# 2022 OZONE SEASON UPDATE

Sunil Kumar
Principal Environmental Engineer

Metropolitan Washington Air Quality Committee
September 28, 2022

Agenda Item 5

Metropolitan Washington
Council of Governments

# Peak 8-Hour Average Ozone Levels (ppb)

## March 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 27 | 28 | 01 | 02 | 03 | 04 | 05 |
| | | 47 | 47 | 46 | 44 | 48 |
| 06 | 07 | 08 | 09 | 10 | 11 | 12 |
| 43 | 38 | 46 | 43 | 43 | 47 | 46 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 44 | 52 | 57 | 58 | 43 | 52 | 44 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 42 | 53 | 55 | 43 | 26 | 47 | 42 |
| 27 | 28 | 29 | 30 | 31 | | |
| 39 | 44 | 46 | 51 | 46 | | |

## April 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 27 | 28 | 29 | 30 | 31 | 01 | 02 |
| | | | | | 42 | 49 |
| 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 47 | 48 | 39 | 41 | 39 | 49 | 39 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 42 | 46 | 51 | 57 | 46 | 59 | 57 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 44 | 32 | 39 | 48 | 50 | 61 | 60 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 64 | 47 | 39 | 47 | 46 | 57 | 56 |

## May 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 |
| | | | | | | 45 |
| 08 | 09 | 10 | 11 | 12 | 13 | 14 |
| 49 | 62 | 63 | 53 | 39 | 24 | 29 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 43 | 48 | 60 | 47 | 54 | 63 | 62 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 55 | 45 | 36 | 40 | 30 | 34 | 41 |
| 29 | 30 | 31 | | | | |
| 55 | 56 | 66 | | | | |

## June 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 29 | 30 | 31 | 01 | 02 | 03 | 04 |
| | | | 59 | 54 | 51 | 66 |
| 05 | 06 | 07 | 08 | 09 | 10 | 11 |
| 58 | 60 | 48 | 63 | 55 | 53 | 37 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 47 | 65 | 47 | 77 | 54 | 61 | 41 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 45 | 59 | 65 | 72 | 45 | 66 | 54 |
| 26 | 27 | 28 | 29 | 30 | | |
| 49 | 47 | 56 | 60 | 76 | | |

## July 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 26 | 27 | 28 | 29 | 30 | 01 | 02 |
| | | | | | 55 | 50 |
| 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 54 | 60 | 41 | 57 | 58 | 55 | 40 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 52 | 69 | 49 | 63 | 59 | 65 | 54 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 43 | 38 | 60 | 66 | 56 | 62 | 68 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 61 | 46 | 36 | 55 | 49 | 49 | 51 |

## August 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 31 | 01 | 02 | 03 | 04 | 05 | 06 |
| | 49 | 54 | 63 | 68 | 60 | 40 |
| 07 | 08 | 09 | 10 | 11 | 12 | 13 |
| 32 | 42 | 48 | 53 | 56 | 44 | 48 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 50 | 40 | 55 | 54 | 58 | 52 | 55 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 34 | 41 | 51 | 56 | 57 | 57 | 59 |
| 28 | 29 | 30 | 31 | | | |
| 57 | 52 | 47 | 47 | | | |

## September 2022

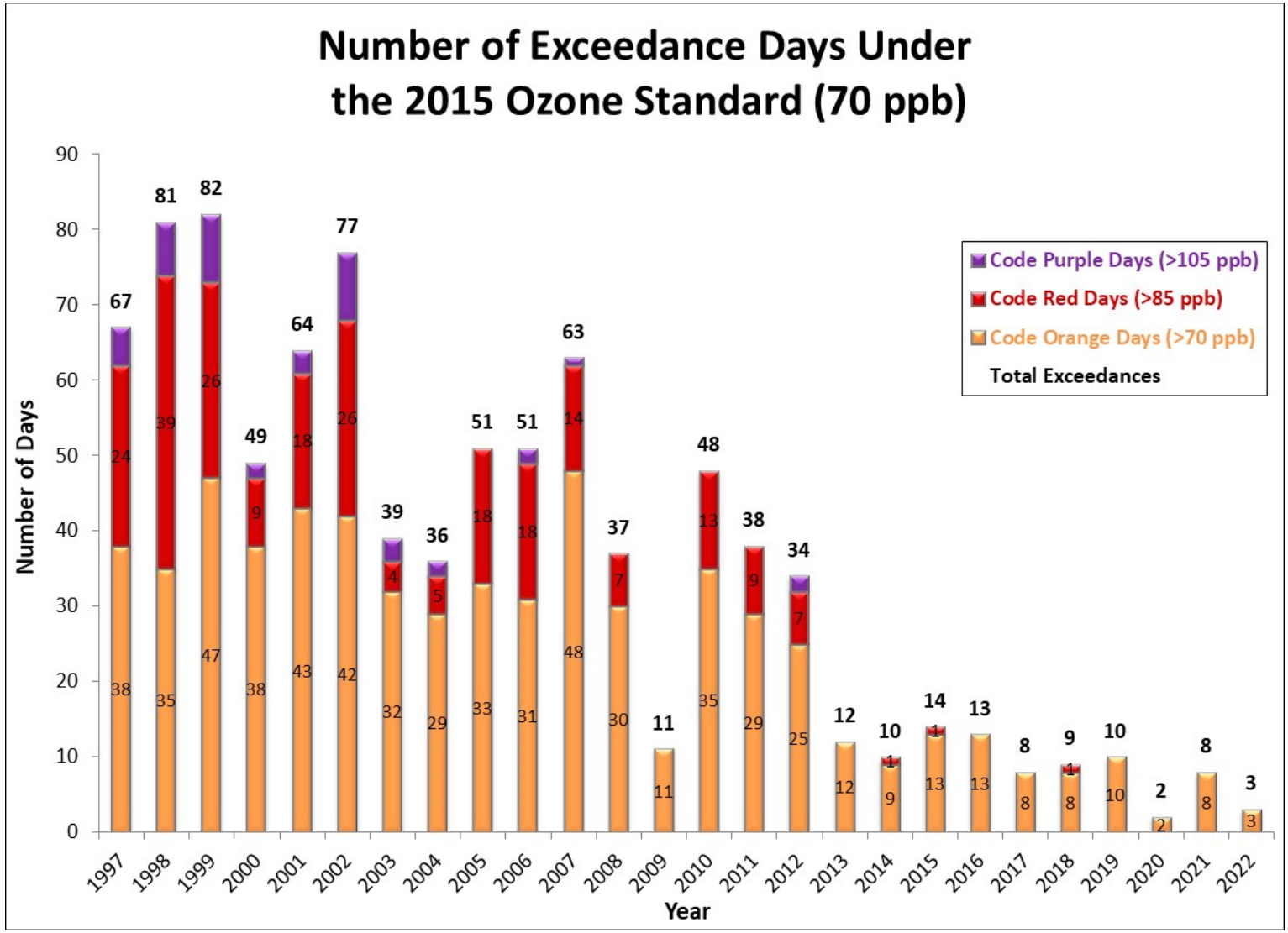
| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 28 | 29 | 30 | 31 | 01 | 02 | 03 |
| | | | | 49 | 60 | 50 |
| 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| 49 | 36 | 36 | 26 | 41 | 55 | 38 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 25 | 30 | 43 | 47 | 48 | | |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | | | | | | |
| 25 | 26 | 27 | 28 | 29 | 30 | |
| | | | | | | |

3 Code Orange days, 64 Code Yellow Days, rest all Code Green Days

Analysis is based on draft data as of September 16, 2022.

Metropolitan Washington Council of Governments

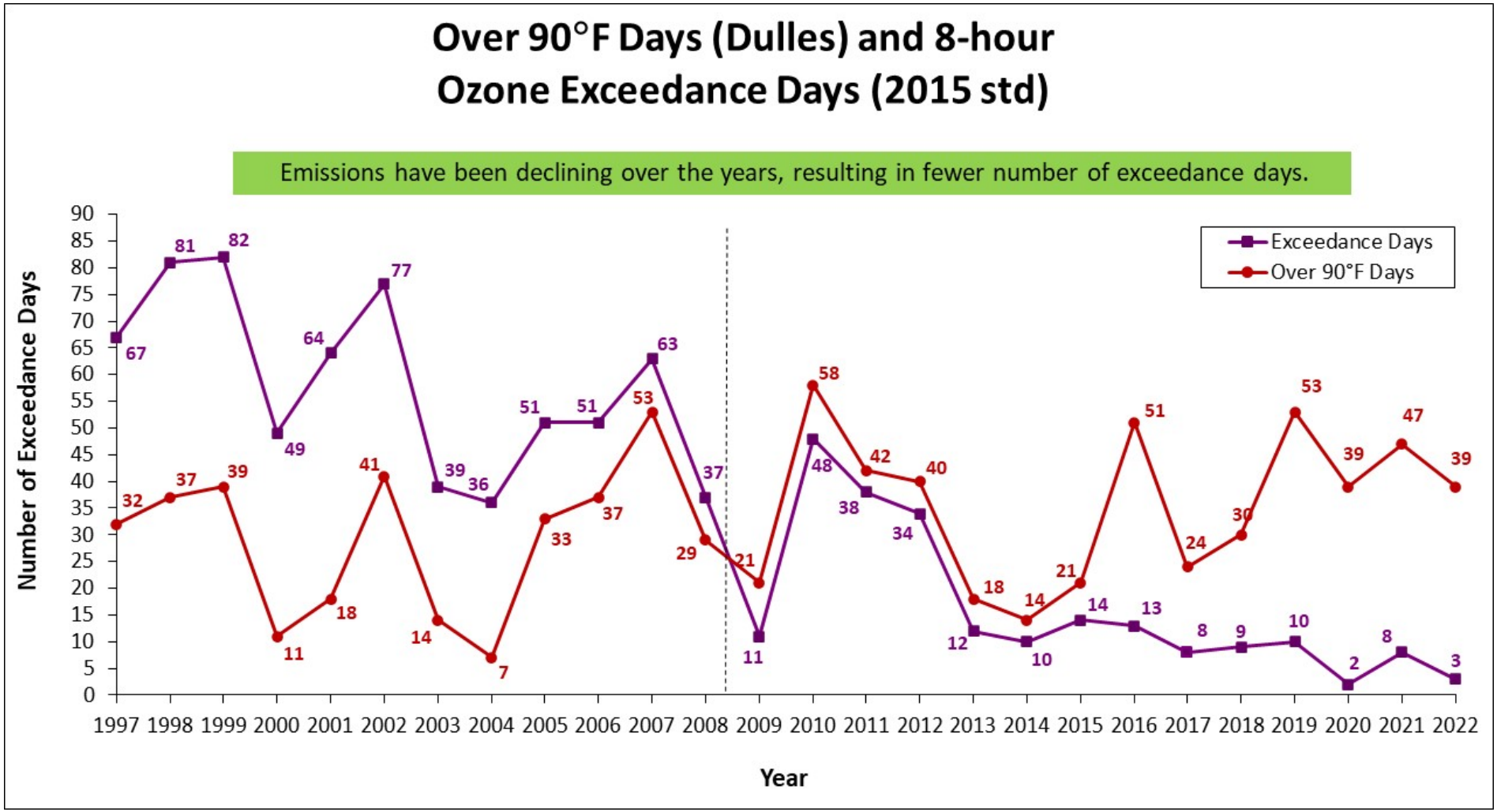
# Ozone Exceedance Trend




2022 data is draft and incomplete as of September 16, 2022.

Metropolitan Washington Council of Governments

# Ozone & Temperature Trend

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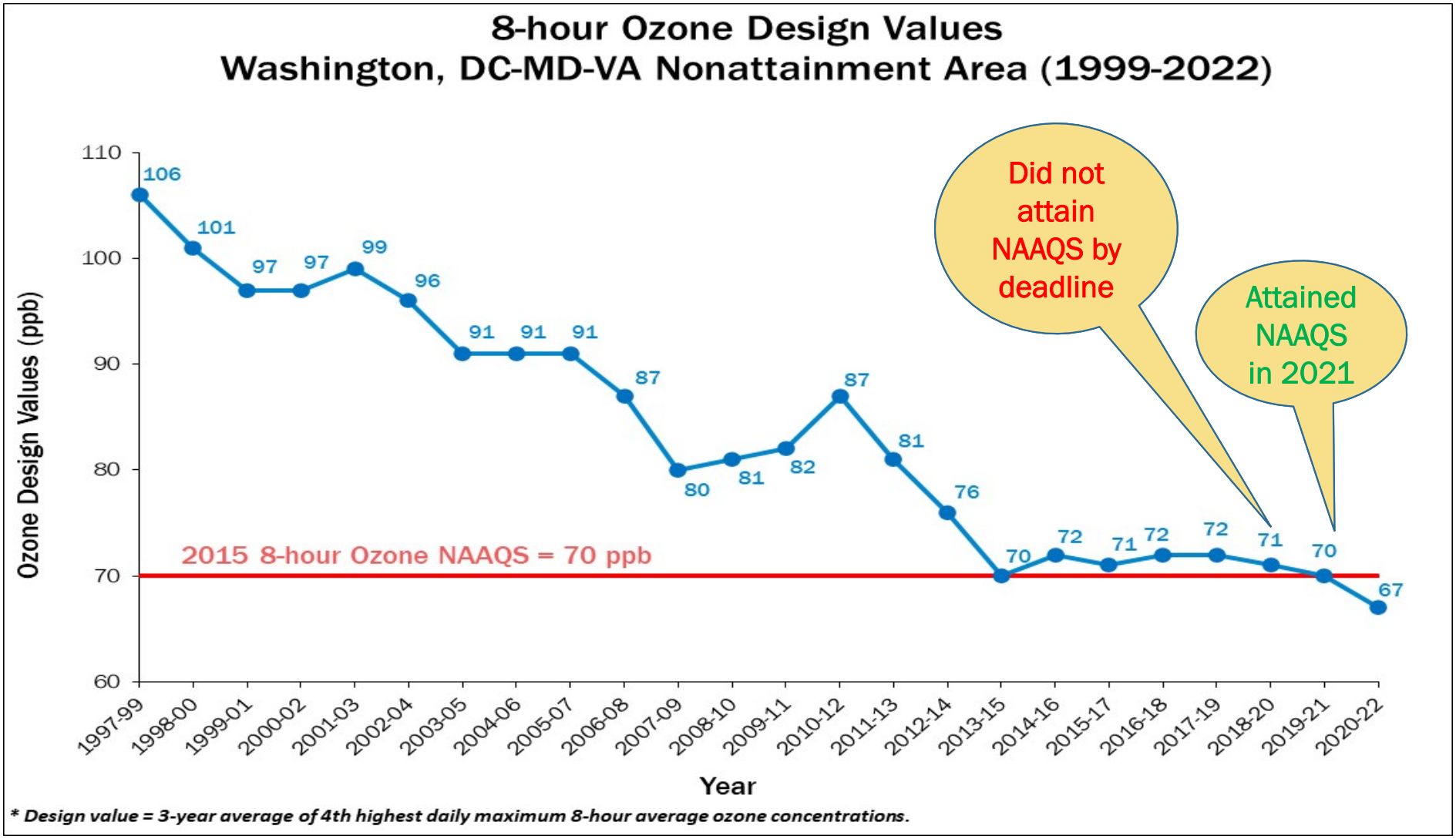
Metropolitan Washington Council of Governments

# Ozone Design Value Trend




2022 data is draft and incomplete as of September 16, 2022.

Metropolitan Washington Council of Governments

# 24-Hour Average PM2.5 Levels (µg/m³)

## March 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 27 | 28 | 01 | 02 | 03 | 04 | 05 |
| | | 11.2 | 10.6 | 6.3 | 9.9 | 10.0 |
| 06 | 07 | 08 | 09 | 10 | 11 | 12 |
| 16.2 | 9.3 | 7.5 | 6.6 | 12.3 | 12.3 | 9.1 |
| 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| 9.2 | 9.0 | 10.1 | 13.1 | 17.5 | 13.3 | 9.2 |
| 20 | 21 | 22 | 23 | 24 | 25 | 26 |
| 4.0 | 7.5 | 11.5 | 7.6 | 11.7 | 9.3 | 5.2 |
| 27 | 28 | 29 | 30 | 31 | | |
| 5.8 | 7.1 | 8.8 | 11.3 | 10.8 | | |

## April 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 27 | 28 | 29 | 30 | 31 | 01 | 02 |
| | | | | | 6.4 | 7.1 |
| 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 8.1 | 11.8 | 11.4 | 4.9 | 5.4 | 6.9 | 4.6 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 5.4 | 8.1 | 6.5 | 12.8 | 9.4 | 6.2 | 8.0 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 6.7 | 5.7 | 6.2 | 6.2 | 7.8 | 9.5 | 10.4 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 11.4 | 12.3 | 12.0 | 8.2 | 5.6 | 7.5 | 9.1 |

## May 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 01 | 02 | 03 | 04 | 05 | 06 | 07 |
| 12.5 | 12.4 | 14.2 | 10.3 | 7.5 | 6.6 | 4.0 |
| 08 | 09 | 10 | 11 | 12 | 13 | 14 |
| 7.3 | 8.3 | 8.1 | 10.5 | 8.2 | 6.7 | 5.8 |
| 15 | 16 | 17 | 18 | 19 | 20 | 21 |
| 6.8 | 8.2 | 7.7 | 7.2 | 9.5 | 18.2 | 15.2 |
| 22 | 23 | 24 | 25 | 26 | 27 | 28 |
| 12.4 | 6.2 | 6.8 | 5.9 | 7.5 | 8.5 | 5.3 |
| 29 | 30 | 31 | | | | |
| 8.6 | 11.7 | 15.5 | | | | |

## June 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 29 | 30 | 31 | 01 | 02 | 03 | 04 |
| | | | 15.1 | 17.3 | 7.1 | 14.5 |
| 05 | 06 | 07 | 08 | 09 | 10 | 11 |
| 10.9 | 11.5 | 11.4 | 19.6 | 7.3 | 8.6 | 10.8 |
| 12 | 13 | 14 | 15 | 16 | 17 | 18 |
| 9.8 | 13.2 | 15.1 | 15.4 | 11.2 | 10.3 | 5.2 |
| 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 5.2 | 7.6 | 11.0 | 16.3 | 6.6 | 10.5 | 13.7 |
| 26 | 27 | 28 | 29 | 30 | | |
| 10.8 | 11.5 | 6.7 | 12.0 | 16.6 | | |

## July 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 26 | 27 | 28 | 29 | 30 | 01 | 02 |
| | | | | | 14.5 | 8.9 |
| 03 | 04 | 05 | 06 | 07 | 08 | 09 |
| 14.9 | 46.3 | 17.5 | 9.1 | 9.0 | 8.6 | 8.0 |
| 10 | 11 | 12 | 13 | 14 | 15 | 16 |
| 9.5 | 10.0 | 9.0 | 10.0 | 9.9 | 12.0 | 11.1 |
| 17 | 18 | 19 | 20 | 21 | 22 | 23 |
| 11.1 | 10.6 | 9.4 | 11.9 | 13.4 | 13.2 | 14.1 |
| 24 | 25 | 26 | 27 | 28 | 29 | 30 |
| 11.6 | 10.8 | 10.2 | 10.7 | 7.7 | 10.2 | 8.0 |
| 31 | | | | | | |
| 10.5 | | | | | | |

## August 2022

| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 31 | 01 | 02 | 03 | 04 | 05 | 06 |
| | 7.9 | 9.0 | 9.4 | 12.4 | 9.8 | 7.2 |
| 07 | 08 | 09 | 10 | 11 | 12 | 13 |
| 6.1 | 9.3 | 8.1 | 8.3 | 7.0 | 5.9 | 5.3 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 6.7 | 8.0 | 7.2 | 9.2 | 7.9 | 10.7 | 8.5 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 5.4 | 8.5 | 7.7 | 10.1 | 14.7 | 13.3 | 13.0 |
| 28 | 29 | 30 | 31 | | | |
| 14.4 | 8.7 | 7.1 | 8.0 | | | |

## September 2022

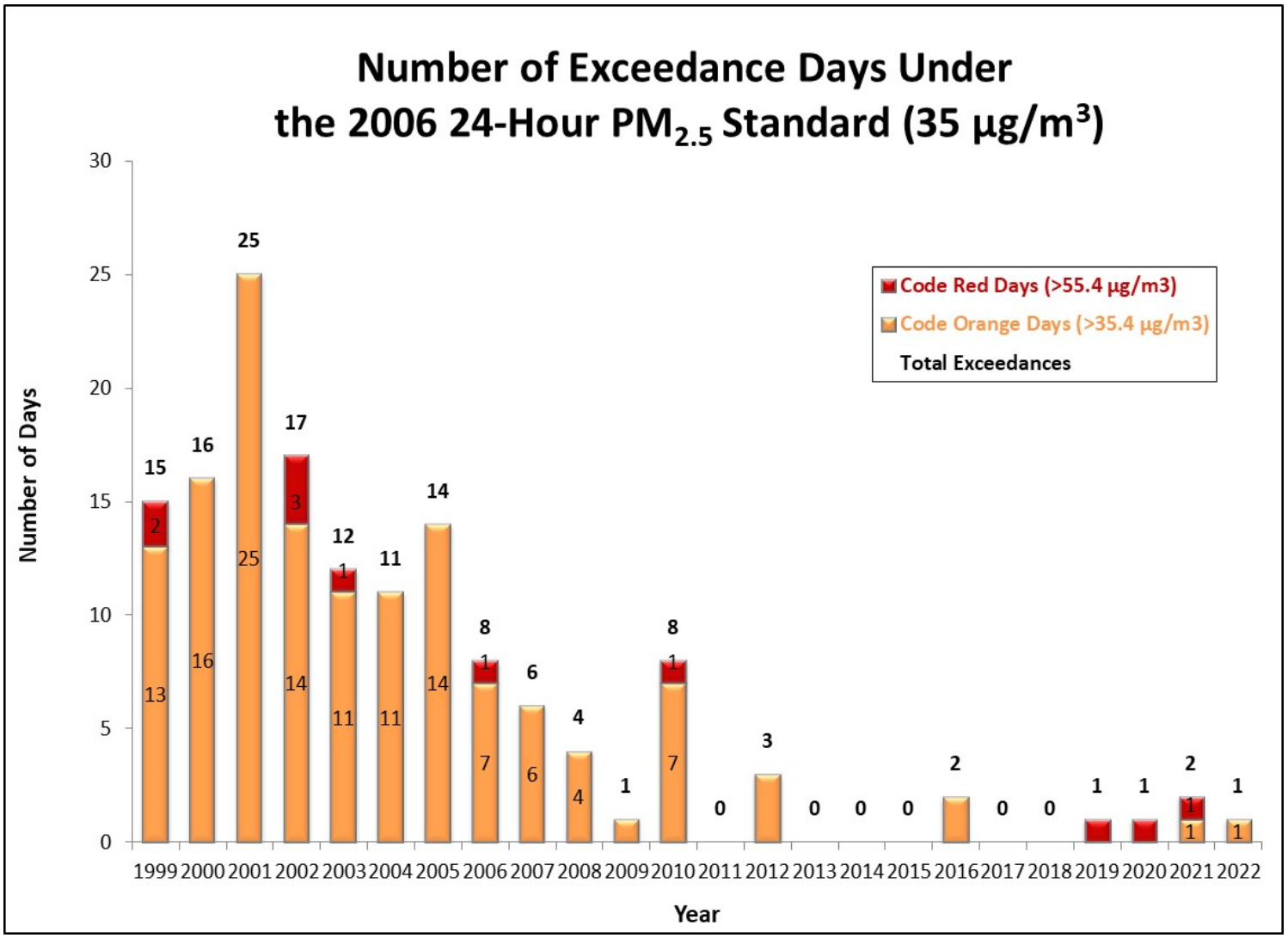
| Sunday | Monday | Tuesday | Wednesday | Thursday | Friday | Saturday |
|---|---|---|---|---|---|---|
| 28 | 29 | 30 | 31 | 01 | 02 | 03 |
| | | | | 7.7 | 9.2 | 7.6 |
| 04 | 05 | 06 | 07 | 08 | 09 | 10 |
| 9.3 | 8.1 | 5.7 | 5.5 | 8.9 | 9.5 | 9.4 |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| 6.7 | 7.3 | 6.1 | 6.4 | 9.1 | | |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| | | | | | | |
| 25 | 26 | 27 | 28 | 29 | 30 | |
| | | | | | | |

1 Code Orange Day, 36 Code Yellow Days, rest all Code Green Days

Analysis is based on draft data as of September 16, 2022.

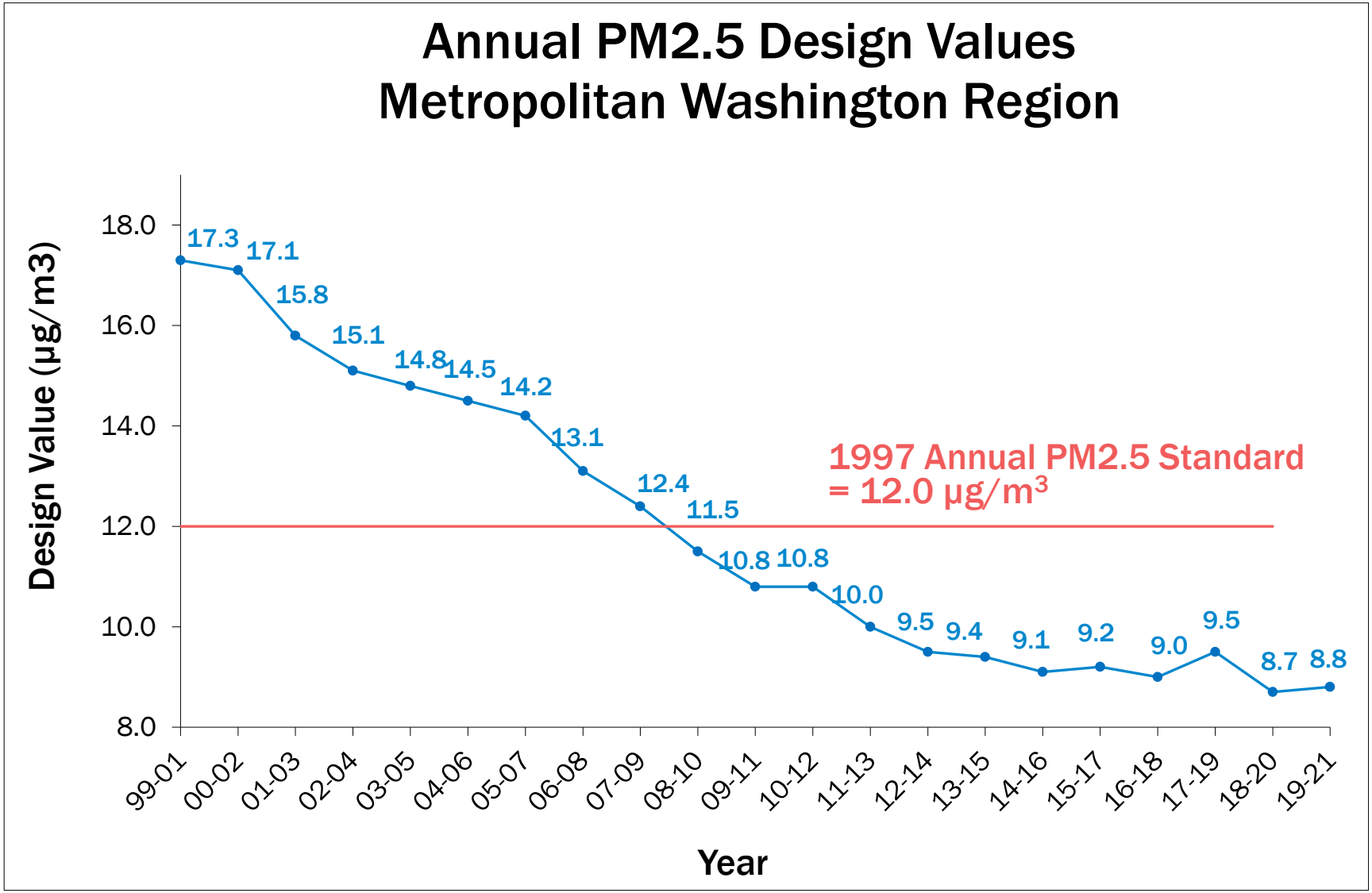
Metropolitan Washington Council of Governments

# PM2.5 Exceedance Trend

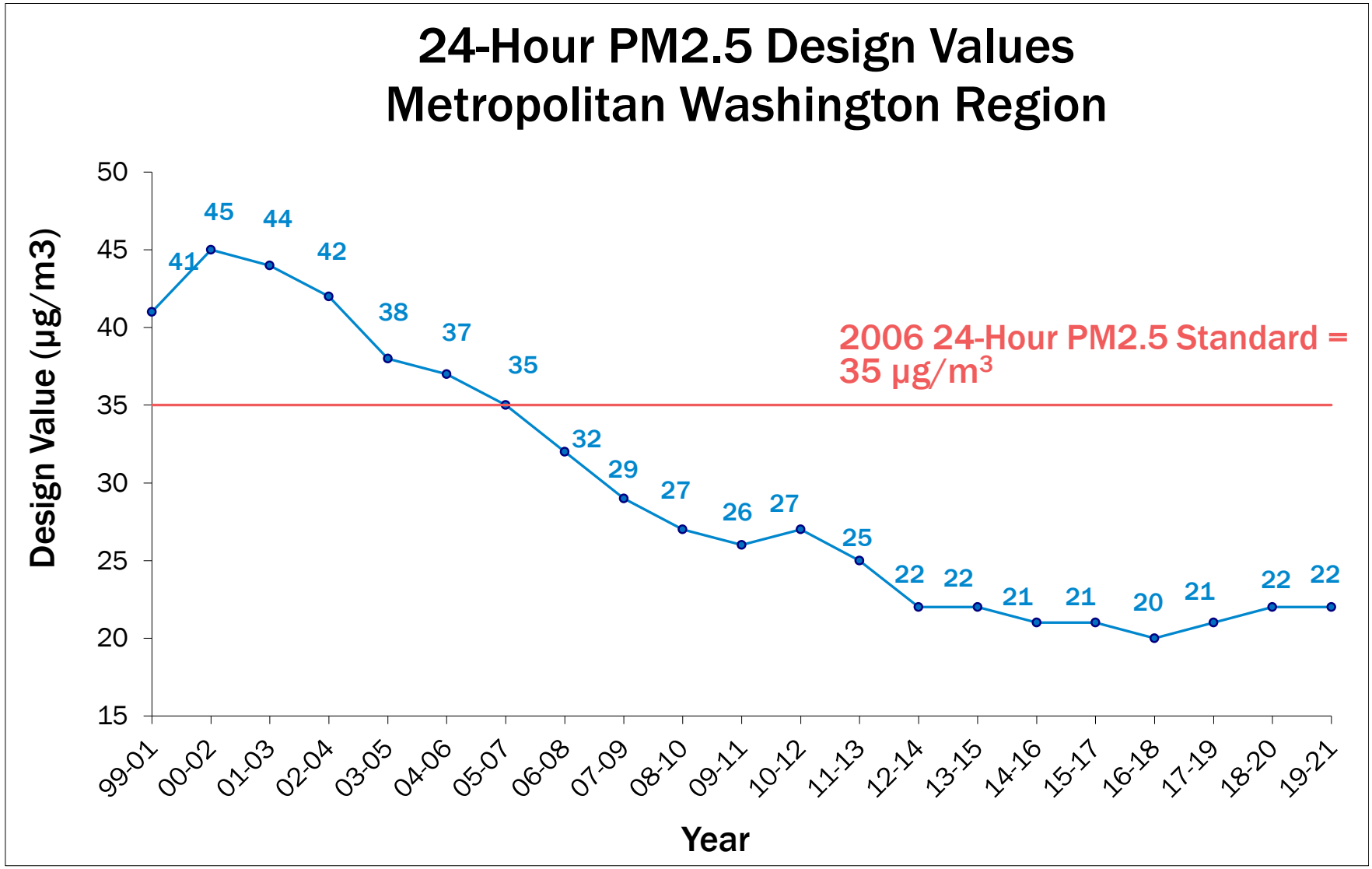



2022 data is draft and incomplete as of September 16, 2022.

# Annual PM2.5 Design Value Trend



# 24-Hour PM2.5 Design Value Trend




Metropolitan Washington Council of Governments

# Geographical Extent of Exceedances - 2022

June 15 – 1 Monitor (McMillan, Washington, DC)

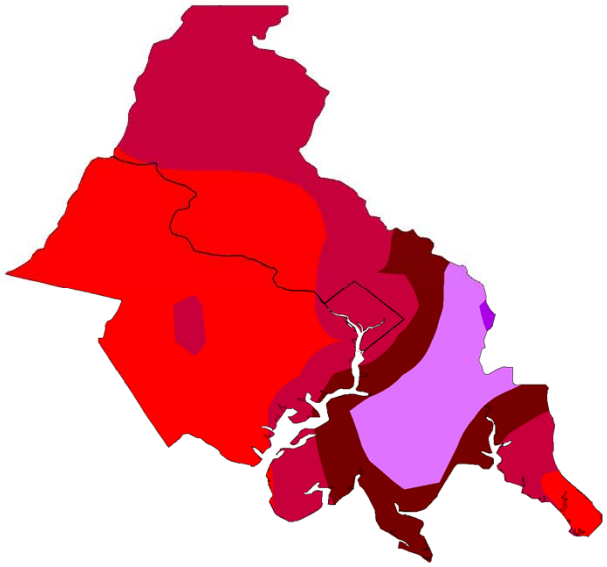
June 22 - 1 Monitor (McMillan, Washington, DC)

June 30 - 5 Monitors
McMillan, Washington, DC
Beltsville, MD
Fredrick, MD
Rockville, MD
Loudoun, VA

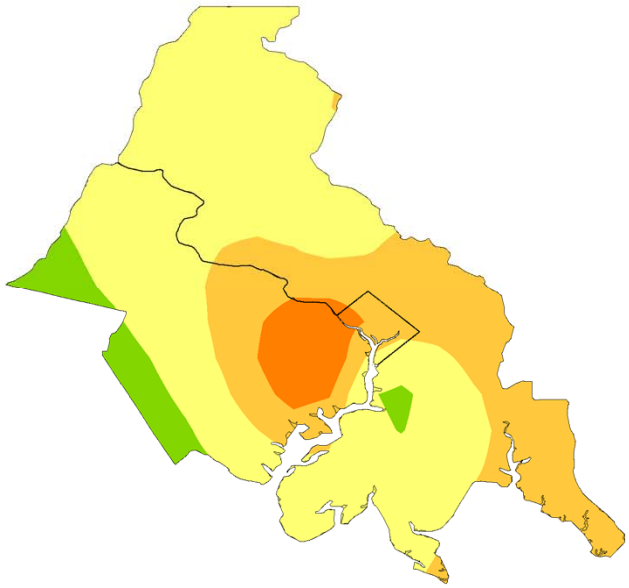
* Draft data as of September 16, 2022.

# Geographical Extent of 2015 Ozone NAAQS Violations Over Time

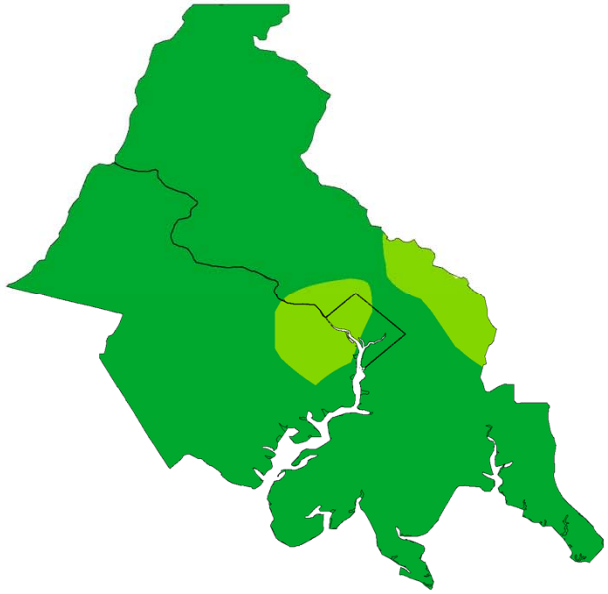
2000

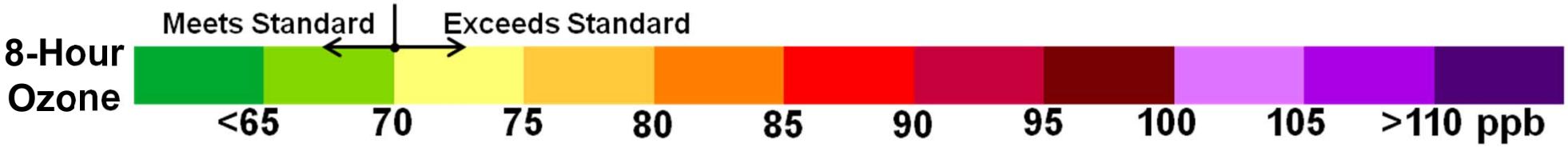


2010



2021






Credit – Maryland Department of the Environment

# Ozone Level Needed in 2023 To Violate 2015 Ozone NAAQS

| Monitor | Draft Design Value (2020-22) (Ppb)* | 4Th High Ozone Needed in 2023 (ppb) | Observed 4th High Ozone (ppb) in 2022* | Highest 4th High Ozone in Last 5 Years |
|---|---|---|---|---|
| Beltsville (MD) | 67 | 75 | 61 | 75 (2019) |
| McMillan (DC) | 67 | 74 | 66 | 73 (2018) |

* Observed draft data as of September 16, 2022.

# Conclusions

- 2022 is 2nd lowest for ozone exceedances (2020 was lowest).
- Despite favorable weather (high temp, low wind) observed on many days, ozone exceedances were very limited in numbers (only 3).
- Exceedances in recent years indicate that most of the factors (high temp, low wind, recirculation, ozone transport, local emissions, and smoke) need to be present on any given day for an exceedance to occur.
- Lowest freight VMT observed in June/July 2022 since 2018. Could this indicate economic slowdown leading to low ozone levels this year?
- Violation of ozone NAAQS not impossible in 2023 after 2020 data is out of picture.
- Is relatively lower number of exceedances this year a temporary phenomenon or the start of a new trend of low ozone levels in the years to come?
- Is changing weather pattern due to climate change playing now a more important role?