



Diesel particulate concentrations in the I-5 corridor, Portland

Summary

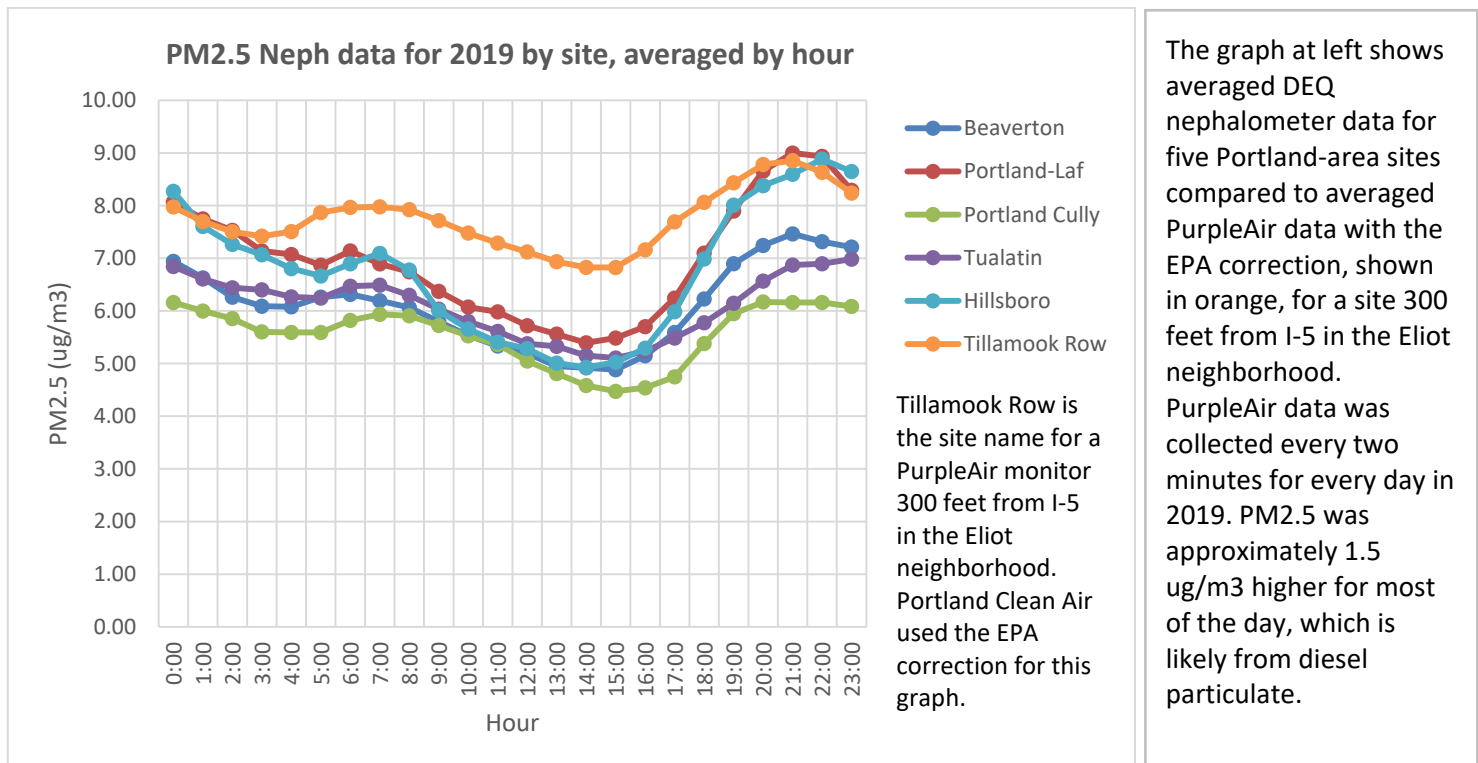
The EPA 2014 National Air Toxics Assessment released August 2018 ranks Multnomah in the worst 1% of counties for exposure to diesel particulate. ODOT reports the highest Portland diesel truck counts on I-5. This is the first study ever to report diesel particulate levels in a Portland neighborhood near I-5 using collected data from a particulate monitor. EPA does not collect Portland monitor data. DEQ has monitored the Portland-area since 1985 but has never taken a sample in a Portland neighborhood near I-5.

This report compares an entire year of DEQ particulate data from five Portland-area sites to an entire year of PurpleAir data collected in the Eliot neighborhood in a site 300 feet east of I-5. All PurpleAir data in this report has the EPA correction which we demonstrate produces a result of similar accuracy to DEQ monitors. This data suggests dangerously high diesel particulate levels in the Eliot neighborhood, which are likely to be similar for Portland neighborhoods east of and adjoining I-5, and worse on the west side of I-5.

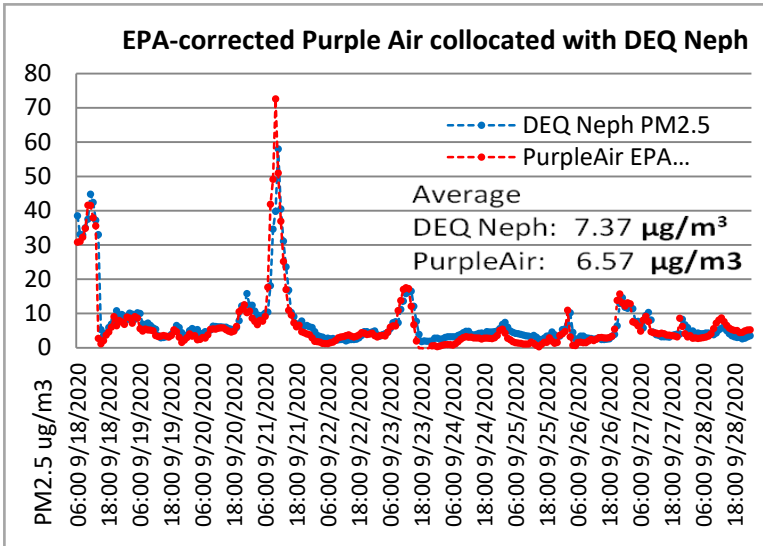
We also compared black carbon levels for a site 100 feet east of I-5 in Tualatin to three other Portland sites using DEQ aethalometer data to determine the likely concentration of diesel particulate in neighborhoods east of and adjoining I-5, such as the Eliot PurpleAir site. This data suggests these areas of Portland closest to and east of I-5 have an annual average of 2.4 ug/m³ to as high as 3 ug/m³ of airborne diesel particulate, which would cause 800 - 1,000 cancers per million people. For comparison, under DEQ Cleaner Air Oregon rules, the worst cancer risk allowed for an industry smokestack is 200 cancers per million for facilities currently operating in Oregon and using the Best Available Control Technology.

Methods

In 2021, DEQ provided Portland Clean Air with all of their Multnomah and Washington County particulate monitor data including: nephelometer data from eight sites, aethalometer data from five sites, and Partisol Plus 2025 data from six sites. Portland Clean Air has averaged and graphed this data for the first time, online at: portlandcleanair.org/files/i5.html and explained here: portlandcleanair.org/files/reports/Diesel%20particulate%20monitoring.pdf



PurpleAir data with the EPA correction is nearly as accurate as DEQ particulate monitor data. The following graph shows EPA-corrected PurpleAir data from a Portland State University PurpleAir unit “Star Lab” downloaded from the Purple Air website compared to the collocated “Lafayette” DEQ nephelometer downloaded through the DEQ AQI website.



The ratio of diesel particulate and woodsmoke at a PM2.5 sample site can be determined by comparing aethalometer data. An aethalometer measures airborne organic and elemental carbon. DEQ has collected aethalometer data 100 feet east of I-5 in Tualatin and three other Portland-area sites.

DEQ Aethalometer readings

Site	Date Start	Date end	EC Carbon	OC Carbon
Cully	5/18	12/19	0.50	0.79
Humboldt School	1/17	12/19	0.54	0.97
Gresham	12/16	12/17	0.52	0.73
Tualatin I-5	1/17	12/19	0.96	1.35

The EPA PM2.5 Speciate Database reported that “Portland/Seattle woodstove combustion” is 80% OC, 17% EC; various other compounds make up the rest; diesel particulate is 53% OC, 42% EC; various compounds make up the rest. Portland Clean Air used these values to write a formula to calculate airborne woodsmoke and diesel particulate concentrations from OC/EC data.

Our results converting aethalometer data to diesel particulate and woodsmoke concentrations are consistent with diesel particulate tract averages reported in EPA 2014 NATA released in 2018 and higher than EPA tract average near I-5 as expected.

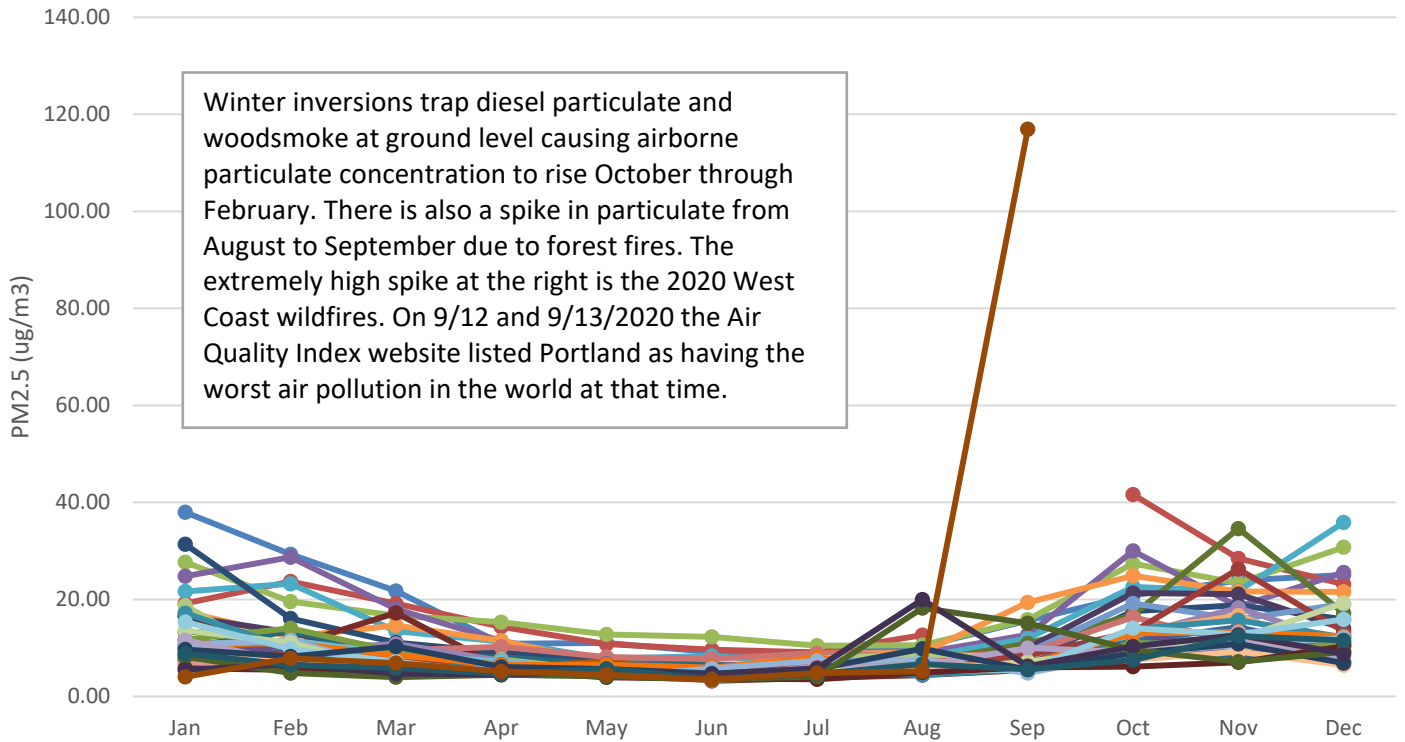
Site	Aethal. diesel	Aethal. woodsmoke	EPA NATA tract diesel
Cully	0.753	0.591	0.704
Humboldt School	0.758	0.814	0.944
Gresham	0.747	0.477	0.609
Tualatin I-5	1.527	0.885	0.678

ODOT counted 871 trucks in 24 hours approximately one thousand feet north from the Tualatin monitor site and 1,300 – 1,500 truck per 24 hours throughout I-5 in Inner NE and SW near the Ross Island Bridge. Because diesel particulate comes mostly from industrial trucks, neighborhoods near I-5 may have nearly double the diesel particulate as the Tualatin site. The high PurpleAir PM2.5 concentrations suggest this is true. This can be answered by DEQ taking aethalometer samples near I-5 in NE Portland.

The following data is from EPA 2011 National Air Toxics Assessment modeling study released in December 2015. “High” is the highest county census tract average. The cancer risk is calculated using California Office of Environmental Health Hazard Assessment published risk assessments. California reports that each .9 ug/m³ of diesel particulate causes 300 cancers per million people. So we calculate the DEQ Tualatin monitor site to have a cancer risk of 500 cancer per million. Inner NE neighborhoods near I-5 have nearly double the daily truck counts and likely have a much as double the cancer risk as the Tualatin site.

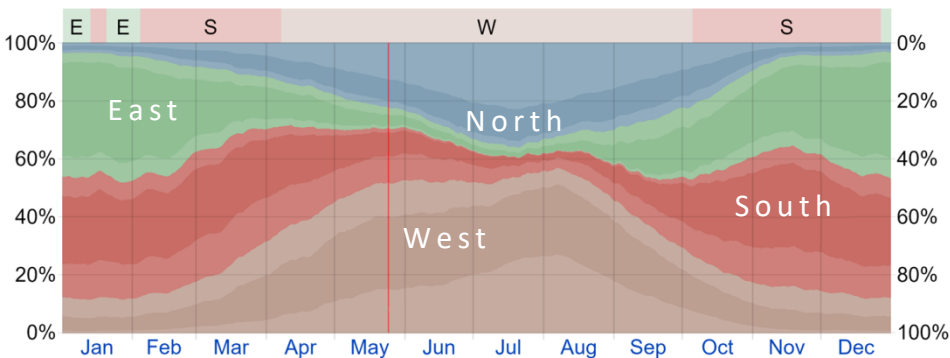
County		Diesel Particulate ug/m3	Cancer Risk (per million)
Multnomah	Avg.	0.8	270
	High	1.8	600
Washington	Avg	0.4	135
	High	0.8	270

1985 - 2020 DEQ Neph data, 5824 SE Lafayette St. Portland, averaged by month



According to weatherspark.com, Portland wind in winter, when diesel particulate is highest, is predominantly blowing north (from the south) and west (from the east) shown here:

Percentage of hours, average Portland wind direction



Conclusion

Due to predominant winter wind direction we expect Portland neighborhoods experiencing the worst diesel particulate are west of and adjoining I-5 which includes Eliot, Overlook, Kenton, Arbor Lodge, and Hayden Island. We expect residents in these neighborhoods living nearest to I-5 experience annual average diesel particulate concentration as high or higher than 3 ug/m3.

Oregon should ban unfiltered trucks statewide or in just the Portland area. California has already done this. Because I-5 is so close to Portland residential neighborhoods, ODOT should halt the

planned I-5 expansion which would increase I-5 traffic and congestion. Other cities have solved this problem by charging a toll. This does not require a toll booth. Modern toll systems use a sensor that counts trips to access a fee. These fees encourage commuters to use public transportation and car pooling. Highway tolls can be designed to cost less for low income people.

The Oregon legislature’s unwillingness to protect human health through legislation is because they accept unlimited corporate donations, a practice that is illegal in 45 states. This requires neighbors to make their demands and focus citizen action directly to unfiltered truck fleets and trucking purchasers instead of lobbying officials.

Written by Greg Bourget 2021.

Weatherspark. 2021. Portland Wind Direction. Online at: <https://weatherspark.com/y/757/Average-Weather-in-Portland-Oregon-United-States-Year-Round>

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