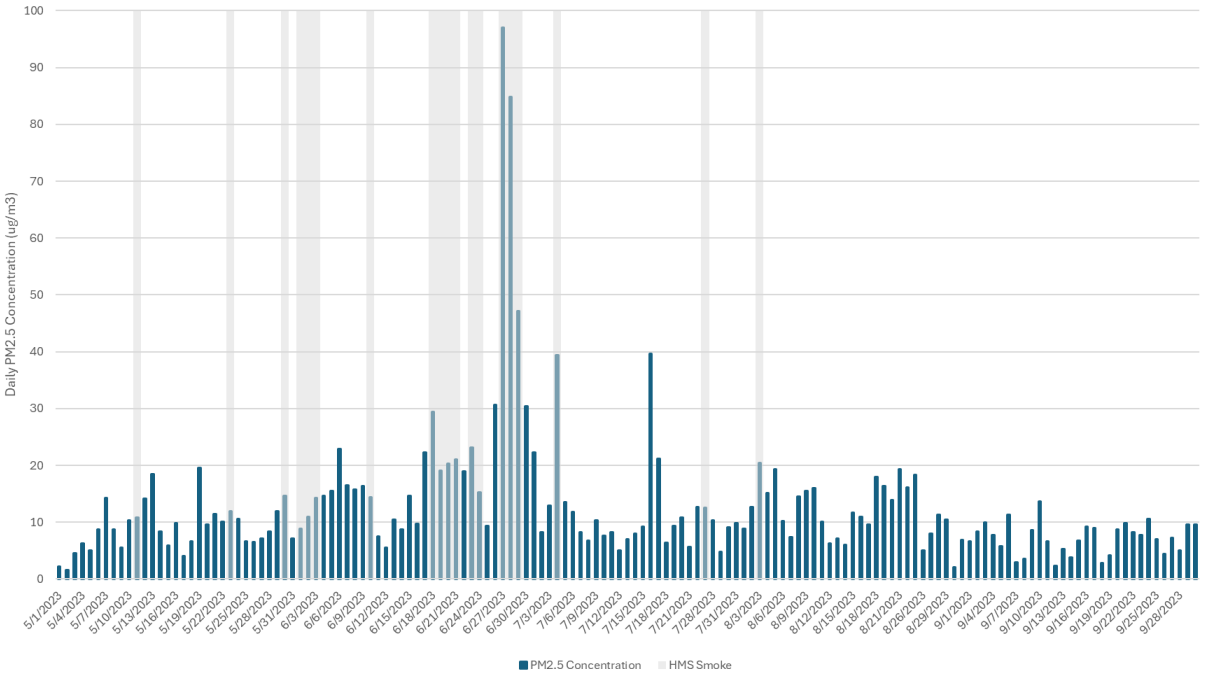


Figure 96. Daily PM2.5 concentrations at the Ogden Dunes (181270024) monitor; May through September 2023.

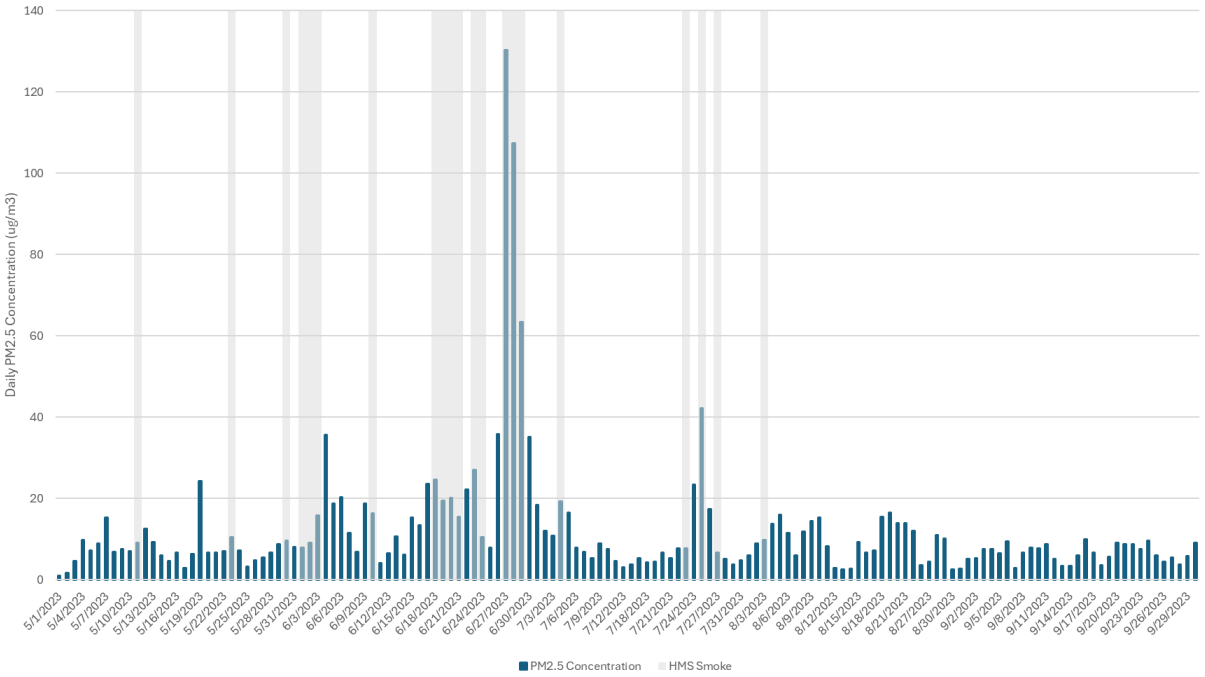


Figure 97. Daily PM2.5 concentrations at the Chiwaukee Prairie Stateline (550590019) monitor; May through September 2023.

OC and K+ are the compounds most associated with wildfire emissions, so comparing these chemical compounds against the monitored 8-hour maximums for these months can provide evidence regarding the impact of such emissions. Speciated data (run every 3 or 6 days) retrieved from the Northbrook Water Plant (170314201) and the Gary-IITRI (180890022) monitors showed increased concentrations of both species in May and June 2023, consistent with the track of the smoke plume analyzed by HMS and observed increases in the ozone concentrations. K+ acts as a useful tracer of wildfire smoke because there are few anthropogenic sources, and concentrations above background levels are a signature of wildfire emissions.

Particularly in late May leading into early June 2023, the magnitudes of OC and K+ were largest at the monitor (except for July 5 observation associated with Independence Day fireworks), demonstrating influence by the wildfire smoke still present in the area. Since the K+ and OC are specific wood combustion markers, these speciated PM2.5 data provide conclusive evidence that the ozone affecting the airmass in Chicago developed in areas under the heavy influence of smoke related emissions.

Figure 98 through Figure 101 show that OC, along with K+, increased around the time of the elevated ozone readings measures during the 2023 episodes at these monitors, days in which smoke was visibly present over the location, providing further support that this was an event with a clear indicator of wildfire influence. What is also observed in these figures is the buildup of concentrations of these tracers as the Canadian wildfire smoke is persistent over the region for multiple days. In these instances, we see a gradual increase in these tracer species concentrations, the longer the plumes reside over the NAA.

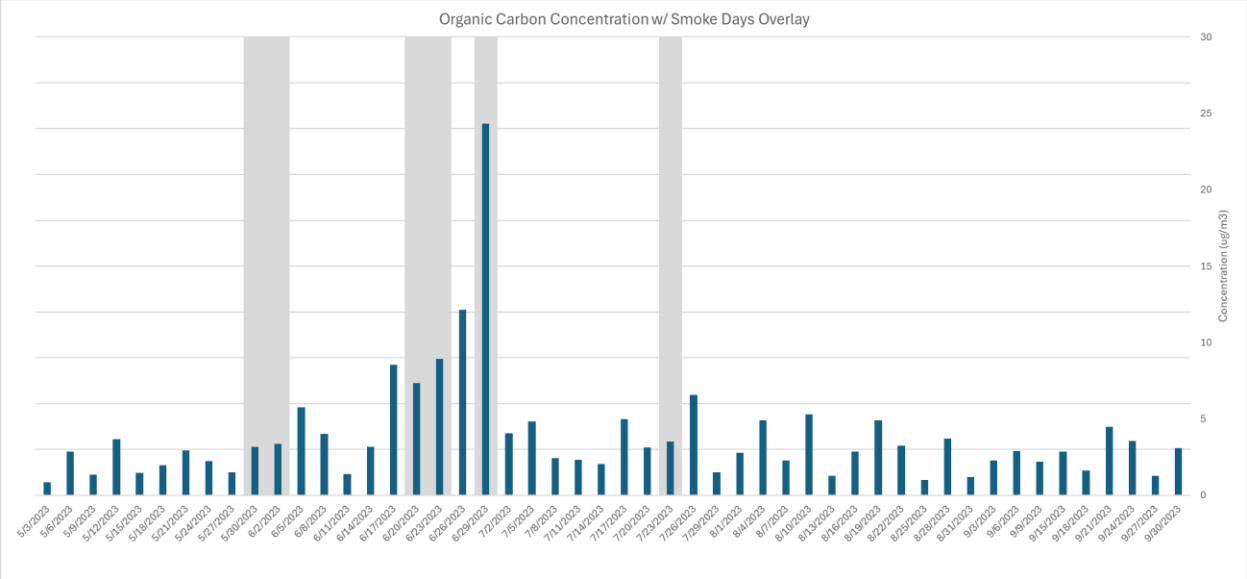


Figure 98. Organic carbon concentrations at Northbrook Water Plant (170314201) monitor; May through September 2023.

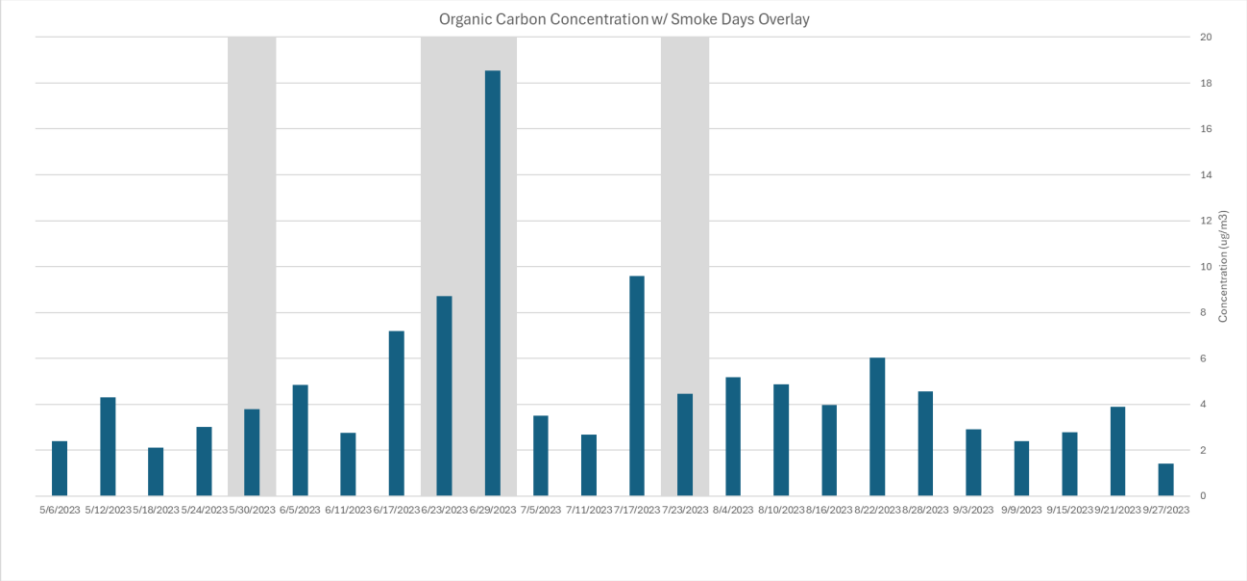


Figure 99. Organic carbon concentrations at Gary-IITRI (180890022) monitor; May through September 2023.

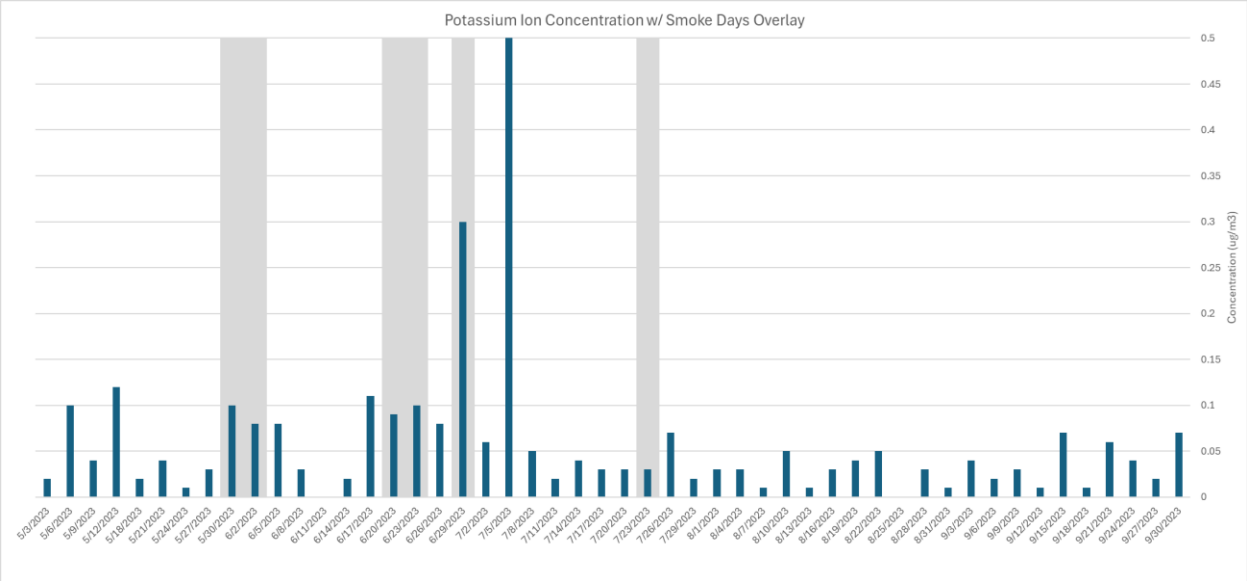


Figure 100. Potassium ion concentrations at Northbrook Water Plant (170314201) monitor; May through September 2023.

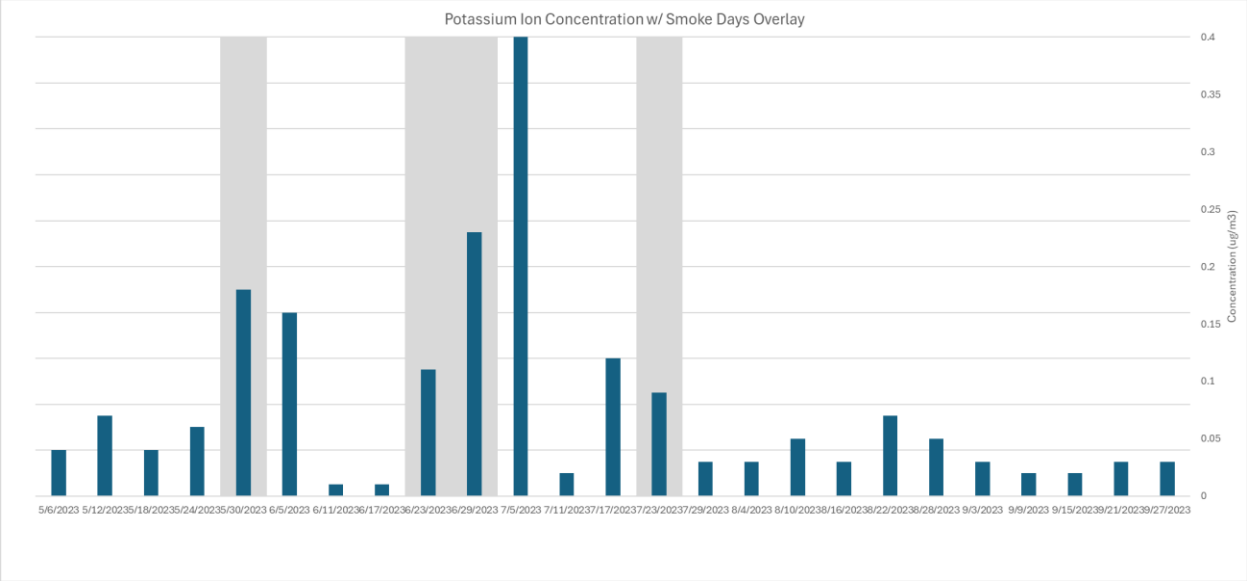


Figure 101. Potassium ion concentrations at Gary-IITRI (180890022) monitor; May through September 2023.

Evidence of Transport of Fire Emissions from the Fire to the Monitor

Visible Satellite Imagery

Visible satellite imagery from the Moderate Resolution Imaging Spectroradiometer (MODIS) Aqua and Terra satellites plainly shows transport of smoke from fires burning in Canada to the midwestern United States, including Chicago, between May and August 2023, when ozone concentrations were at their highest. In the example episodes below, June 26-28, July 23-25, and August 1-3, 2023, the movement of a dense smoke plume south and southeast from Canada is particularly noteworthy as these plumes eventually make their way across the international border and into the Lake Michigan region, enhancing ozone concentrations along its path.

The associated smoke text products[14] produced by NOAA for June 28, July 25, and August 3, 2023, and represented in Figure 103, Figure 107, and Figure 110 note the following:

June 28, 2023

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 1550Z June 28, 2023

SMOKE:

Canada, Eastern and Central United States, Atlantic Ocean… The major wildfires across portions of Canada continue with a large area of smoke over much of Canada and extending to the south over the Central and Southeastern United States. The smoke also extended well off the east coasts of Canada and the United States over the northern and central Atlantic to western portions of Europe. To the west, some of the thinner density smoke had spread to the west and south to just off the southwestern coast of Canada and the Pacific Northwest United States and into the far northeastern Pacific Ocean. Within this area, the thickest smoke was located from western Quebec through southern Ontario and into portions of the Midwestern and Upper Midwest of the United States and also over northern Alberta, the southern Northwest Territories and northern British Columbia."

July 25, 2023

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 1600Z July 25, 2023

SMOKE:

Canada/United States/Atlantic Ocean/Northern Mexico/Pacific Ocean off the U.S. West Coast and south Mexico/Northern Gulf of Mexico… The enormous area of smoke primarily from the Canadian wildfires continues to be seen covering virtually all of Canada and most of the U.S. including most of Alaska, along with the northern half of Mexico and the northeastern Pacific off southern Alaska and southwest coast of Canada. Within this larger area of thin density smoke were batches of moderate to thick density smoke.

[14] https://www.ospo.noaa.gov/products/land/smoke/

The thick to very thick smoke that covered much of northern Canada within the Northwestern Territories and extending southeast through central Canada and into the Midwestern states and Great Lakes region was associated from numerous wildfires in western and northwestern Canada. The moderate smoke from these fires extended from Alaska and Pacific Ocean off of the southern Alaskan coast, through central Canada, and moving to the southeast/east where it eventually settled into eastern Canada, where fires in Quebec were previously seen producing localized moderate to thick smoke, but cloud cover precluded today's analysis in the region. This smoke also extended well over the northwestern and north central U.S., covering much of Mid-west, Mississippi valley region and northeastern U.S.

August 3, 2023

DESCRIPTIVE TEXT NARRATIVE FOR SMOKE/DUST OBSERVED IN SATELLITE IMAGERY THROUGH 0145Z August 3, 2023

SMOKE:

Northern and Eastern U.S./Canada/Atlantic Ocean... The very large area of light density smoke continued to be seen across southern/central Alaska, most of Canada except for far northeast sections, the central and eastern US, and portions of the western Atlantic. The medium to high density smoke is seen from the western sections of the Yukon Territory through northwest Territory, Nunavut, northern British Columbia, northern/central Alberta and Saskatchewan, most of Manitoba and Ontario, and into western sections of Quebec. Then, the highest density smoke extends south through the Great Lakes region, Ohio Valley and parts of the Mid-Atlantic and central/eastern sections of North Carolina and South Carolina and then into the western Atlantic.

The movement of this smoke corresponds to the expansion of elevated ozone values along the pathway of transport to Chicago, as demonstrated in following sections using ozone observations, NOAA HMS smoke products, and Ozone AQI maps.

Figure 102. MODIS Terra true color satellite imagery from June 27, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

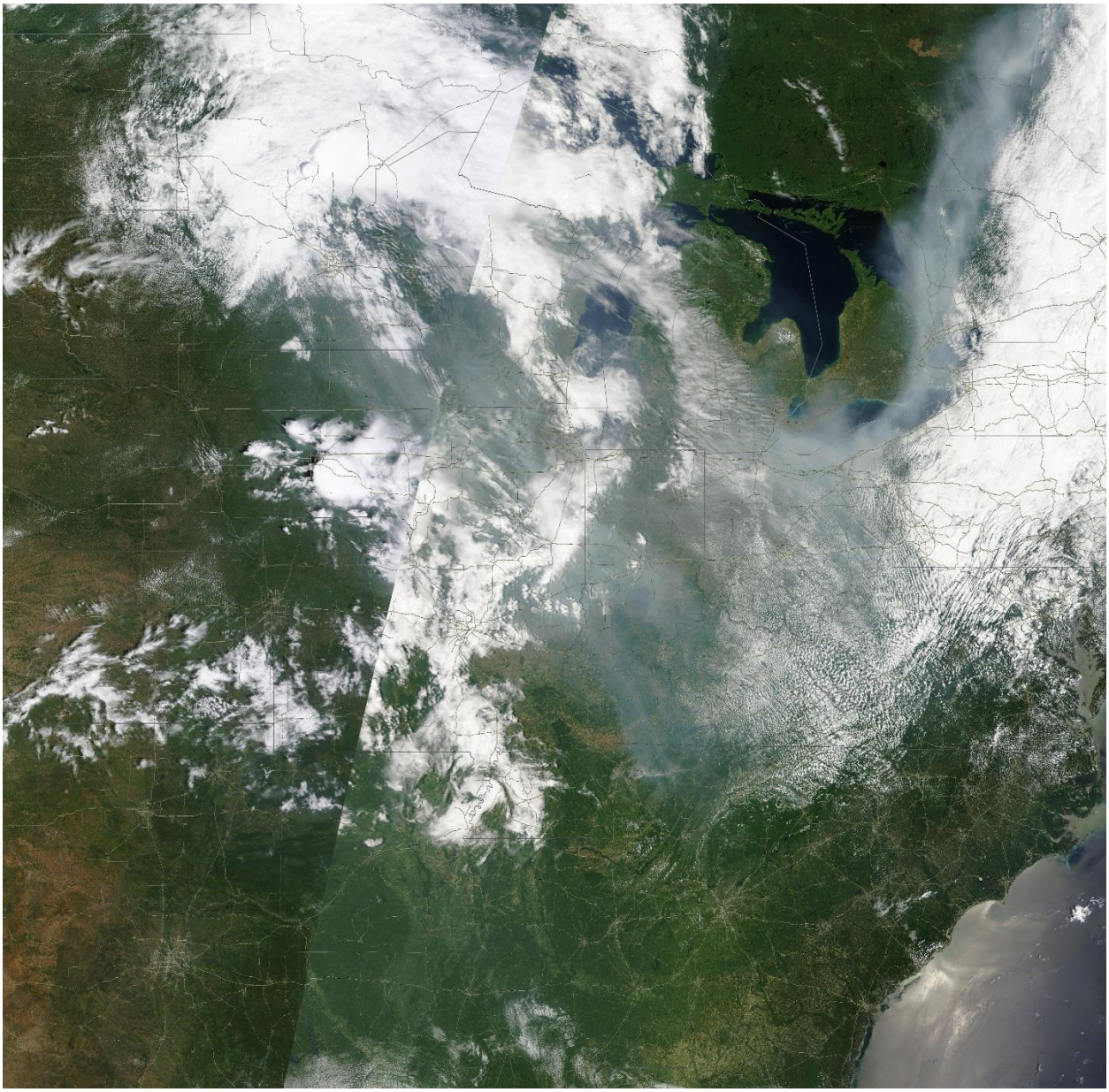


Figure 103. MODIS Terra true color satellite imagery from June 28, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

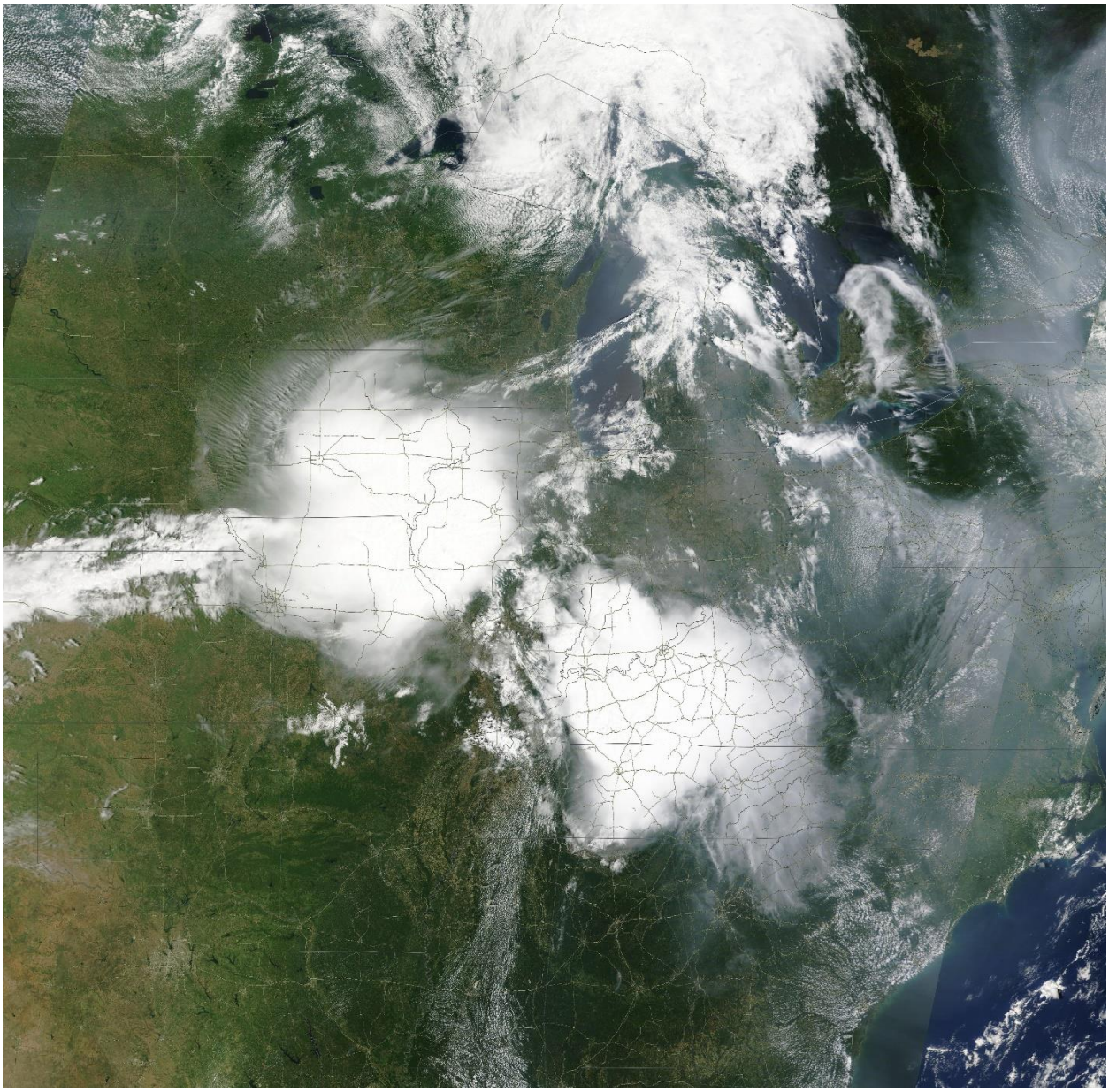


Figure 104. MODIS Terra true color satellite imagery from June 29, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

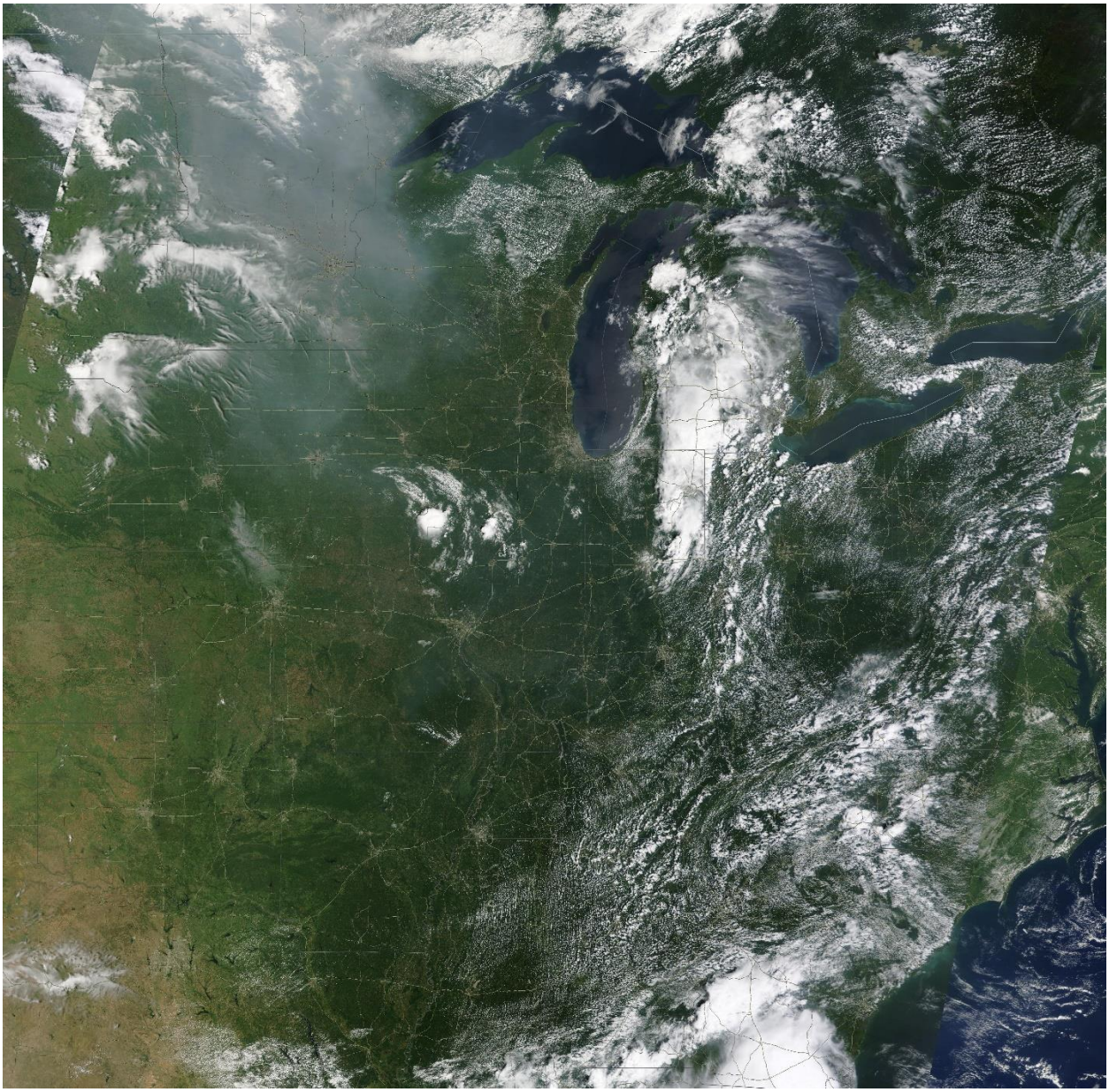


Figure 105. MODIS Terra true color satellite imagery from July 23, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

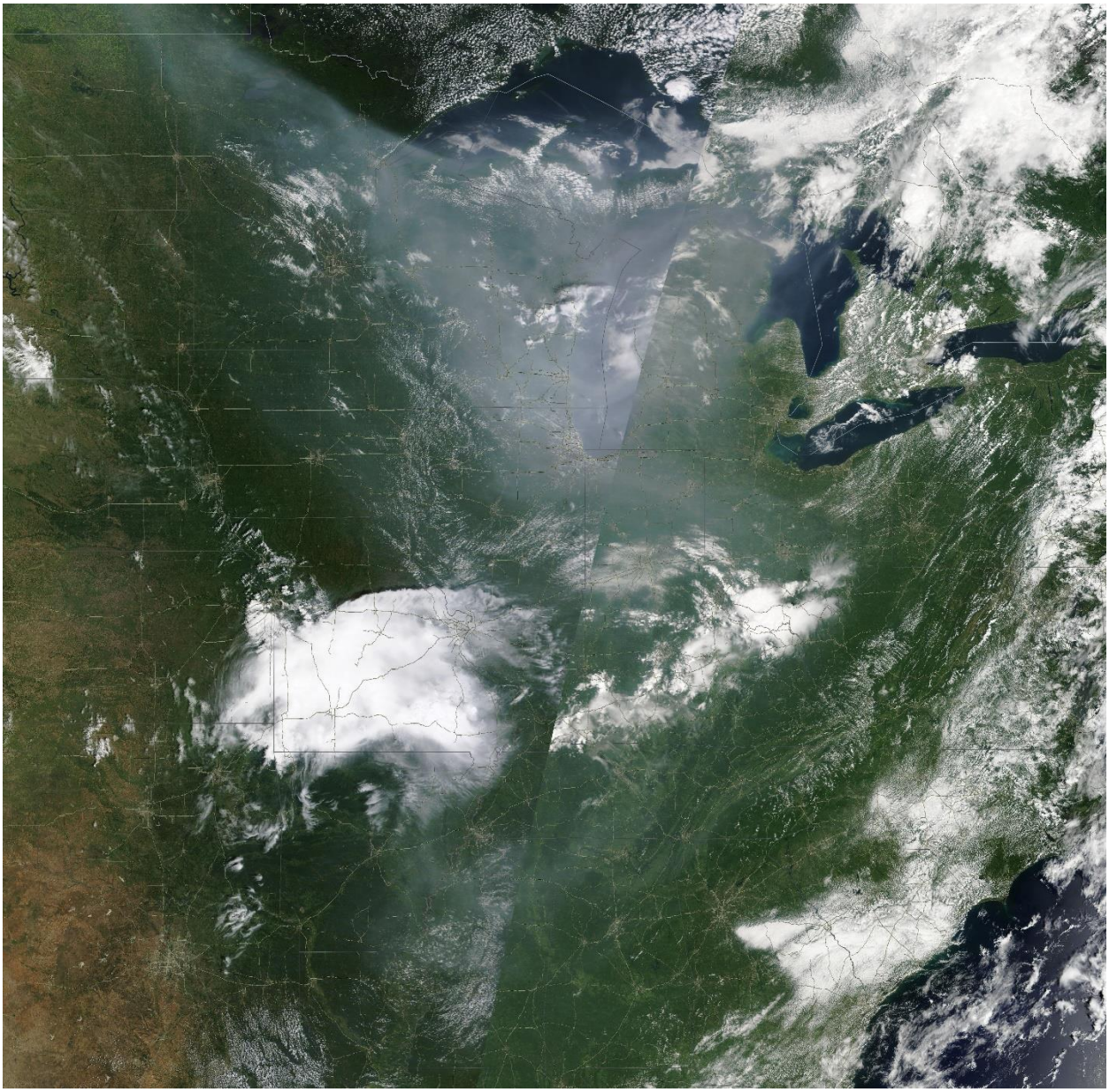


Figure 106. MODIS Terra true color satellite imagery from July 24, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

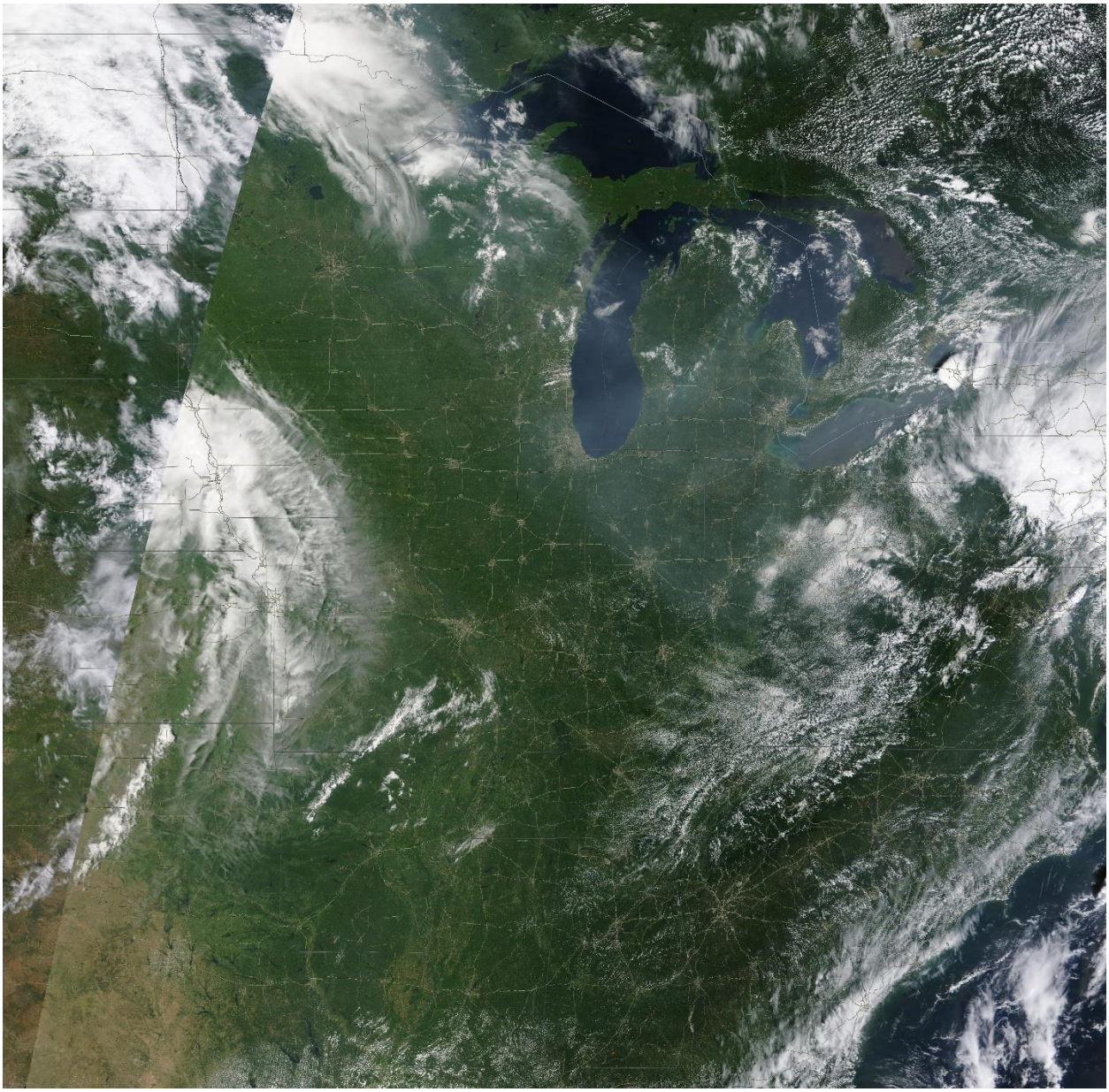


Figure 107. MODIS Terra true color satellite imagery from July 25, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

Figure 108. MODIS Terra true color satellite imagery from August 1, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

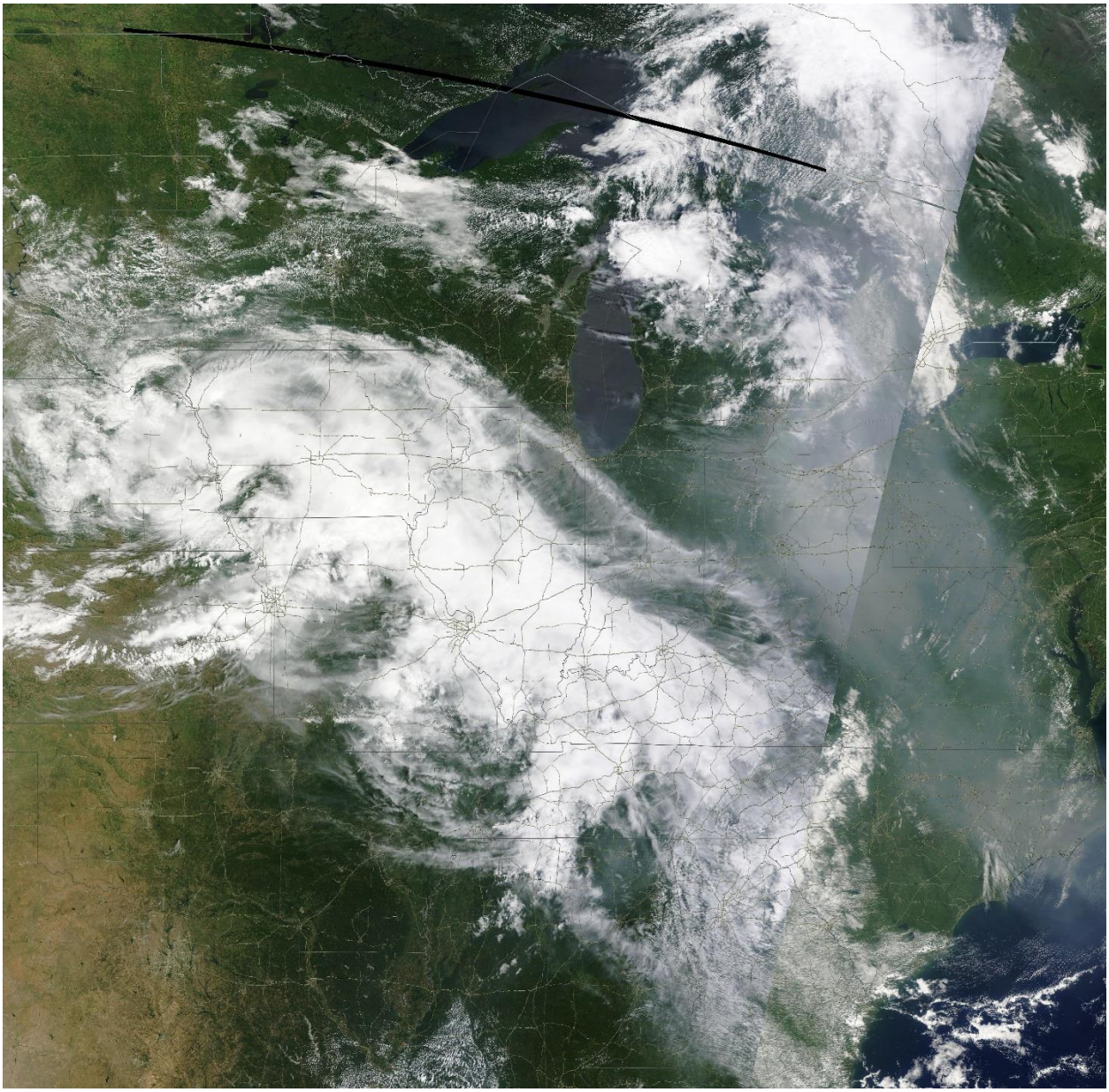


Figure 109. MODIS Terra true color satellite imagery from August 2, 2023, with smoke present over the Lake Michigan and Chicago region. Image source: NASA Worldview.

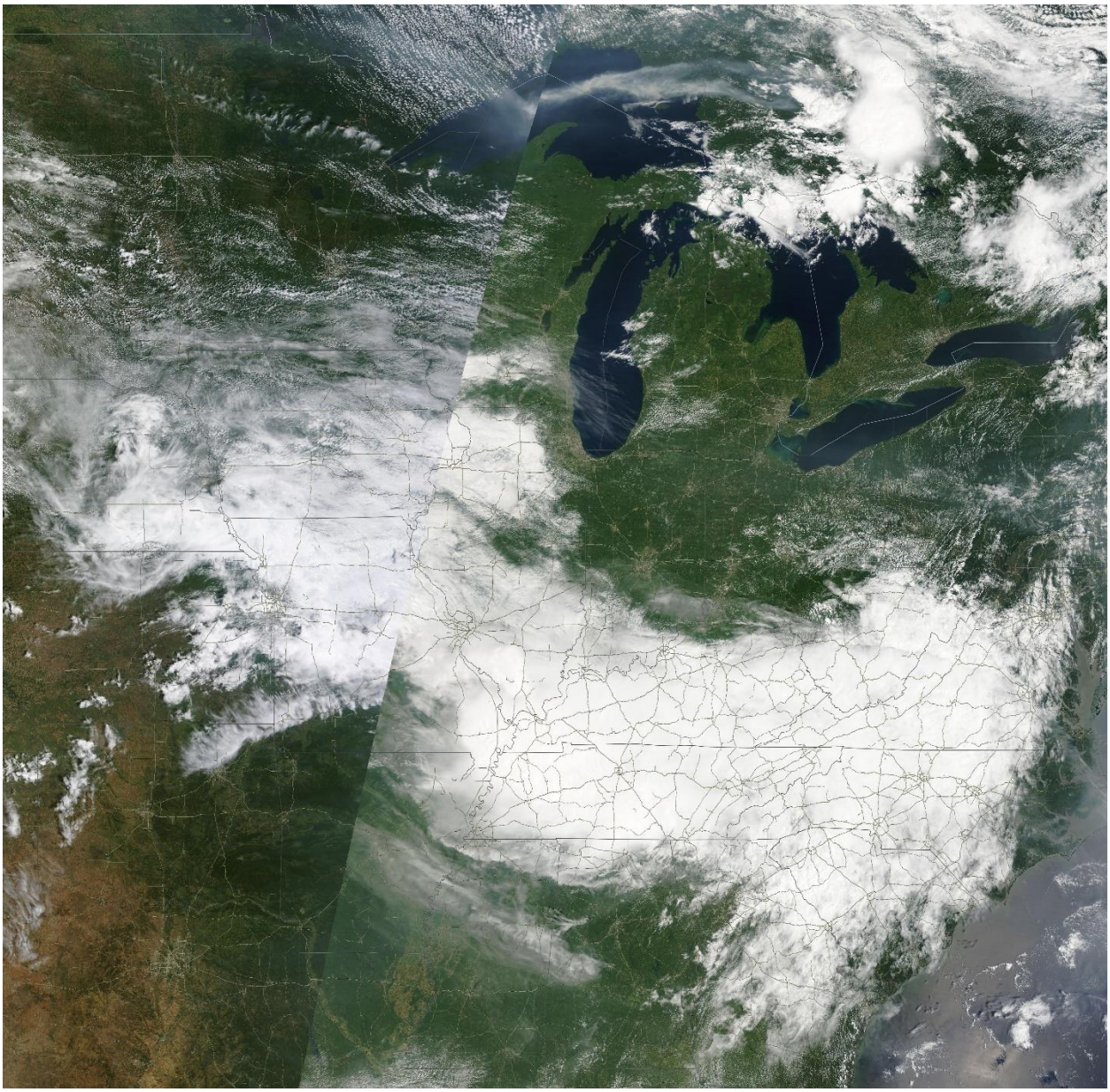


Figure 110. MODIS Terra true color satellite imagery from August 3, 2023, with smoke lingering over the Lake Michigan and Chicago region. Image source: NASA Worldview.

HMS Smoke Plume Data and Ozone AQI Maps

Based on the considerable collective size of the Canadian wildfire complexes, significant amounts of ozone and PM2.5 precursors were emitted in addition to other smoke components. As early as May 10, 2023, plumes from the Canadian wildfires began dispersing into the Chicago region. Through all of June and into early July, with additional episodes in late July and early August, wildfire smoke was prevalent in the Midwestern U.S. and enhanced ozone concentrations in the Lake Michigan region.

Figure 111 shows the progression of the smoke plumes over the Midwest during the example episode of June 27, 28, and 29, 2023, as analyzed by the HMS staff at NOAA, using satellite images and Ozone AQI. This series of maps shows the movement of the Canadian smoke plumes as a first plume tracks west and then south toward the Mississippi Valley eventually finding its way over Chicago during the episode.

Similar patterns are seen in Figure 112 and Figure 113, which represent the July 23-25, 2023, and August 1-3, 2023, episodes, respectively. As shown in these figures, wildfire smoke had an Ozone AQI impact on monitors in Chicago and the surrounding area during these episodes. Additionally, the Ozone AQI tracks well with the movement of the densest portion of the smoke plume with highest values coinciding with thickest smoke.

Figure 111, Figure 112, and Figure 113 corroborate the evidence of smoke over Chicago demonstrated by the visual satellite images (Figure 102 through Figure 110) that enhanced the ozone concentrations during these episodes.

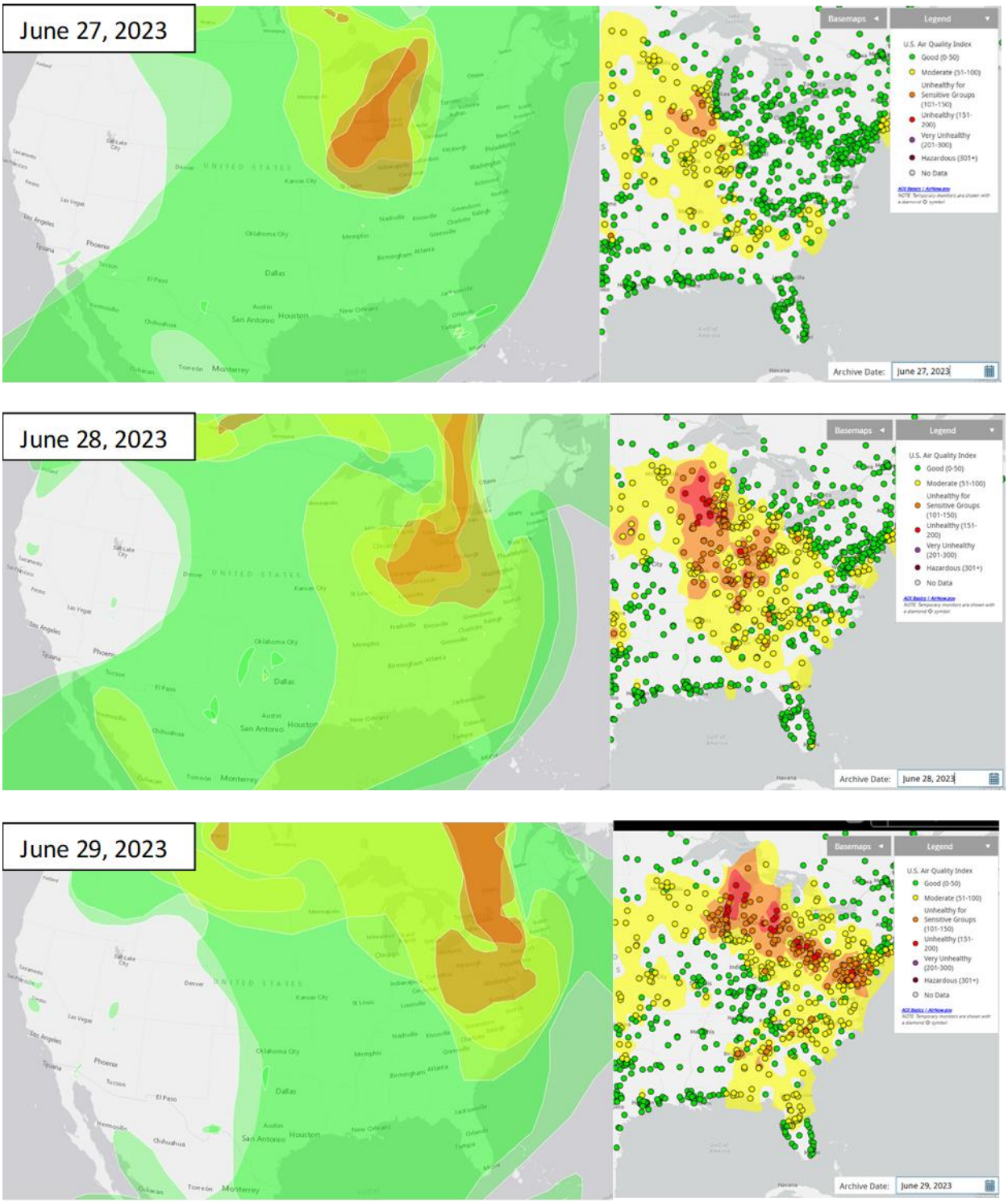


Figure 111. HMS Smoke Analysis (left) and Ozone AQI Maps (right) from June 27-29, 2023.

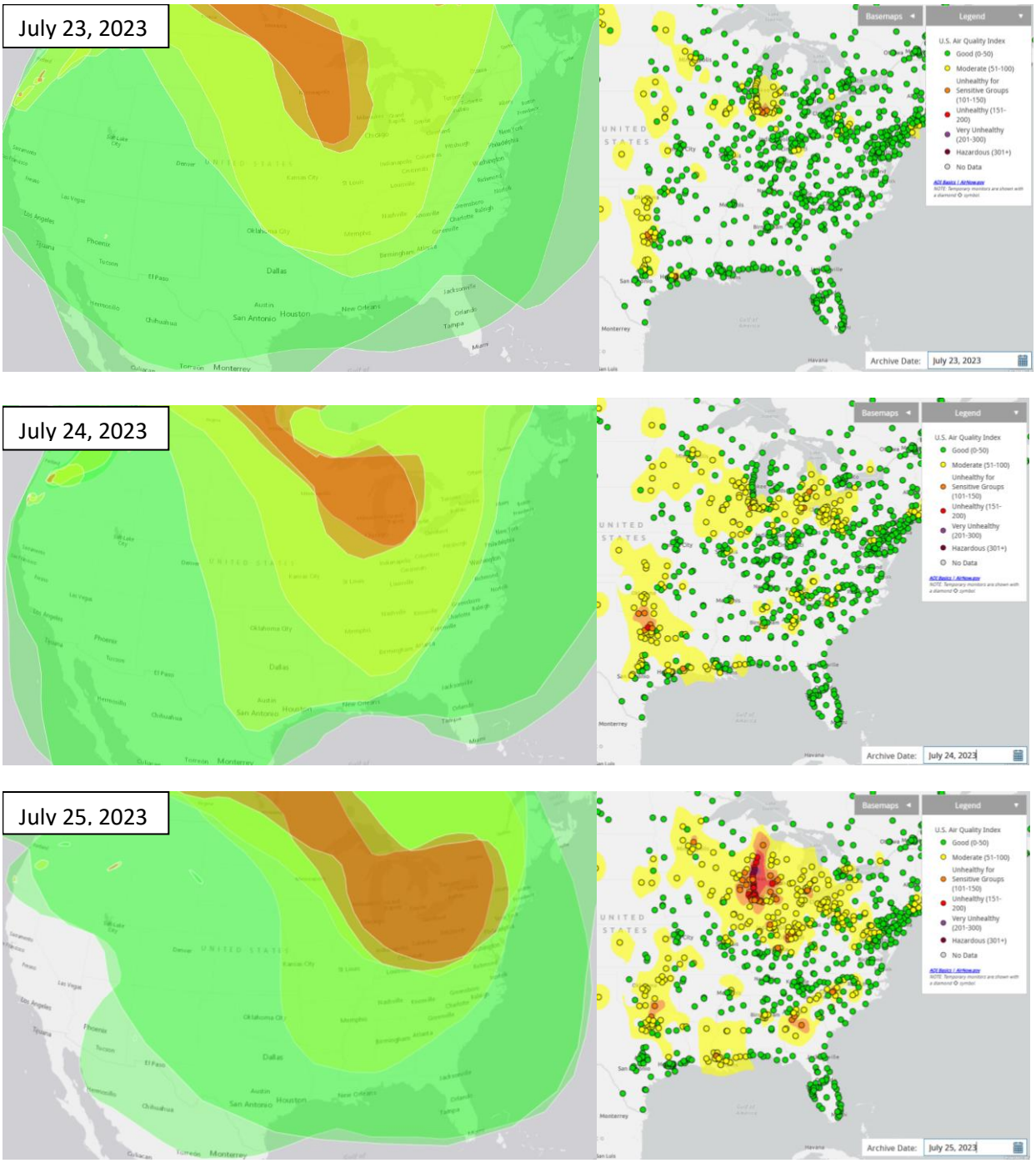


Figure 112. HMS Smoke Analysis (left) and Ozone AQI Maps (right) from July 23-25, 2023.

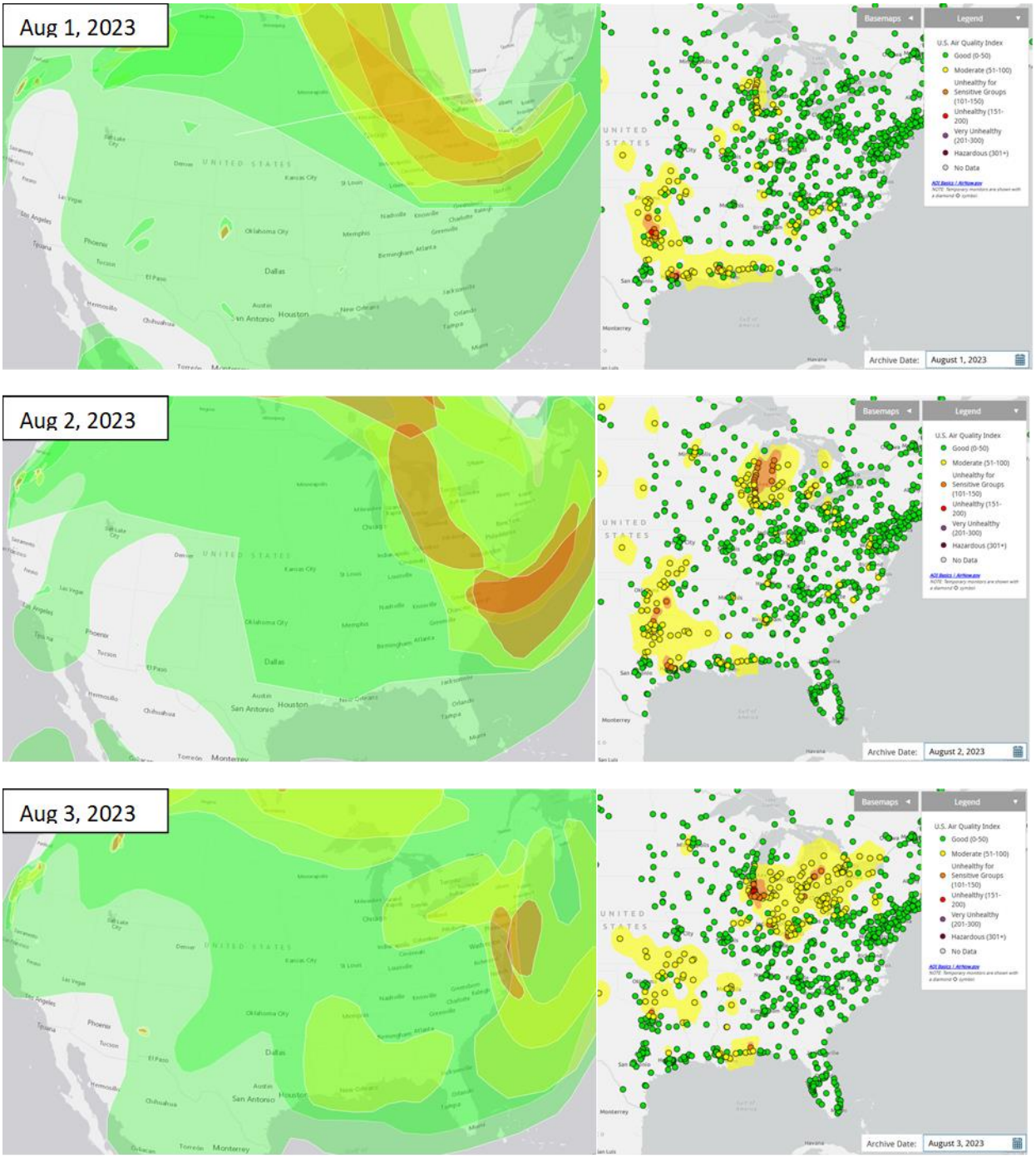


Figure 113. HMS Smoke Analysis (left) and Ozone AQI Maps (right) from August 1-3, 2023.

Additional ozone AQI and HMS smoke plume plots for the summer of 2023 can be found in Appendix A.

Regional Supporting Measurements

Additionally, the comparison of the HMS smoke plumes with MDA8 ozone concentrations shows that ozone concentrations increased at monitors along the paths of the smoke plumes between Canada, the northern and Midwestern states, and across all of Lake Michigan. This impact is even clearer based on examination of the highest ozone concentrations at other Illinois, Indiana, and Wisconsin sites. Ozone concentrations on most of the noted episode dates and as found in non-Chicago CBSA monitors in Illinois are presented in Table 3, were associated with the ten highest annual concentrations at other regional monitors. This is also seen in Table 4 at Indiana locations, and in Table 5 at non-Chicago CBSA Wisconsin monitors. While some of these sites may not have exceeded the level of the ozone NAAQS during this period, it is clearly seen that during the episode of the smoke transport, these sites had unusually high MDA8 ozone concentrations.

In fact, across all the monitors in the region and across all the top ten days at each of those monitors in Illinois, Indiana, and Wisconsin, only a handful of monitor-days observed did not occur within the Canadian wildfire extended episode in the summer of 2023.

Table 3. Observed Top Ten MDA8 Ozone Concentrations (ppb) at non-Chicago CBSA Monitors in Illinois enhanced by the Canadian Wildfire Smoke during the 2023 Canadian wildfire episodes (HMS smoke days highlighted in orange).

State	County	Monitor ID	1st Max Value	1st Max Date	2nd Max Value	2nd Max Date	3rd Max Value	3rd Max Date	4th Max Value	4th Max Date	5th Max Value	5th Max Date	6th Max Value	6th Max Date	7th Max Value	7th Max Date	8th Max Value	8th Max Date	9th Max Value	9th Max Date	10th Max Value	10th Max Date
Illinois	Adams	170010007	81	6/3/2023	80	6/6/2023	77	6/20/2023	76	5/30/2023	76	6/23/2023	75	6/19/2023	74	5/29/2023	73	6/15/2023	72	6/14/2023	72	6/28/2023
Illinois	Champaign	170190007	78	5/24/2023	76	6/3/2023	75	6/2/2023	75	6/28/2023	74	6/24/2023	72	6/10/2023	68	5/23/2023	68	6/6/2023	67	5/22/2023	67	6/15/2023
Illinois	Champaign	170191001	81	5/24/2023	79	6/3/2023	78	6/24/2023	77	6/2/2023	77	6/10/2023	75	6/6/2023	72	5/23/2023	72	5/29/2023	72	6/15/2023	70	6/20/2023
Illinois	Clark	170230001	81	6/2/2023	78	5/24/2023	76	6/6/2023	75	6/3/2023	71	6/24/2023	69	6/10/2023	68	6/4/2023	68	6/15/2023	66	5/23/2023	65	5/29/2023
Illinois	Effingham	170491001	82	6/6/2023	81	6/28/2023	79	6/10/2023	78	5/30/2023	77	6/24/2023	76	6/2/2023	76	6/3/2023	73	6/15/2023	71	6/5/2023	71	6/17/2023
Illinois	Hamilton	170650002	81	6/6/2023	77	6/3/2023	75	6/10/2023	74	5/24/2023	74	6/15/2023	73	5/30/2023	72	6/2/2023	72	6/30/2023	71	6/14/2023	69	6/17/2023
Illinois	Jersey	170830117	84	5/31/2023	84	6/3/2023	83	6/10/2023	82	5/24/2023	78	5/30/2023	76	5/29/2023	76	6/6/2023	76	6/20/2023	75	6/2/2023	73	6/17/2023
Illinois	Jo Daviess	170859991	87	6/28/2023	79	6/19/2023	77	6/3/2023	76	5/31/2023	76	6/20/2023	74	5/30/2023	73	6/24/2023	72	5/22/2023	71	5/29/2023	70	5/11/2023
Illinois	McLean	171132003	81	5/24/2023	80	6/2/2023	78	6/3/2023	77	6/10/2023	76	6/28/2023	75	6/24/2023	74	6/20/2023	73	5/23/2023	73	6/6/2023	71	5/30/2023
Illinois	Macon	171150013	82	6/3/2023	81	6/28/2023	79	5/24/2023	79	6/2/2023	79	6/6/2023	79	6/10/2023	77	6/24/2023	75	5/30/2023	74	5/31/2023	72	5/23/2023
Illinois	Macoupin	171170002	79	5/24/2023	79	6/3/2023	76	6/6/2023	75	6/2/2023	75	6/28/2023	74	6/10/2023	74	6/23/2023	73	5/29/2023	73	6/20/2023	71	5/31/2023
Illinois	Madison	171190120	82	6/3/2023	80	5/24/2023	79	6/6/2023	78	6/10/2023	76	5/30/2023	75	5/29/2023	74	5/31/2023	74	6/17/2023	74	6/20/2023	73	6/2/2023
Illinois	Madison	171190122	86	6/6/2023	83	6/3/2023	81	5/24/2023	78	6/10/2023	78	6/15/2023	76	5/30/2023	75	5/29/2023	75	6/2/2023	75	6/17/2023	75	6/20/2023
Illinois	Madison	171193007	81	6/3/2023	81	6/6/2023	78	6/10/2023	77	5/24/2023	74	5/29/2023	74	5/30/2023	74	6/14/2023	74	6/15/2023	74	6/20/2023	73	6/2/2023
Illinois	Peoria	171430024	86	5/24/2023	83	6/3/2023	80	6/2/2023	80	6/20/2023	80	6/22/2023	79	6/6/2023	78	6/24/2023	78	6/28/2023	77	6/10/2023	76	5/29/2023
Illinois	Peoria	171431001	86	5/24/2023	82	6/3/2023	81	6/28/2023	80	6/2/2023	80	6/22/2023	80	6/24/2023	79	6/6/2023	79	6/10/2023	79	6/20/2023	77	5/30/2023
Illinois	Randolph	171570001	88	6/6/2023	87	6/3/2023	82	6/10/2023	80	6/15/2023	79	6/14/2023	77	5/24/2023	76	5/29/2023	75	6/9/2023	74	6/17/2023	73	5/30/2023
Illinois	Rock Island	171613002	84	6/19/2023	83	6/3/2023	83	6/20/2023	79	5/29/2023	79	6/23/2023	78	6/28/2023	77	5/30/2023	77	6/4/2023	77	6/27/2023	76	6/10/2023
Illinois	Saint Clair	171630010	93	6/6/2023	84	6/3/2023	77	5/24/2023	77	6/10/2023	77	6/14/2023	76	5/29/2023	76	5/30/2023	76	6/15/2023	75	6/30/2023	74	6/9/2023
Illinois	Sangamon	171670014	81	6/3/2023	80	5/24/2023	79	6/10/2023	77	6/2/2023	77	6/28/2023	75	5/30/2023	75	6/6/2023	75	6/23/2023	74	6/20/2023	74	6/24/2023
Illinois	Winnebago	172012001	86	6/28/2023	80	5/30/2023	80	6/2/2023	80	6/19/2023	79	6/29/2023	76	6/3/2023	76	6/27/2023	75	6/24/2023	74	5/23/2023	73	6/18/2023

Table 4. Observed Top Ten MDA8 Ozone Concentrations (ppb) at non-Chicago CBSA Monitors in Indiana enhanced by the Canadian Wildfire Smoke during the 2023 Canadian wildfire episodes (HMS smoke days highlighted in orange).

State	County	Monitor ID	1st Max Value	1st Max Date	2nd Max Value	2nd Max Date	3rd Max Value	3rd Max Date	4th Max Value	4th Max Date	5th Max Value	5th Max Date	6th Max Value	6th Max Date	7th Max Value	7th Max Date	8th Max Value	8th Max Date	9th Max Value	9th Max Date	10th Max Value	10th Max Date
Indiana	Allen	180030002	79	6/2/2023	77	6/18/2023	77	6/29/2023	75	6/19/2023	72	6/28/2023	70	5/24/2023	70	8/3/2023	69	6/30/2023	69	7/24/2023	69	7/25/2023
Indiana	Allen	180030015	53	10/24/2023	44	11/4/2023	43	11/16/2023	41	11/3/2023	38	10/26/2023	38	11/6/2023	37	10/25/2023	37	11/5/2023	35	11/15/2023	35	11/24/2023
Indiana	Bartholomew	180050007	84	6/28/2023	77	6/6/2023	76	5/24/2023	76	6/2/2023	74	6/24/2023	71	6/3/2023	68	6/10/2023	66	8/4/2023	65	5/23/2023	63	4/12/2023
Indiana	Boone	180110001	99	6/28/2023	79	7/25/2023	78	6/2/2023	76	5/24/2023	76	6/3/2023	76	6/6/2023	74	5/22/2023	72	5/23/2023	72	6/18/2023	70	6/5/2023
Indiana	Brown	180130001	78	5/24/2023	74	6/2/2023	67	6/3/2023	66	6/6/2023	66	6/24/2023	64	5/23/2023	61	4/12/2023	61	4/20/2023	61	5/22/2023	61	5/29/2023
Indiana	Carroll	180150002	77	6/2/2023	76	6/3/2023	75	5/24/2023	74	6/18/2023	71	5/23/2023	70	5/22/2023	69	6/28/2023	68	6/5/2023	68	8/4/2023	66	5/29/2023
Indiana	Clark	180190008	82	6/28/2023	74	6/2/2023	74	8/23/2023	72	7/25/2023	71	6/3/2023	69	6/6/2023	68	6/10/2023	68	6/15/2023	68	6/24/2023	68	8/4/2023
Indiana	Delaware	180350010	73	6/2/2023	73	6/18/2023	73	6/28/2023	71	6/10/2023	70	5/24/2023	68	6/3/2023	67	5/23/2023	66	6/5/2023	65	5/22/2023	65	6/29/2023
Indiana	Elkhart	180390007	74	6/2/2023	74	6/18/2023	74	7/25/2023	71	6/19/2023	69	6/10/2023	69	6/29/2023	68	5/23/2023	68	6/20/2023	67	4/14/2023	67	5/29/2023
Indiana	Floyd	180430008	96	6/28/2023	76	6/2/2023	73	6/3/2023	71	8/4/2023	70	6/6/2023	69	4/20/2023	69	6/24/2023	67	8/23/2023	66	6/4/2023	66	6/10/2023
Indiana	Greene	180550001	84	6/6/2023	79	5/24/2023	79	6/2/2023	77	6/24/2023	74	6/3/2023	74	6/15/2023	73	6/4/2023	71	6/10/2023	68	6/5/2023	66	5/23/2023
Indiana	Hamilton	180570006	77	6/28/2023	75	5/24/2023	74	6/2/2023	72	6/3/2023	72	6/18/2023	70	6/10/2023	67	5/22/2023	67	5/23/2023	67	6/5/2023	66	7/19/2023
Indiana	Hendricks	180630004	76	8/3/2023	72	6/2/2023	72	6/28/2023	71	5/24/2023	69	5/22/2023	69	6/6/2023	68	6/3/2023	67	8/21/2023	66	5/23/2023	66	6/5/2023
Indiana	Howard	180670004	78	6/2/2023	77	6/28/2023	76	8/4/2023	74	5/24/2023	74	6/18/2023	73	6/3/2023	70	6/5/2023	69	5/22/2023	68	5/23/2023	66	6/10/2023
Indiana	Knox	180839991	78	6/6/2023	77	5/24/2023	76	6/2/2023	75	6/10/2023	75	6/24/2023	73	6/15/2023	72	6/28/2023	71	6/3/2023	70	6/4/2023	65	5/31/2023
Indiana	LaPorte	180910005	80	8/3/2023	79	6/10/2023	77	6/18/2023	77	6/19/2023	76	4/14/2023	76	6/21/2023	73	6/2/2023	73	7/4/2023	72	6/23/2023	72	7/23/2023
Indiana	LaPorte	180910010	80	6/2/2023	74	6/18/2023	73	6/19/2023	70	5/23/2023	70	5/29/2023	70	8/3/2023	69	6/21/2023	68	6/20/2023	67	6/10/2023	66	6/3/2023
Indiana	Madison	180950011	76	6/2/2023	75	6/10/2023	74	5/24/2023	73	6/28/2023	71	6/3/2023	70	6/5/2023	70	6/18/2023	69	5/23/2023	68	5/22/2023	67	7/14/2023
Indiana	Marion	180970050	84	6/28/2023	77	6/2/2023	76	5/24/2023	72	6/18/2023	72	8/4/2023	69	6/6/2023	68	6/3/2023	68	6/10/2023	68	6/15/2023	68	7/7/2023
Indiana	Marion	180970057	86	8/4/2023	84	6/28/2023	77	6/2/2023	73	5/24/2023	73	8/3/2023	72	7/25/2023	70	6/3/2023	70	6/6/2023	68	5/22/2023	67	5/23/2023
Indiana	Marion	180970078	89	6/28/2023	84	8/4/2023	79	6/2/2023	77	5/24/2023	74	6/6/2023	73	6/3/2023	72	6/18/2023	72	7/25/2023	70	5/22/2023	69	5/23/2023
Indiana	Marion	180970087	86	6/28/2023	74	8/4/2023	72	7/25/2023	71	6/18/2023	63	5/22/2023	63	6/10/2023	62	6/21/2023	61	5/11/2023	60	6/2/2023	58	4/19/2023
Indiana	Perry	181230009	74	6/24/2023	71	6/6/2023	68	6/10/2023	67	5/24/2023	66	6/15/2023	64	6/3/2023	64	6/9/2023	63	6/2/2023	62	4/12/2023	62	5/10/2023
Indiana	Posey	181290003	78	6/6/2023	78	6/28/2023	75	6/3/2023	74	6/10/2023	74	6/24/2023	73	5/24/2023	71	6/15/2023	70	6/14/2023	69	6/2/2023	67	4/13/2023
Indiana	St. Joseph	181410010	76	6/2/2023	71	6/18/2023	70	5/23/2023	70	6/19/2023	68	5/24/2023	68	5/29/2023	67	6/3/2023	67	6/20/2023	66	4/14/2023	66	6/21/2023
Indiana	St. Joseph	181410015	79	6/2/2023	78	6/18/2023	74	6/19/2023	73	5/23/2023	73	5/29/2023	73	6/30/2023	72	4/14/2023	71	6/10/2023	71	6/28/2023	70	6/20/2023
Indiana	St. Joseph	181410016	76	6/2/2023	75	6/18/2023	73	6/30/2023	72	6/19/2023	71	6/10/2023	70	5/29/2023	70	7/25/2023	68	6/20/2023	68	6/29/2023	66	4/14/2023
Indiana	Shelby	181450001	84	6/28/2023	74	6/2/2023	73	5/24/2023	71	6/6/2023	70	6/3/2023	70	6/18/2023	67	6/15/2023	67	7/25/2023	67	8/4/2023	66	5/22/2023
Indiana	Vanderburgh	181630013	81	6/28/2023	75	6/6/2023	73	6/24/2023	72	6/10/2023	71	6/3/2023	71	6/15/2023	69	5/24/2023	66	6/2/2023	66	6/14/2023	65	6/5/2023
Indiana	Vanderburgh	181630021	83	6/28/2023	78	6/6/2023	75	6/3/2023	75	6/10/2023	75	6/24/2023	71	5/24/2023	71	6/15/2023	69	6/2/2023	69	6/14/2023	68	6/5/2023
Indiana	Vigo	181670018	76	6/24/2023	71	6/27/2023	70	6/2/2023	70	6/15/2023	69	6/10/2023	67	6/28/2023	66	5/24/2023	66	6/20/2023	65	6/17/2023	65	6/18/2023
Indiana	Vigo	181670024	78	6/2/2023	77	5/24/2023	74	6/3/2023	72	6/24/2023	71	6/6/2023	69	5/23/2023	68	6/15/2023	68	6/27/2023	66	6/10/2023	65	6/5/2023
Indiana	Wabash	181699991	78	6/2/2023	71	5/24/2023	71	6/18/2023	70	6/5/2023	65	5/23/2023	65	5/29/2023	65	6/19/2023	64	4/13/2023	64	6/10/2023	64	6/17/2023
Indiana	Warrick	181730008	80	6/28/2023	77	6/6/2023	76	6/24/2023	74	6/10/2023	74	6/15/2023	71	6/3/2023	69	5/24/2023	69	6/14/2023	68	6/8/2023	67	6/2/2023
Indiana	Warrick	181730011	79	6/28/2023	77	6/6/2023	77	6/24/2023	72	6/10/2023	72	6/15/2023	71	6/3/2023	71	6/14/2023	69	5/24/2023	68	6/9/2023	66	6/8/2023

Table 5. Observed Top Ten MDA8 Ozone Concentrations (ppb) at non-Chicago CBSA Monitors in Wisconsin enhanced by the Canadian Wildfire Smoke during the 2023 Canadian wildfire episodes (HMS smoke days highlighted in orange).

State	County	Monitor ID	1st Max Value	1st Max Date	2nd Max Value	2nd Max Date	3rd Max Value	3rd Max Date	4th Max Value	4th Max Date	5th Max Value	5th Max Date	6th Max Value	6th Max Date	7th Max Value	7th Max Date	8th Max Value	8th Max Date	9th Max Value	9th Max Date	10th Max Value	10th Max Date
Wisconsin	Ashland	550030010	67	4/11/2023	66	5/23/2023	65	6/20/2023	63	4/12/2023	62	5/11/2023	62	5/31/2023	61	5/27/2023	61	5/28/2023	60	6/22/2023	59	5/29/2023
Wisconsin	Brown	550090026	82	6/29/2023	81	5/30/2023	76	5/23/2023	74	6/19/2023	74	6/28/2023	71	6/21/2023	69	4/14/2023	69	6/17/2023	69	10/3/2023	67	5/11/2023
Wisconsin	Columbia	550210015	89	6/28/2023	86	6/19/2023	83	6/29/2023	82	5/30/2023	79	6/2/2023	78	5/23/2023	78	6/24/2023	77	6/1/2023	76	6/18/2023	75	5/31/2023
Wisconsin	Dane	550250041	98	6/28/2023	85	6/29/2023	84	6/19/2023	81	5/30/2023	80	6/18/2023	79	6/2/2023	79	6/27/2023	78	6/3/2023	78	6/5/2023	77	5/23/2023
Wisconsin	Dodge	550270001	82	5/30/2023	82	6/19/2023	81	6/29/2023	78	4/28/2023	78	5/23/2023	76	6/1/2023	75	6/24/2023	74	6/2/2023	73	5/29/2023	73	6/18/2023
Wisconsin	Door	550290004	89	6/29/2023	78	5/30/2023	74	6/2/2023	73	4/14/2023	73	7/25/2023	71	4/15/2023	71	5/11/2023	70	5/12/2023	70	5/23/2023	70	5/29/2023
Wisconsin	Eau Claire	550350014	80	6/28/2023	76	6/22/2023	75	6/20/2023	74	5/23/2023	74	6/21/2023	74	6/23/2023	72	6/24/2023	71	4/12/2023	69	5/29/2023	69	5/30/2023
Wisconsin	Fond du Lac	550390006	77	5/30/2023	73	6/29/2023	71	5/23/2023	71	6/19/2023	68	6/5/2023	67	6/23/2023	67	6/28/2023	65	5/11/2023	65	5/29/2023	65	6/24/2023
Wisconsin	Forest	550410007	76	5/30/2023	74	6/19/2023	73	5/31/2023	72	5/12/2023	68	6/21/2023	67	5/11/2023	67	6/18/2023	65	5/22/2023	65	5/29/2023	65	6/24/2023
Wisconsin	Jefferson	550550009	82	6/19/2023	81	6/28/2023	79	5/30/2023	79	6/2/2023	78	6/18/2023	78	6/29/2023	76	6/24/2023	75	5/23/2023	72	5/11/2023	72	5/29/2023
Wisconsin	Kewaunee	550610002	98	7/25/2023	94	6/29/2023	79	6/2/2023	75	5/30/2023	74	8/2/2023	73	6/19/2023	72	5/29/2023	71	6/1/2023	69	5/11/2023	69	6/22/2023
Wisconsin	La Crosse	550630012	88	6/28/2023	78	6/20/2023	77	5/30/2023	76	6/4/2023	73	6/22/2023	72	6/5/2023	71	6/24/2023	70	6/23/2023	69	5/29/2023	69	6/3/2023
Wisconsin	Manitowoc	550710007	96	7/25/2023	80	6/29/2023	77	8/2/2023	69	7/4/2023	67	6/19/2023	66	4/14/2023	66	5/11/2023	66	5/30/2023	66	6/1/2023	66	6/24/2023
Wisconsin	Marathon	550730012	92	6/28/2023	79	5/30/2023	79	6/19/2023	75	6/5/2023	74	5/31/2023	73	6/4/2023	72	5/11/2023	71	6/18/2023	71	6/21/2023	70	5/28/2023
Wisconsin	Milwaukee	550790010	85	7/25/2023	73	6/29/2023	69	6/28/2023	68	6/19/2023	65	4/14/2023	65	6/21/2023	64	6/18/2023	62	6/2/2023	62	6/10/2023	61	5/30/2023
Wisconsin	Milwaukee	550790068	97	7/25/2023	82	6/29/2023	78	6/19/2023	76	6/28/2023	73	6/2/2023	73	6/21/2023	72	6/1/2023	71	4/14/2023	71	5/11/2023	71	5/12/2023
Wisconsin	Milwaukee	550790085	104	7/25/2023	90	6/29/2023	77	6/19/2023	76	6/1/2023	74	8/2/2023	73	4/14/2023	73	5/30/2023	72	5/11/2023	72	6/2/2023	72	6/21/2023
Wisconsin	Outagamie	550870009	81	5/30/2023	81	6/19/2023	77	5/23/2023	72	6/2/2023	72	6/28/2023	71	6/17/2023	71	6/23/2023	70	4/14/2023	70	5/11/2023	69	5/29/2023
Wisconsin	Ozaukee	550890008	107	7/25/2023	97	6/29/2023	78	6/19/2023	77	6/1/2023	75	5/11/2023	74	8/2/2023	73	4/14/2023	73	5/30/2023	73	6/21/2023	73	6/24/2023
Wisconsin	Ozaukee	550890009	106	7/25/2023	97	6/29/2023	81	8/2/2023	77	6/1/2023	75	6/24/2023	75	7/4/2023	74	6/19/2023	73	4/14/2023	73	5/11/2023	72	5/30/2023
Wisconsin	Racine	551010020	105	7/25/2023	86	6/29/2023	77	6/28/2023	76	4/14/2023	76	6/2/2023	76	6/10/2023	76	6/19/2023	75	6/1/2023	75	6/21/2023	75	8/2/2023
Wisconsin	Rock	551050030	96	6/28/2023	86	5/30/2023	84	6/2/2023	84	6/19/2023	81	6/27/2023	80	6/3/2023	80	6/18/2023	80	6/29/2023	79	6/24/2023	78	6/1/2023
Wisconsin	Sauk	551110007	99	6/28/2023	86	6/19/2023	79	5/30/2023	76	6/2/2023	76	6/20/2023	74	5/31/2023	74	6/21/2023	74	6/24/2023	73	6/23/2023	72	5/11/2023
Wisconsin	Sheboygan	551170006	112	7/25/2023	98	6/29/2023	84	8/2/2023	82	7/4/2023	81	6/24/2023	78	4/14/2023	78	6/1/2023	76	6/2/2023	75	5/31/2023	74	6/19/2023
Wisconsin	Sheboygan	551170009	94	7/25/2023	90	6/29/2023	74	5/30/2023	74	6/19/2023	73	10/3/2023	72	6/1/2023	70	4/14/2023	70	6/28/2023	69	5/11/2023	69	6/5/2023
Wisconsin	Taylor	551199991	82	6/28/2023	73	5/23/2023	73	6/20/2023	72	6/23/2023	71	6/22/2023	70	6/21/2023	69	5/30/2023	68	5/28/2023	68	5/31/2023	66	6/18/2023
Wisconsin	Vilas	551250001	76	5/30/2023	74	5/23/2023	73	5/31/2023	73	6/18/2023	73	6/21/2023	71	6/22/2023	69	5/29/2023	69	6/20/2023	68	5/22/2023	68	6/1/2023
Wisconsin	Walworth	551270006	83	6/28/2023	82	6/2/2023	82	6/19/2023	82	6/24/2023	80	6/1/2023	80	6/18/2023	80	6/29/2023	79	5/30/2023	78	5/23/2023	77	5/11/2023
Wisconsin	Waukesha	551330027	85	6/29/2023	83	6/2/2023	83	6/19/2023	80	7/25/2023	78	4/14/2023	78	5/11/2023	78	5/30/2023	76	5/23/2023	76	6/21/2023	75	6/18/2023

Recommendations

Based on the results of this analysis and the widespread impact of Canadian wildfire smoke on Chicago area monitors both within the NAA and statewide in Illinois, Indiana, and Wisconsin, the following action is recommended.

1. Each date at each monitor within the Chicago NAA identified to have been influenced by Canadian wildfire smoke during the May-September 2023 time frame, and found to have enhanced ozone concentrations as a result, should be flagged as influenced by exceptional events, and the associated pollutant concentration values should be removed from the regulatory record used to determine design values and attainment designations.
    a. The "regulatory significant" nomenclature typically applied to concurring with exceptional events demonstrations should not be limited to the attainment / nonattainment determination and instead should include any date or concentration that was enhanced by wildfire smoke, regardless of the attainment outcome of the exceptions.
2. Consideration should be given to excluding dates and concentrations at other monitors outside of the Chicago NAA, but in the same regional airshed, that would have also been impacted by Canadian wildfire smoke during the same summer 2023 episode. This may include simply referencing other state exceptional events demonstrations when proximal monitors were impacted on the same dates and by the same wildfire plumes. An example application would be excluding dates and concentrations from regional Illinois, Indiana, or Wisconsin monitors outside of the Chicago ozone NAA area consistent with dates and monitors within the NAA.
3. Consideration should be given to states, including Illinois, Indiana, and Wisconsin, to allow limited information necessary to support the clear causal relationship criterion for any wildfire date that fell within the 2023 Canadian wildfire episode. Ample evidence has been provided here and elsewhere to support the fact that smoke from Canadian wildfires in spring and summer of 2023 had significant impact on ozone and PM2.5 observations and enhanced concentrations beyond reasonable and typical conditions. As it is understood that many states are preparing exceptional events demonstrations for monitors and dates affected during the Canadian wildfire episodes of 2023, it would be appropriate to allow for information in this document to be adopted to satisfy Tier 1 obligations in those demonstrations.

Appendix A

Ozone AQI and HMS Smoke Plots – May 15 – June 30, 2023

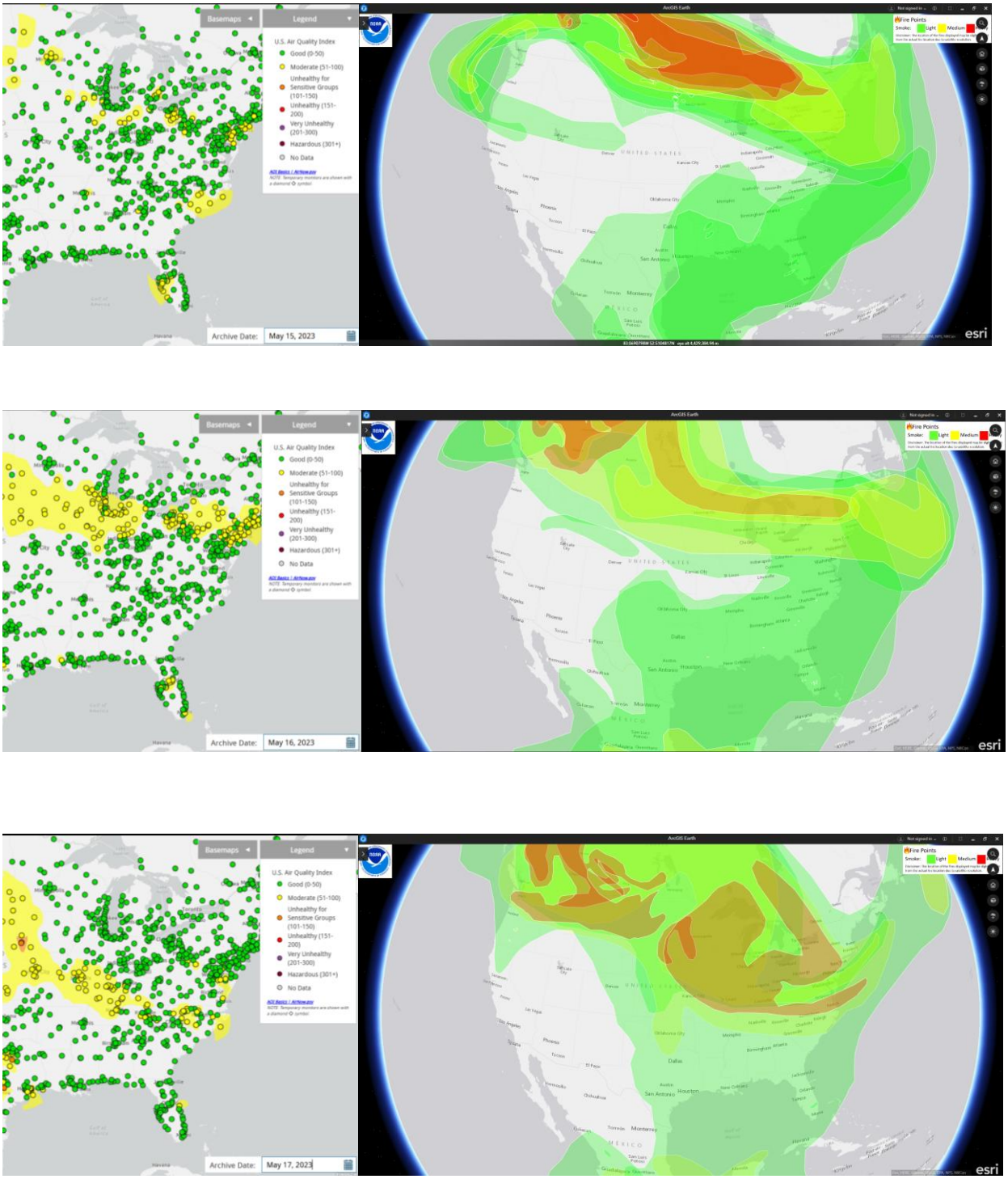
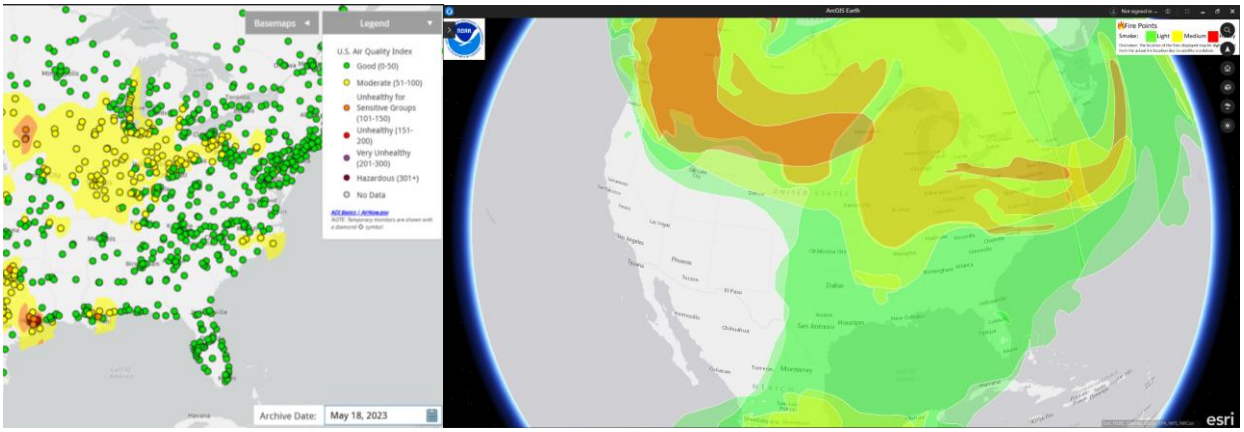
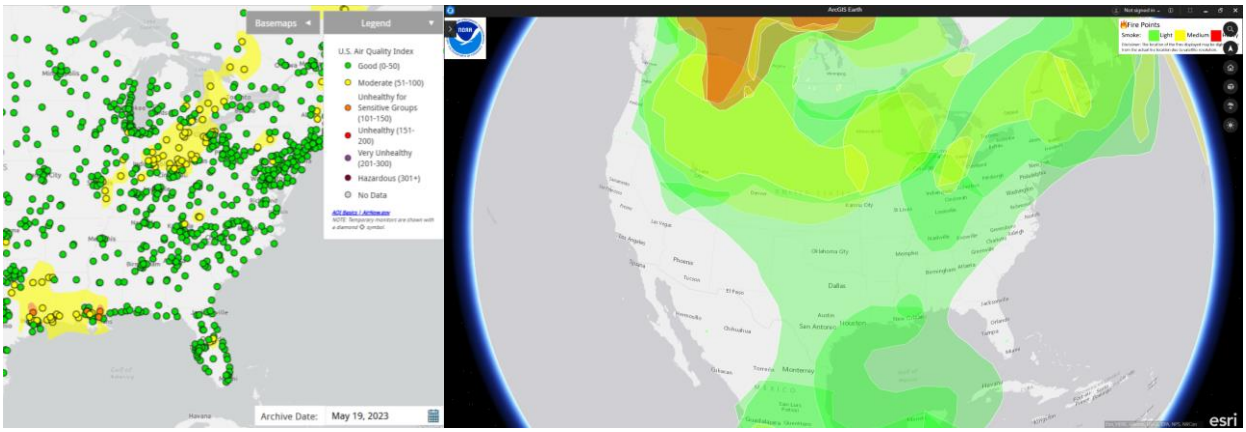


Figure A-1. Ozone AQI and HMS Smoke Plots, May 15 (top), May 16 (middle), and May 17 (bottom), 2023





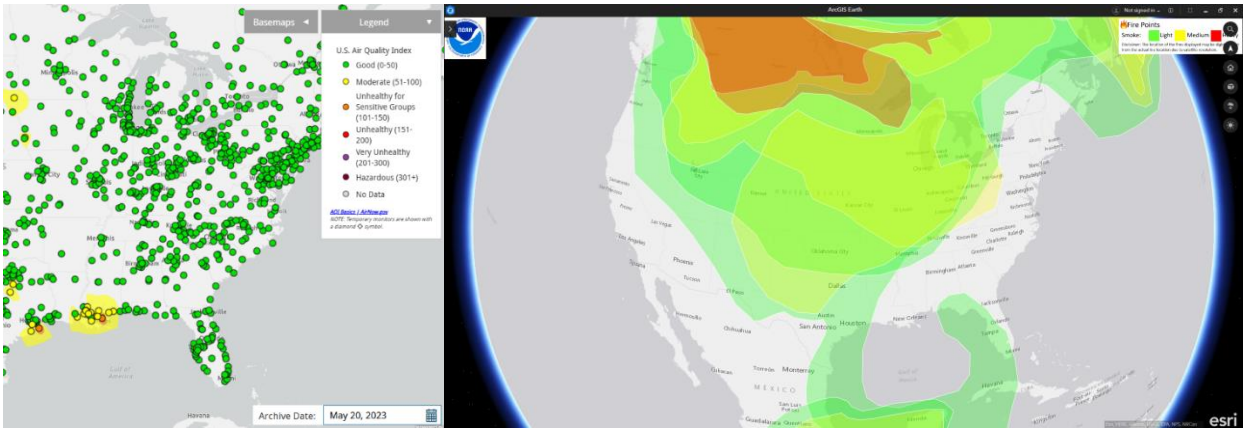
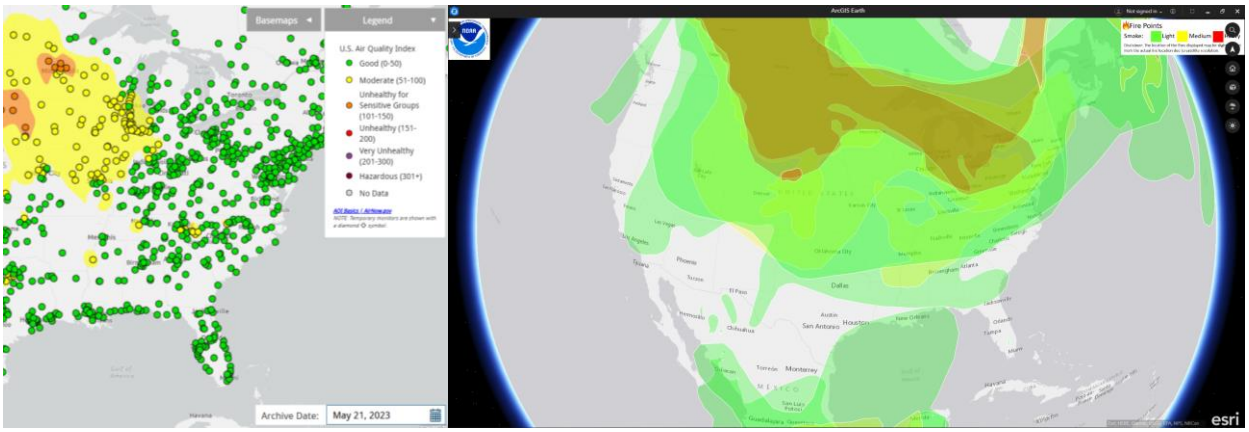
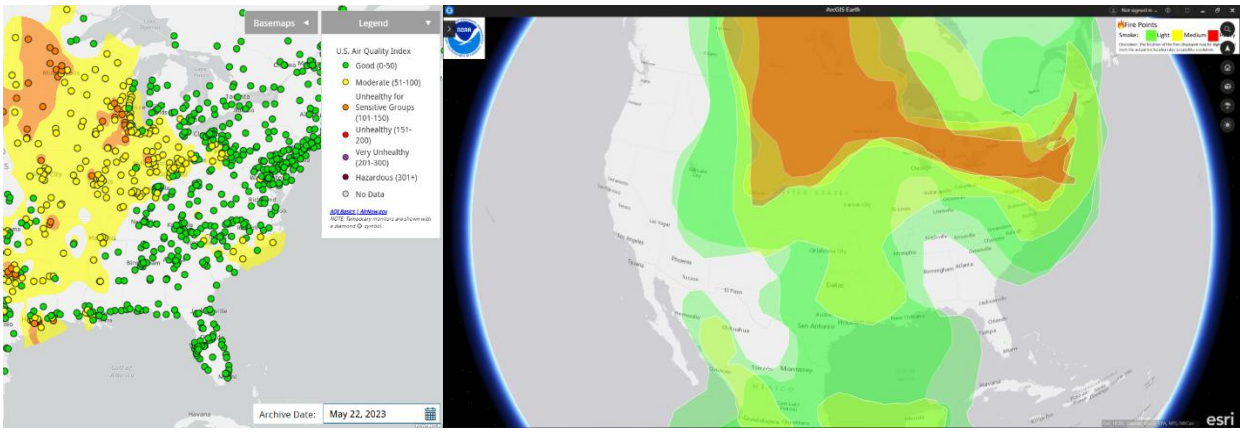


Figure A-2. Ozone AQI and HMS Smoke Plots, May 18 (top), May 19 (middle), and May 20 (bottom), 2023





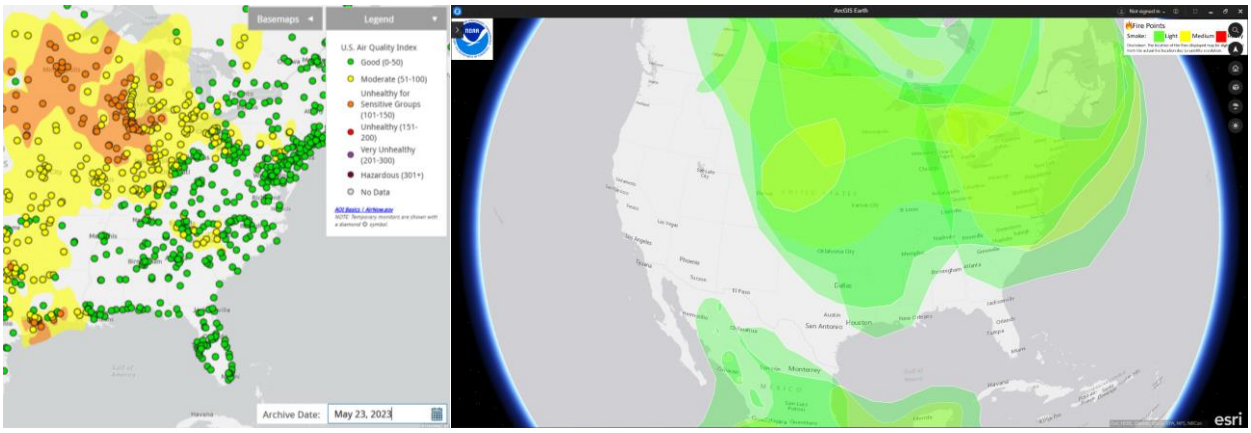
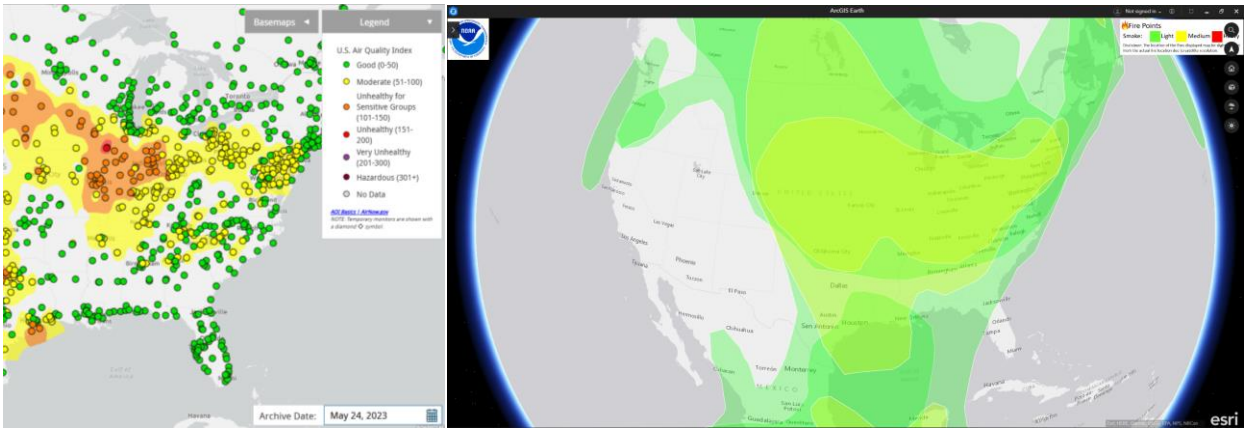
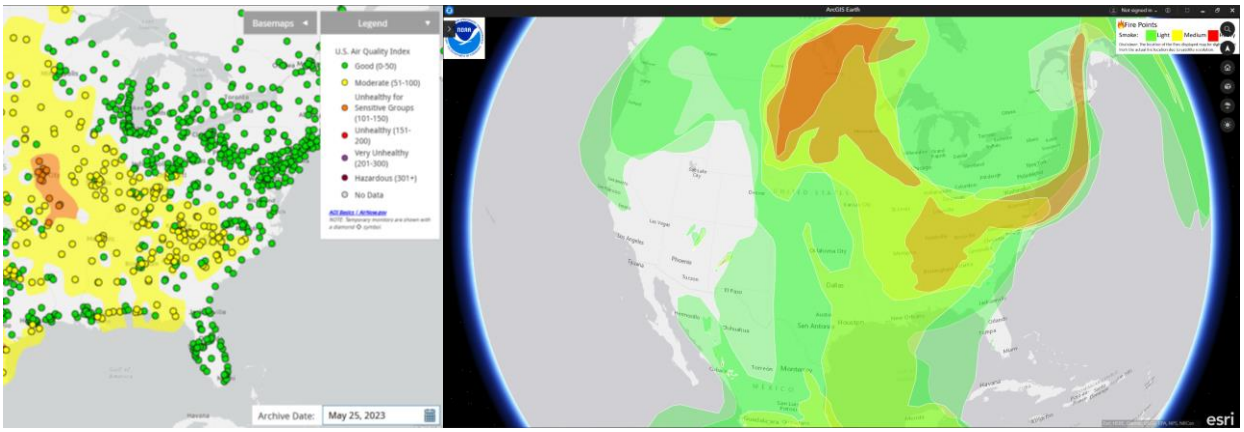


Figure A-3. Ozone AQI and HMS Smoke Plots, May 21 (top), May 22 (middle), and May 23 (bottom), 2023





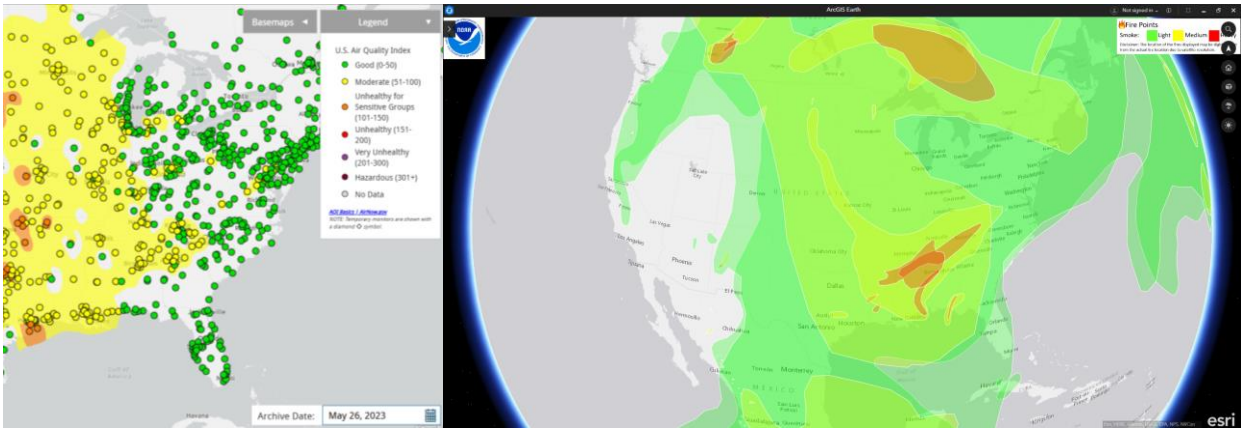


Figure A-4. Ozone AQI and HMS Smoke Plots, May 24 (top), May 25 (middle), and May 26 (bottom), 2023

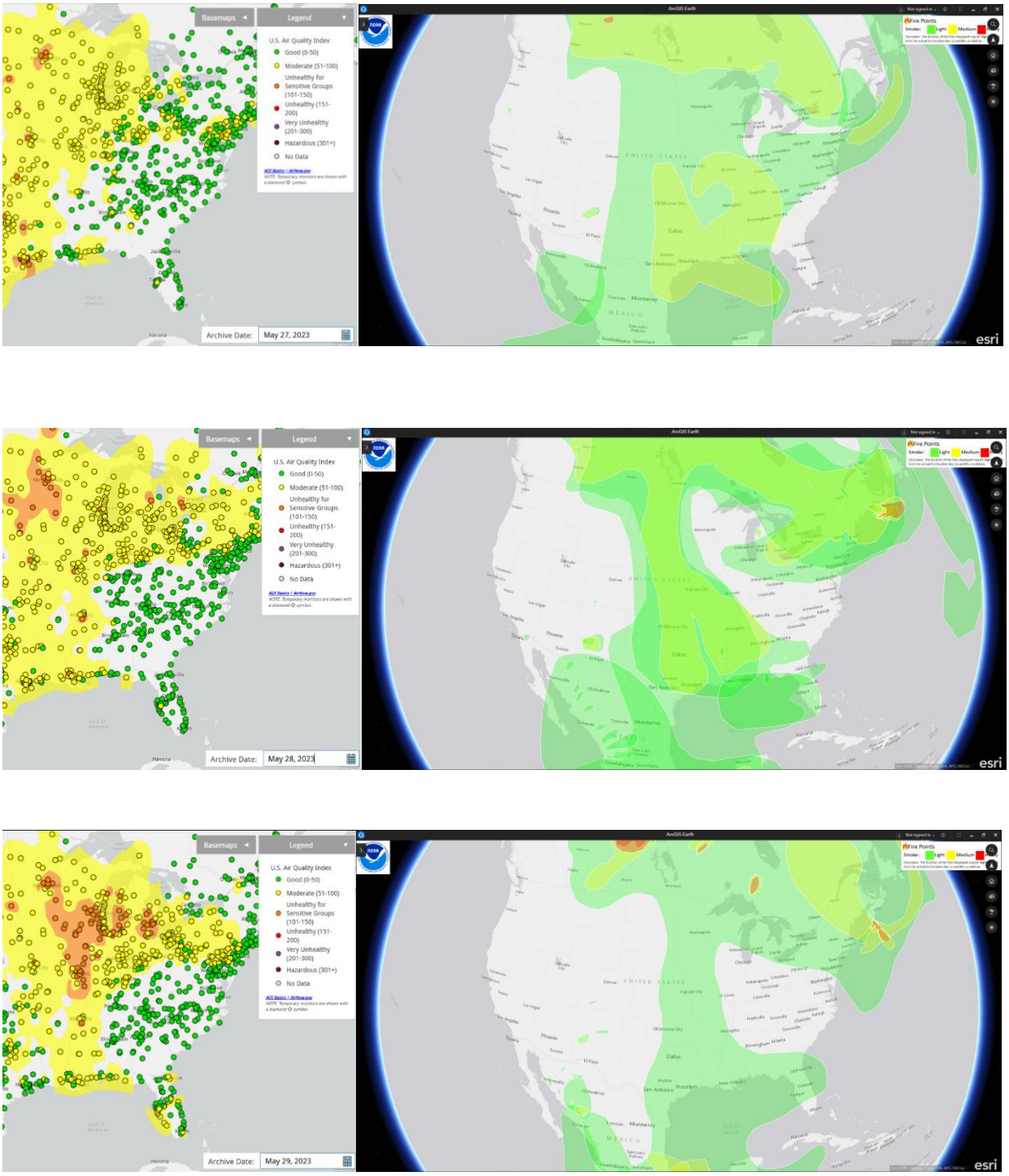


Figure A-5. Ozone AQI and HMS Smoke Plots, May 27 (top), May 28 (middle), and May 29 (bottom), 2023

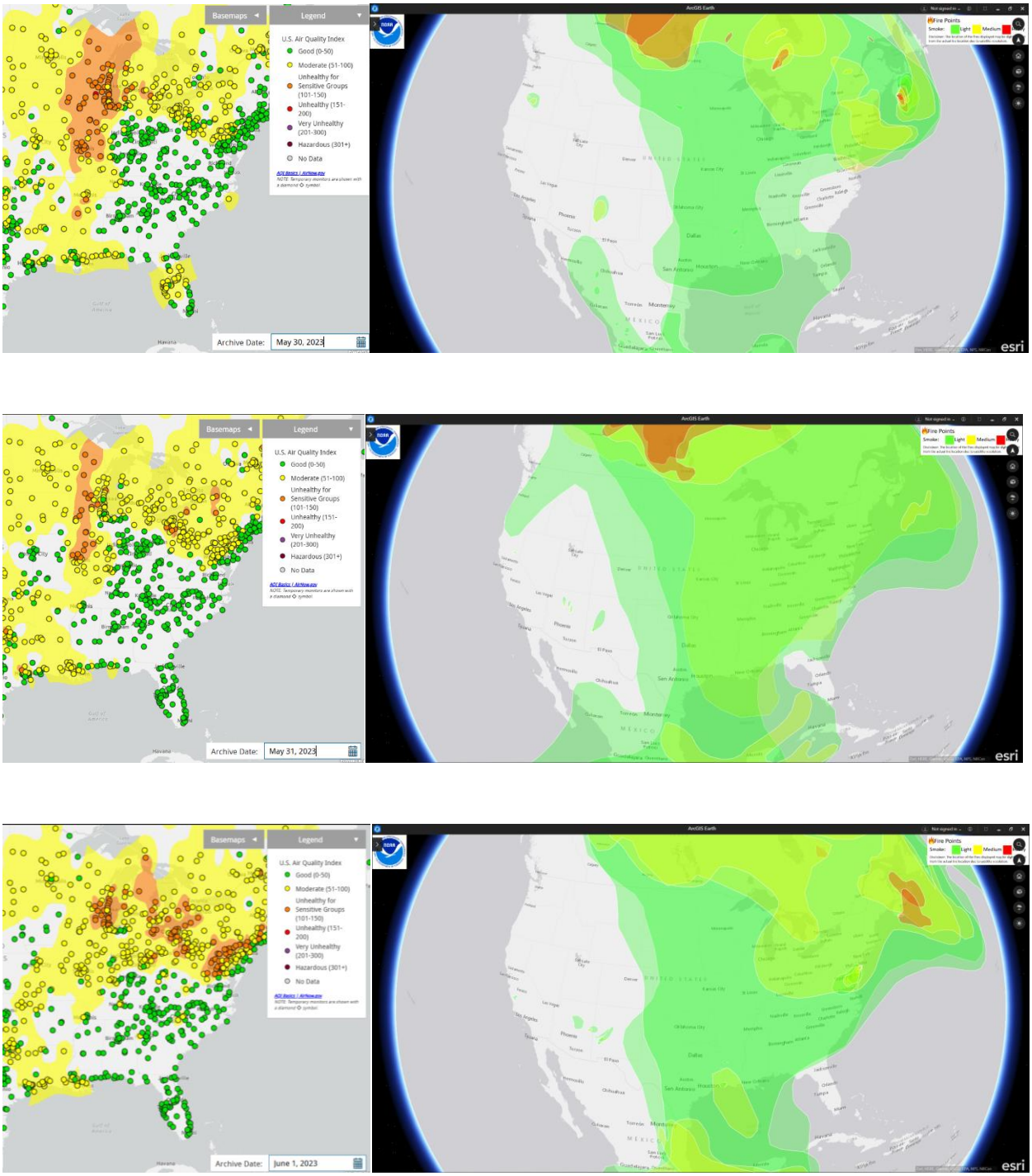


Figure A-6. Ozone AQI and HMS Smoke Plots, May 30 (top), May 31 (middle), and June 1 (bottom), 2023

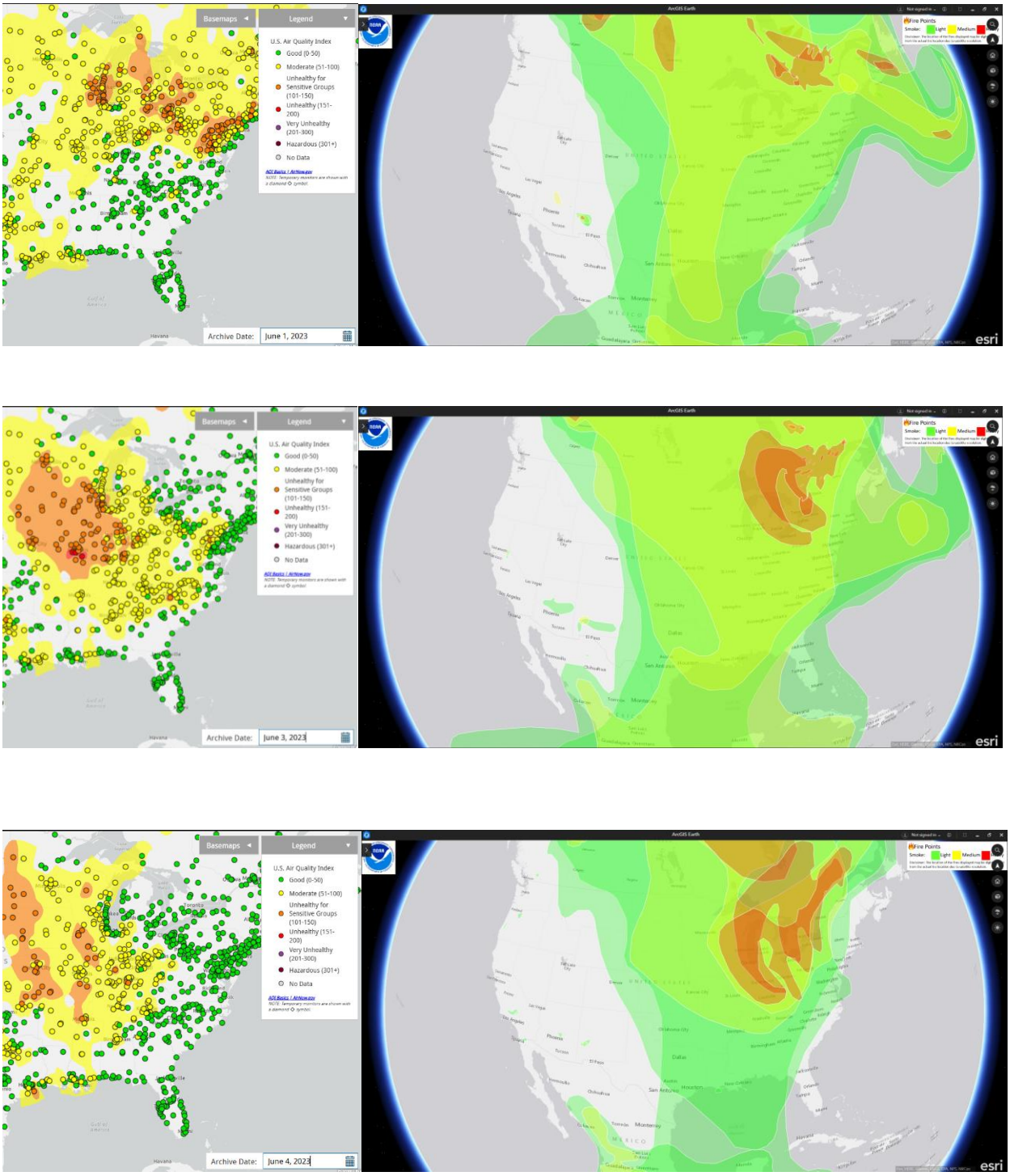
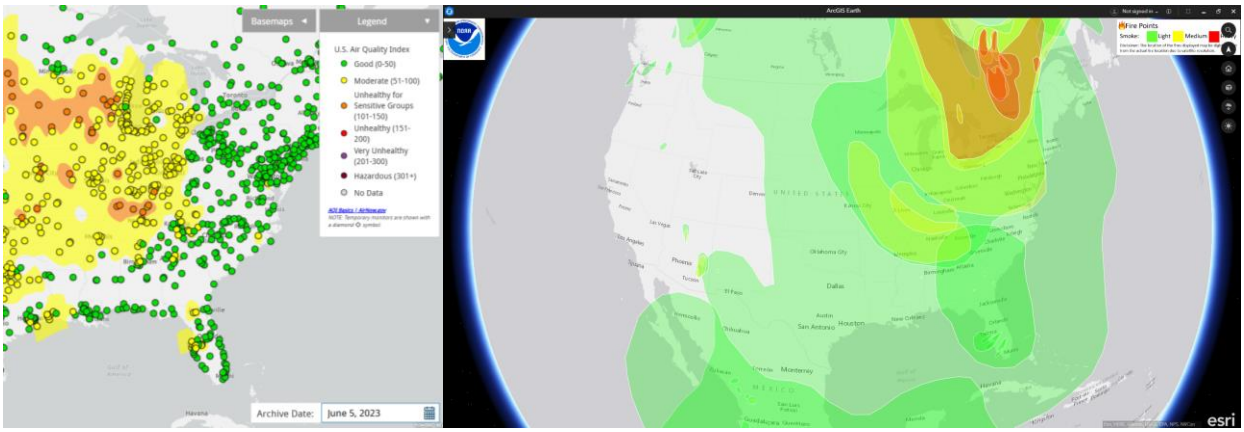
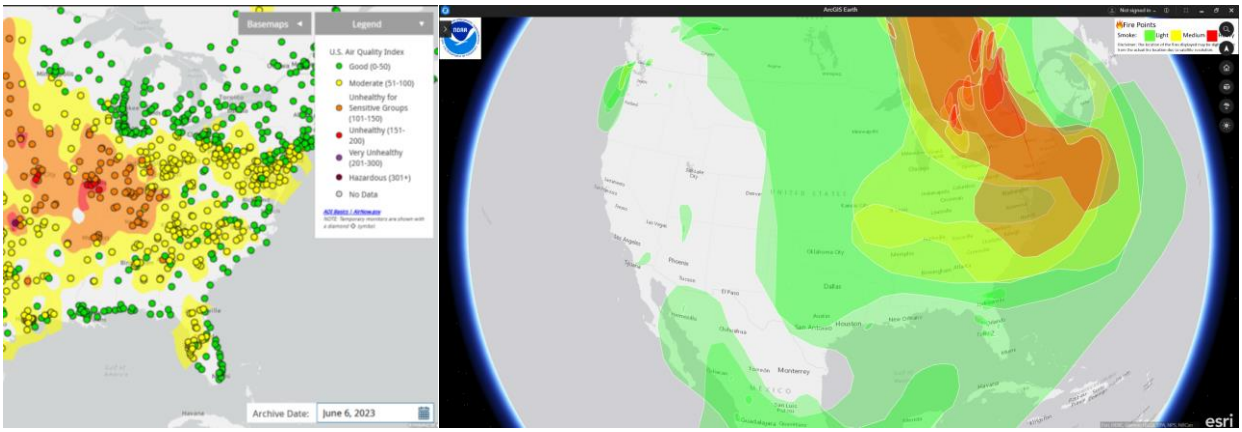


Figure A-7. Ozone AQI and HMS Smoke Plots, June 2 (top), June 3 (middle), and June 4 (bottom), 2023





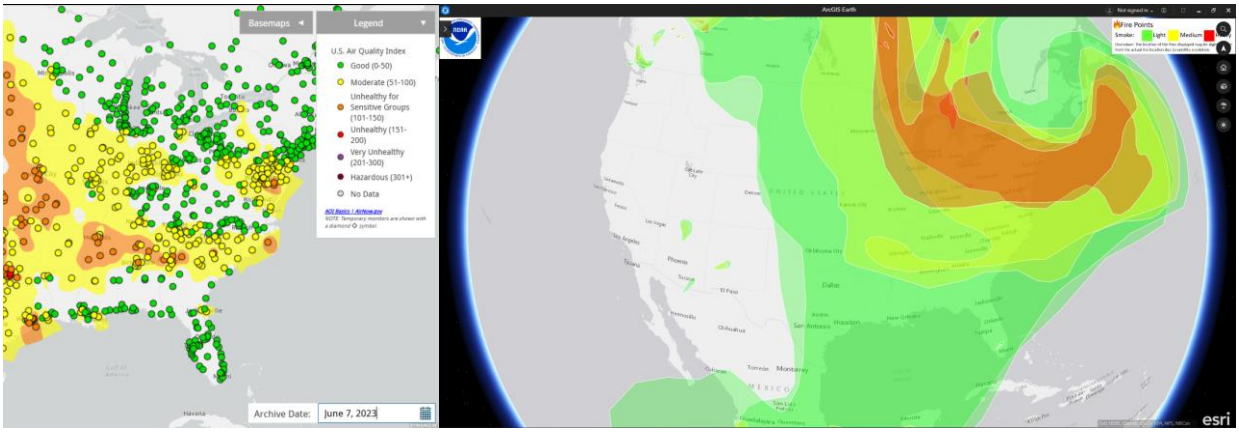


Figure A-8. Ozone AQI and HMS Smoke Plots, June 5 (top), June 6 (middle), and June 7 (bottom), 2023

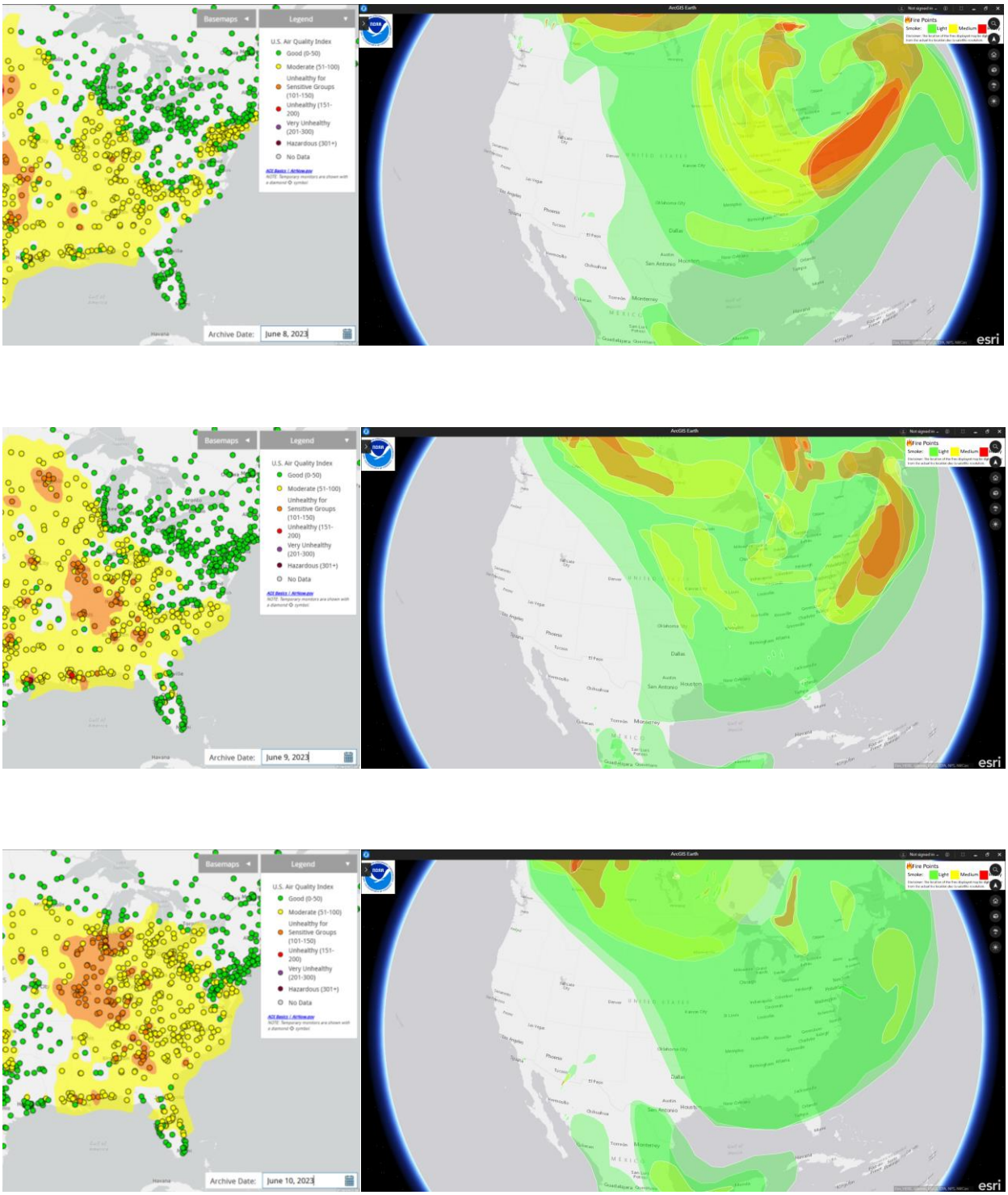


Figure A-9. Ozone AQI and HMS Smoke Plots, June 8 (top), June 9 (middle), and June 10 (bottom), 2023

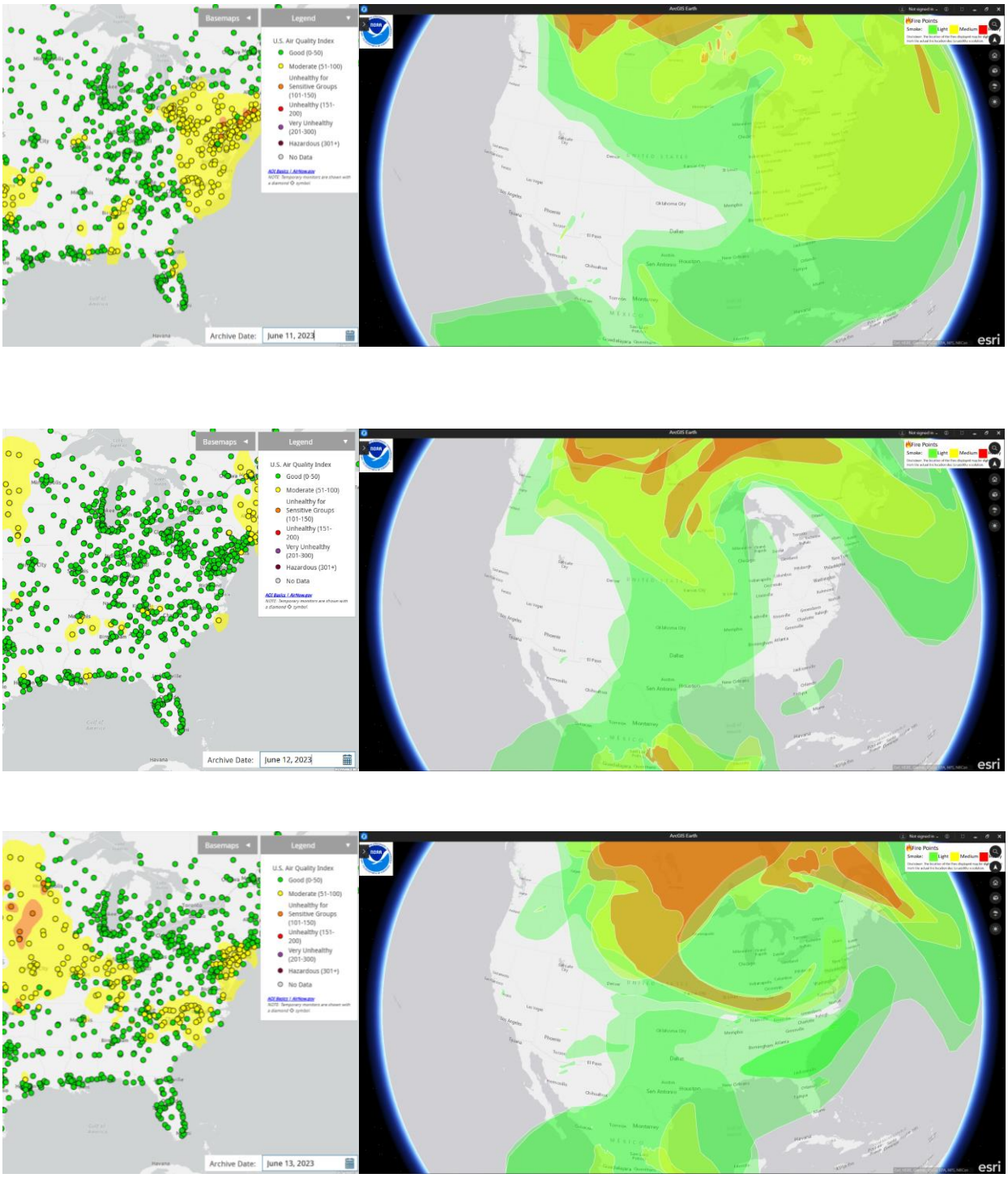


Figure A-10. Ozone AQI and HMS Smoke Plots, June 11 (top), June 12 (middle), and June 13 (bottom), 2023

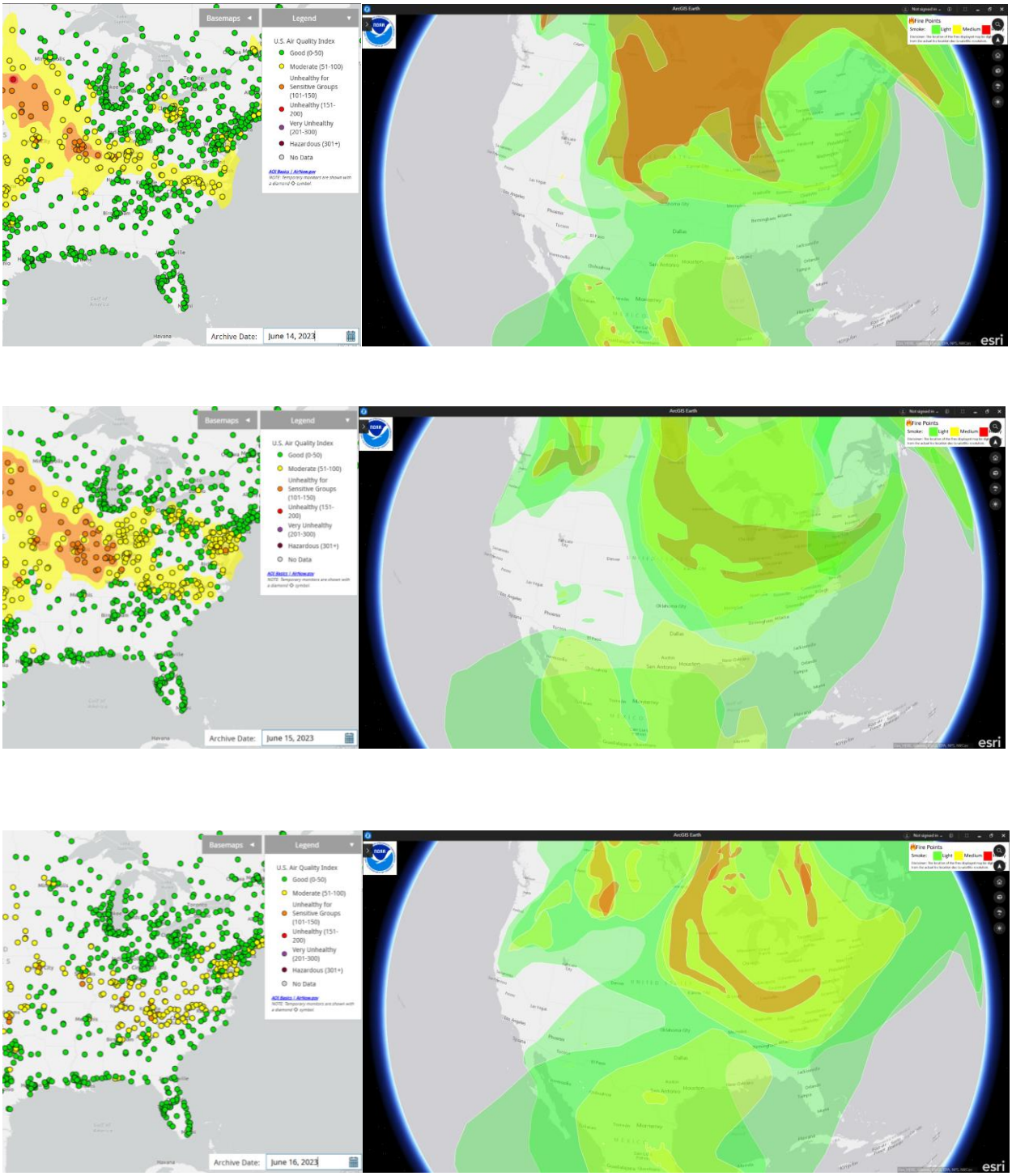


Figure A-11. Ozone AQI and HMS Smoke Plots, June 14 (top), June 15 (middle), and June 16 (bottom), 2023

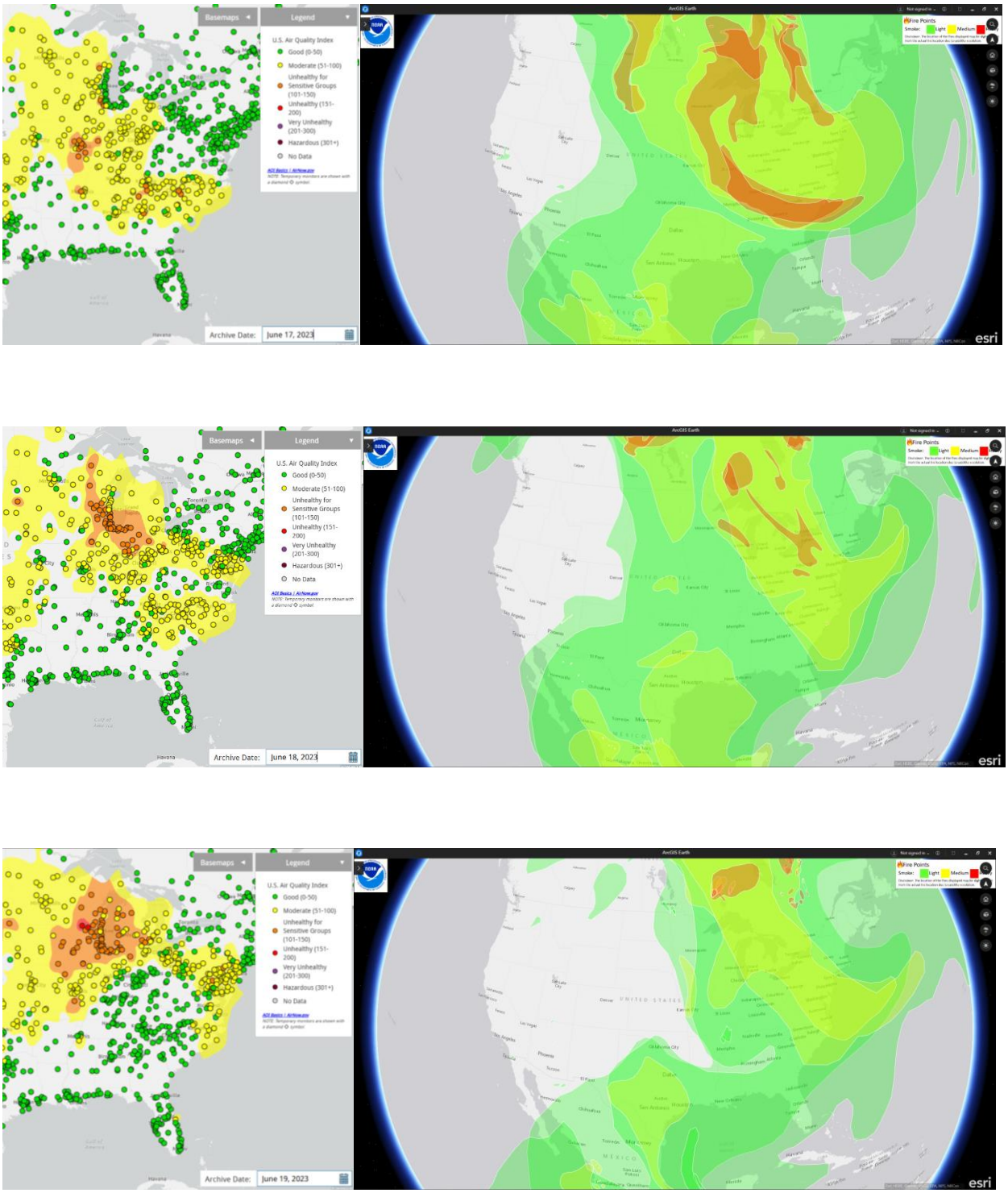
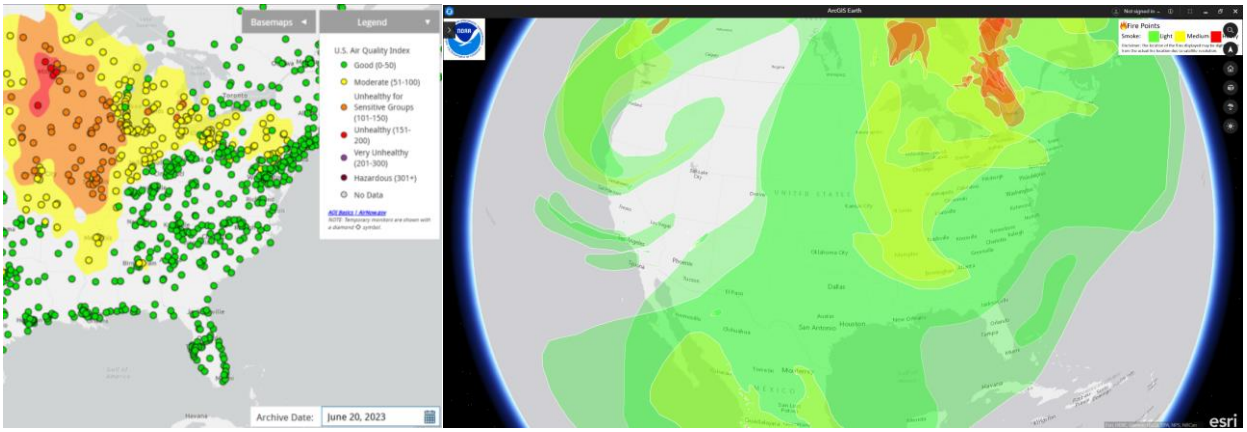
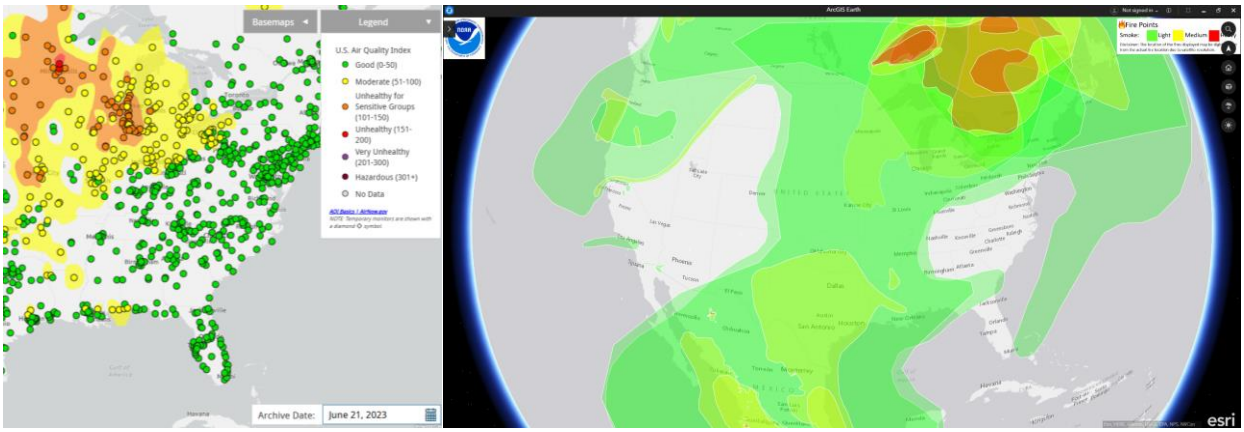


Figure A-12. Ozone AQI and HMS Smoke Plots, June 17 (top), June 18 (middle), and June 19 (bottom), 2023





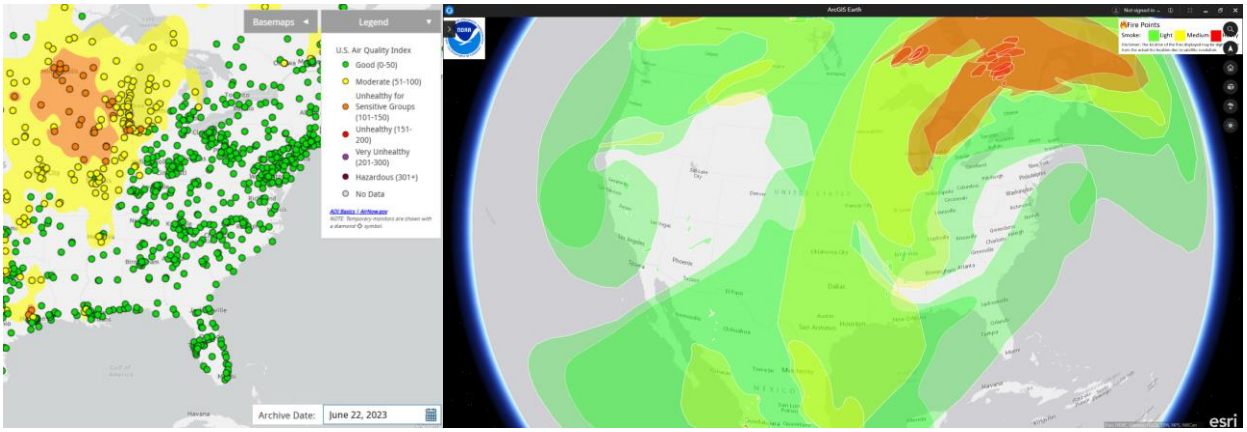
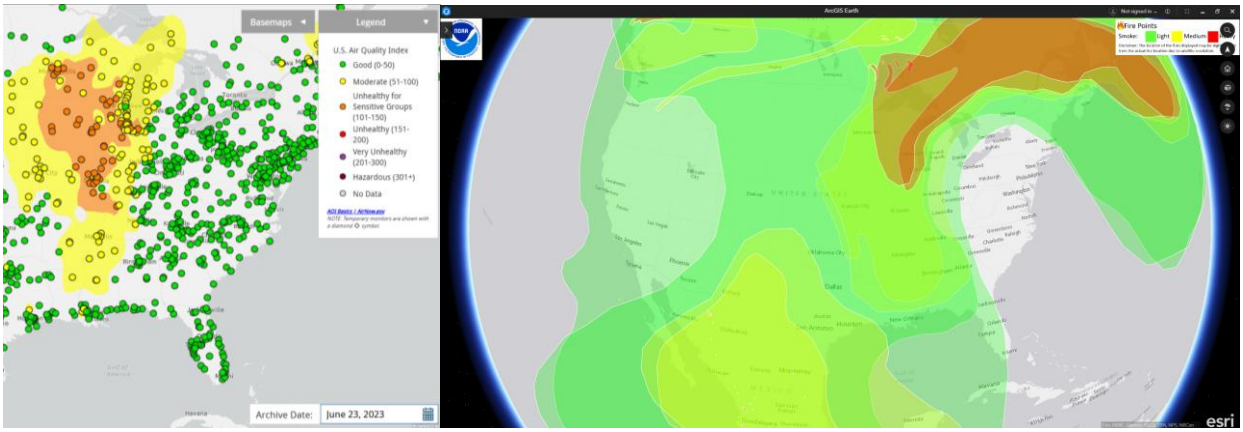
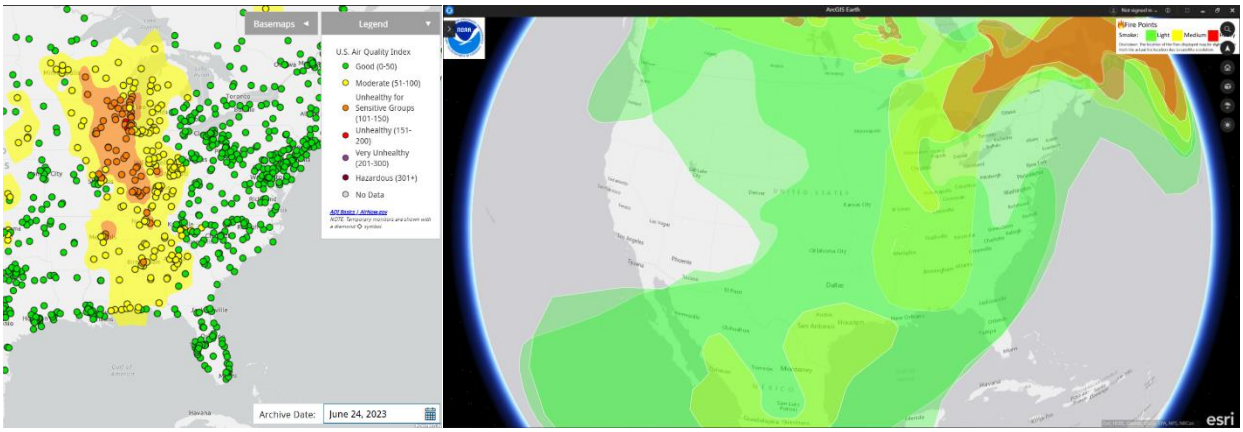


Figure A-13. Ozone AQI and HMS Smoke Plots, June 20 (top), June 21 (middle), and June 22 (bottom), 2023





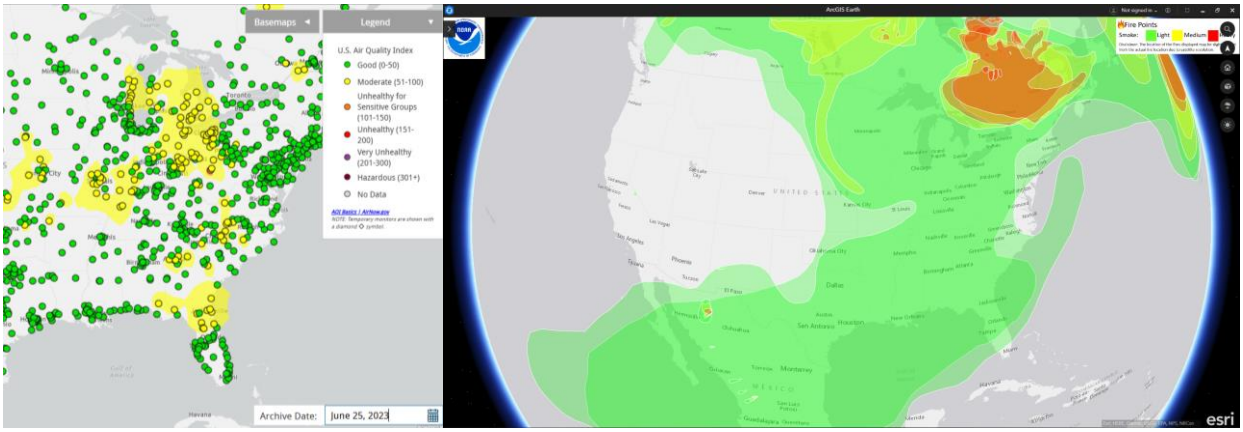


Figure A-14. Ozone AQI and HMS Smoke Plots, June 23 (top), June 24 (middle), and June 25 (bottom), 2023

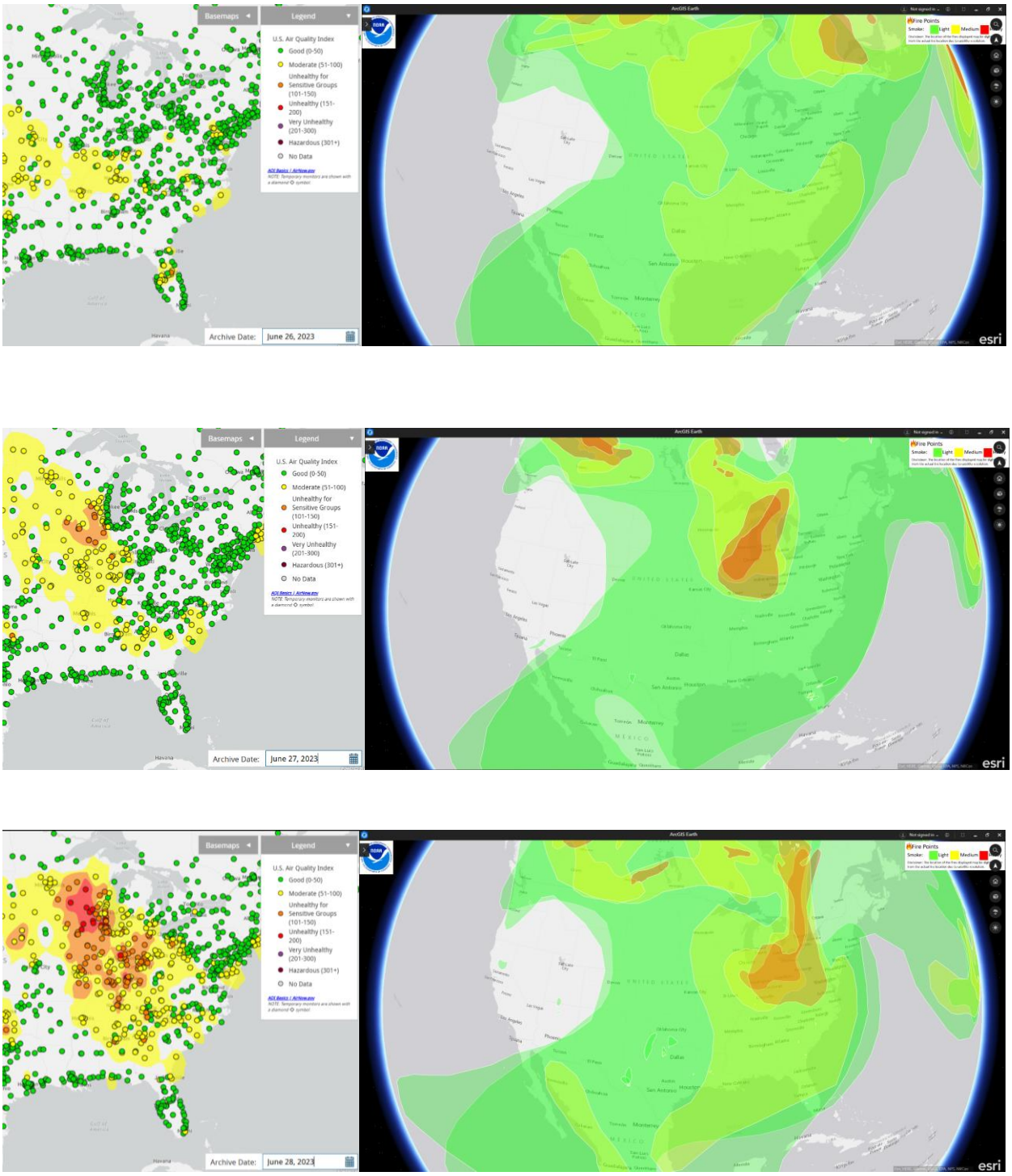


Figure A-15. Ozone AQI and HMS Smoke Plots, June 26 (top), June 27 (middle), and June 28 (bottom), 2023

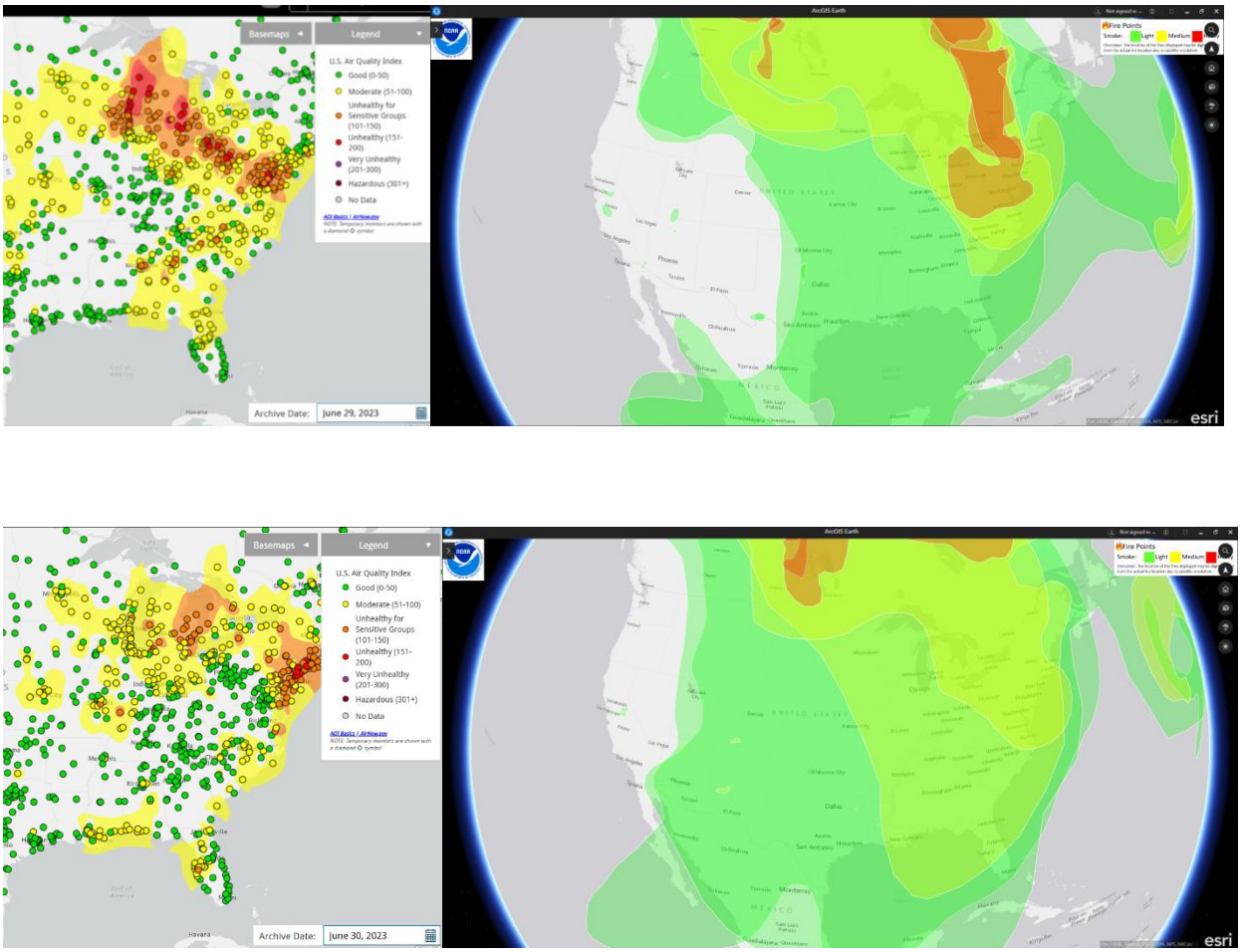


Figure A-16. Ozone AQI and HMS Smoke Plots, June 29 (top) and June 30 (bottom), 2023