



Possible Effects of COVID-19 Stay-At-Home Order on Kansas City Area Air Quality

May 11, 2020

The Missouri Department of Natural Resources is continuing to evaluate the possible effects on air quality of the COVID-19 stay-at-home order, issued for Kansas City beginning on March 24, 2020 through May 4, 2020. This is an updated analysis extending the initial analysis forward from April 15 through May 4. The trends during this additional time period remain similar to the initial time period.

Since the COVID-19 event is having an impact on emission from many sources across the country and the world, the following analysis is based on limited observational data and the department is not drawing conclusions as a result of this analysis.

An effect of the order is a reduction in motor vehicle traffic, because fewer people are commuting to work and fewer people are driving on the weekend. Motor vehicle exhaust is a significant source of nitric oxide (NO), which is oxidized in the atmosphere to nitrogen dioxide (NO₂). Therefore, a reduction in traffic would be expected to lead to a reduction in the NO₂ concentration in the air, especially near major highways.

The near-roadway NO₂ monitoring network was established to measure the population exposure to peak 1-hour NO₂ concentrations. Peak 1-hour concentrations of NO₂ result from many sources that emit nitric oxide in addition to motor vehicles, including but not limited, to industrial boilers, furnaces, factories, power plants, fires, and certain home heating appliances. Therefore, these near-roadway sites were established within 50 meters (or 164 feet) of road segments with the highest traffic volumes in areas with populations of one million people or more to measure worst-case peak 1-hour NO₂ concentrations from all these sources in areas with the high population density.

It is important to recognize that ambient air NO₂ monitors alone are not able to directly identify the source of the NO₂ pollution they measure. Source apportionment of the monitored ambient NO₂ is a complex analysis involving many factors and is beyond the scope of this observational analysis.

NO₂, among other pollutants, is a precursor to ground level ozone. Unlike NO₂, ozone is not directly emitted by sources, but a pollutant formed in the atmosphere by very complex chemical

reactions involving oxides of nitrogen and volatile organic compounds in the presence of sunlight and other conducive weather conditions. Maximum ozone concentrations are typically monitored 10 to 30 miles down wind of precursor emission sources. The department intends to conduct more observational analysis of ozone concentrations during this period, but weather conditions during March and April are generally not conducive to producing significant peak ozone concentrations from precursor pollutants.

The Department operates a near-road air monitoring site (called Blue Ridge I-70) on the east side of Kansas City adjacent to I-70 about two miles east of the I-435 interchange (Figure 1). This site is not in violation of the NO₂ national ambient air quality standard (NAAQS); see dnr.mo.gov/env/apcp/docs/nitrogendioxidemonitordata.pdf. However, data from this site still show the effect of vehicle traffic. We have evaluated NO₂ data from this site in the past: We calculated and graphed average NO₂ concentrations by time of day, and separately for weekdays, weekends and major holidays. The weekday averages clearly show higher concentrations during early morning and early evening, which are probably caused by increased commuter traffic at those times. The weekend averages do not show the same peaks, but do show an increase in the late evening.

To begin to evaluate the effect of the stay-at-home order on air quality, we generated the graphs described above for the period of March 24 to May 4 for 2019 and 2020. Graphs are shown on the following pages. The weekday graphs from the Blue Ridge I-70 near-road site (Figure 3) still show morning and evening peaks, possibly caused in part by truck traffic, but the NO₂ concentrations measured in 2020 are generally lower than those in 2019 for most of the day. The weekend graphs (Figure 4) for much of the day are similar, but the evening peak is much lower in the 2020 graph than in the 2019 graph.

Graphs from the Troost site in central Kansas City (Figures 5 and 6) do not show as much of a reduction from 2019 to 2020, suggesting that sources besides motor vehicles may contribute to the NO₂ concentration at that site.

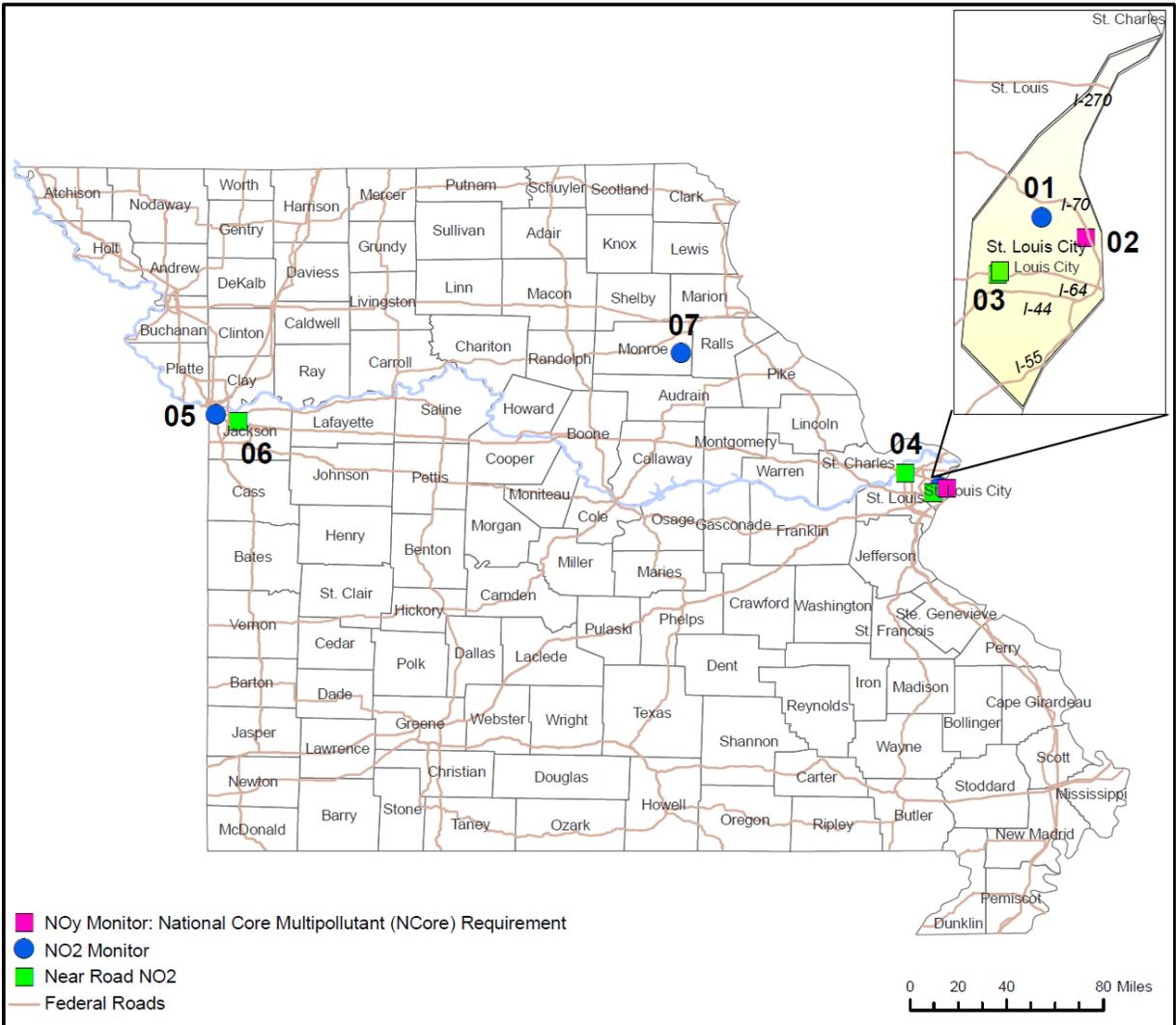
The Department will continue to evaluate the possible effects the stay-at-home order has on air quality by extending this analysis in time both as the order continues and when the order is rescinded and people return to usual activity. We will also evaluate other air pollutants for possible effects.

For more information about nitrogen dioxide, see the following EPA website, which includes links to additional information on health effects, standards, implementation, etc. at epa.gov/no2-pollution.



Figure 1. Blue Ridge I-70 air monitoring site, Kansas City

Figure 2. Missouri Statewide Nitrogen Dioxide (NO₂) Monitoring Network, 2020



St. Louis Area

- 01 Margaretta+
- 02 Blair Street**
- 03 Forest Park, I-64*
- 04 Rider Trail, I-70*

Kansas City Area

- 05 Troost
- 06 Blue Ridge, I-70*

Outstate Area

- 07 Mark Twain State Park***

*Near-Road sites
 **National (NCore) multi-pollutant site
 ***Background site
 +Discontinued Monitor



Figure 3. Weekday Nitrogen Dioxide (NO₂) Concentrations by Hour of the Day at Blue Ridge (KC)
 Near-Roadway Site
 Kansas City Area Stay-At-Home Order Effective on Mar. 24, 2020
 Data is from Mar. 24 to May 4 of 2019 and 2020
 (Preliminary Data)

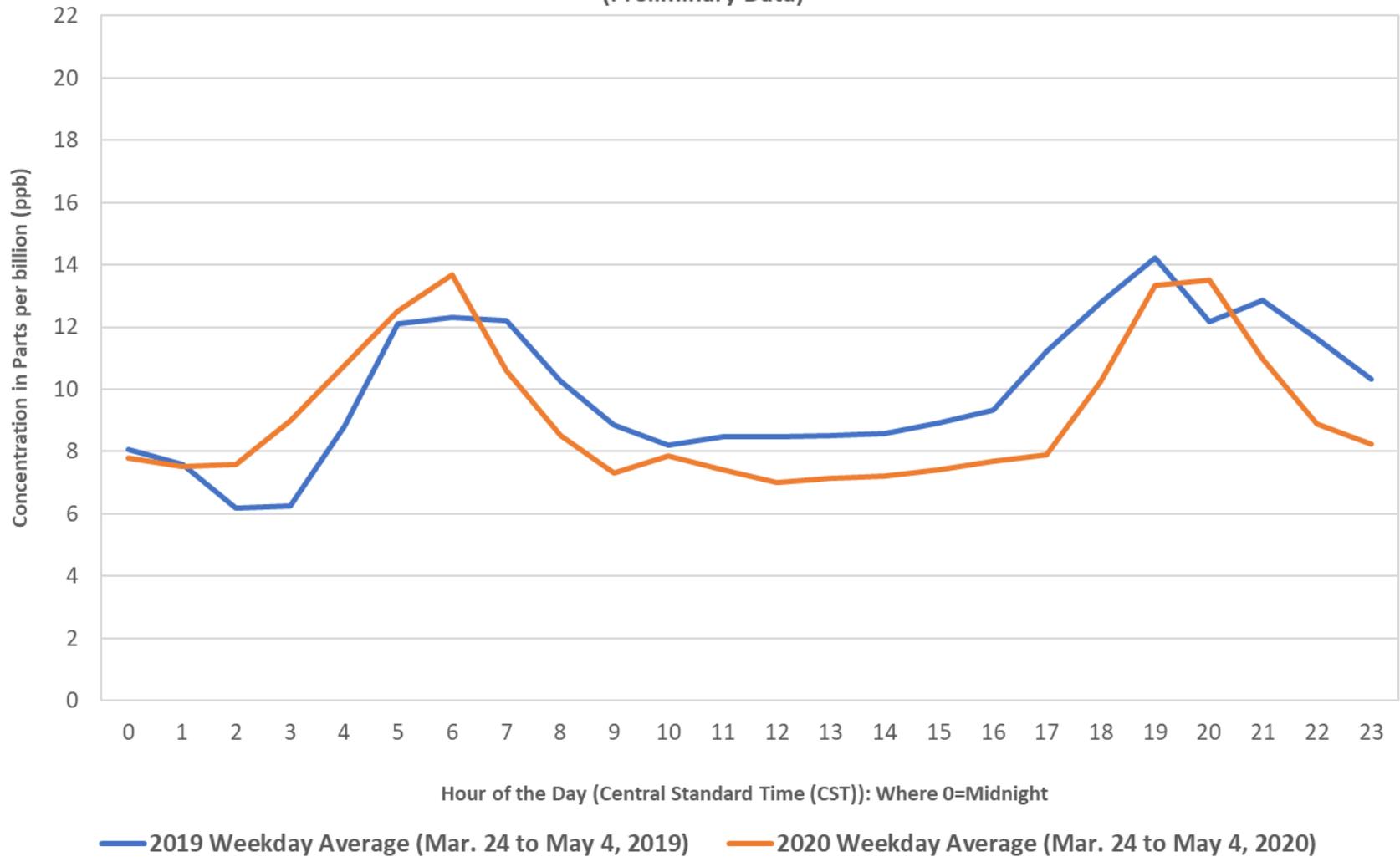


Figure 4. Weekend Nitrogen Dioxide (NO₂) Concentrations by Hour of the Day at Blue Ridge (KC)
Near-Roadway Site
Kansas City Area Stay-At-Home Order Effective on Mar. 24, 2020
Data is from Mar. 24 to May 4 of 2019 and 2020
(Preliminary Data)

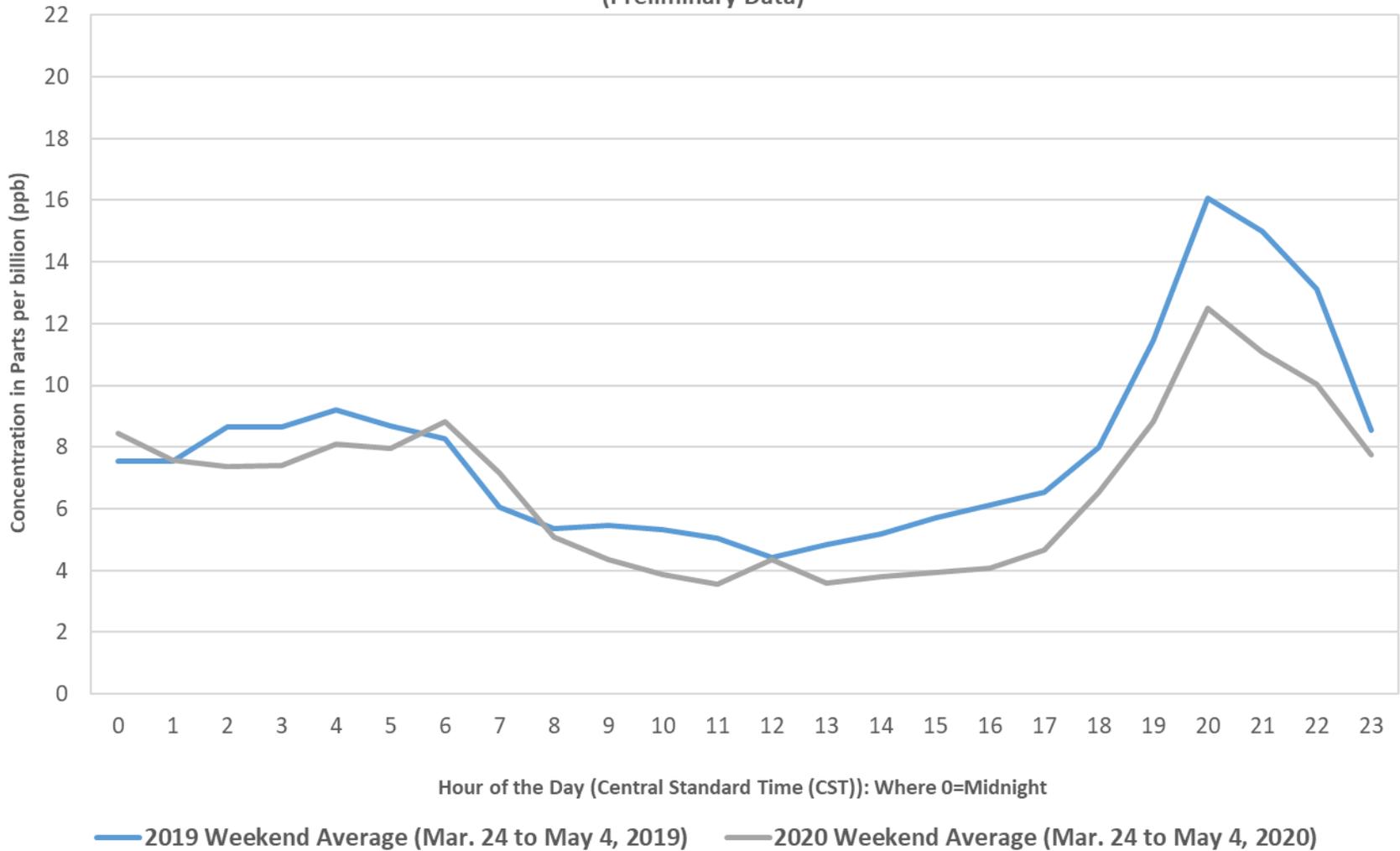
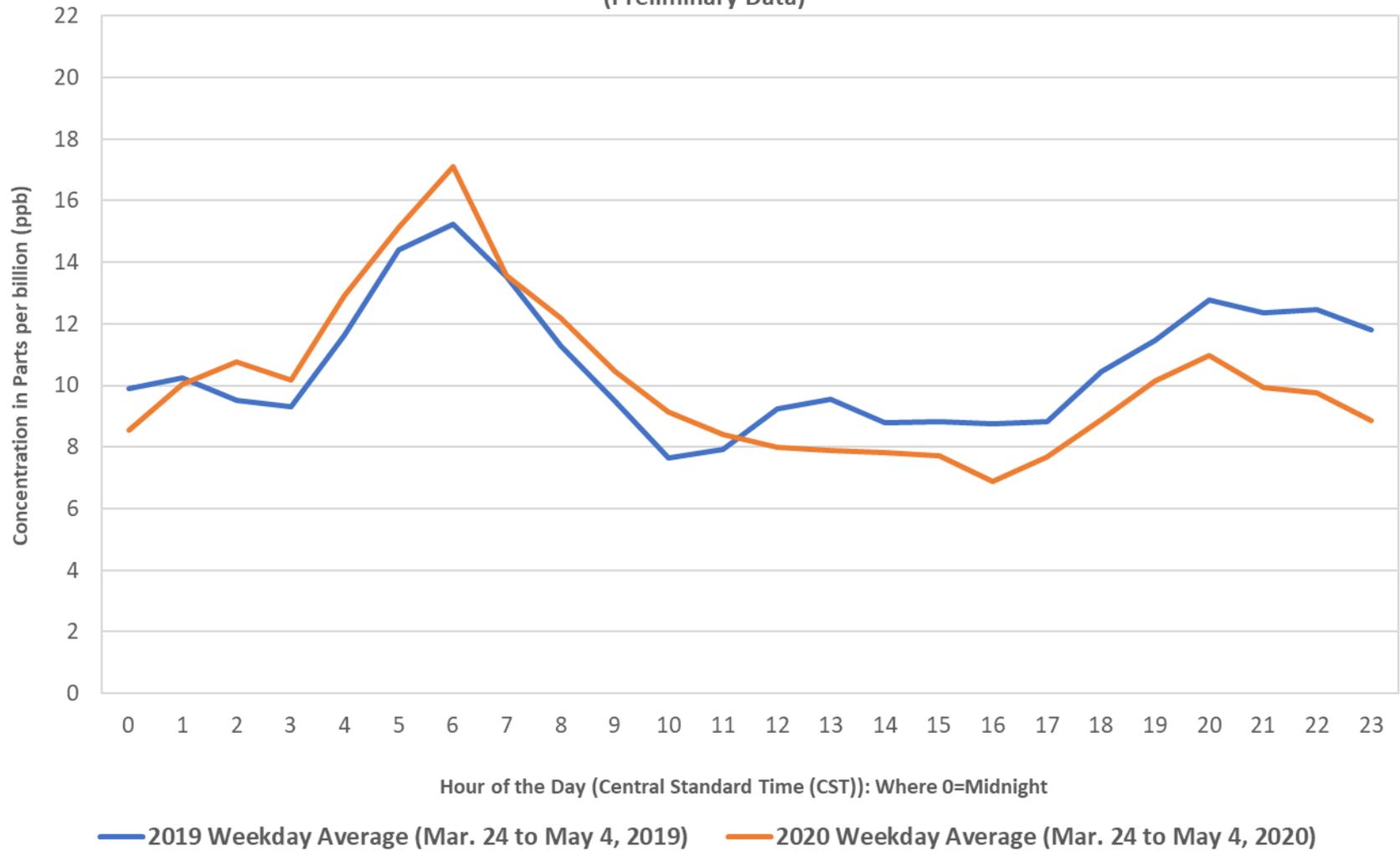


Figure 5. Weekday Nitrogen Dioxide (NO₂) Concentrations by Hour of the Day at Troost (KC)
 Area Wide Site
 Kansas City Area Stay-At-Home Order Effective on Mar. 24, 2020
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 (Preliminary Data)



**Figure 6. Weekend Nitrogen Dioxide (NO₂) Concentrations by Hour of the Day at Troost (KC)
Area Wide Site
Kansas City Area Stay-At-Home Order Effective on Mar. 24, 2020
Data is from Mar. 24 to May 4 of 2019 and 2020
(Preliminary Data)**

