



# Linnton Air Monitor Report

3/30/23 Portland, Oregon

Linnton Neighborhood Association (LNA) is concerned about airborne petrochemicals being emitted by ten gasoline and asphalt companies in our neighborhoods. Linnton tank farm owners report over 36,000 pounds of annual petrochemical emissions to Cleaner Air Oregon using AP-42, a formula written by the oil industry, even though the US Environmental Protection Agency (EPA) recommends monitoring and source testing instead.

DEQ told Linnton Neighborhood Association they will not require monitoring and source testing of Portland tank farms in several meetings over the past two years. This is effectively an exemption from Cleaner Air Oregon, the only DEQ program that includes human health as a factor to regulate industrial air pollution.

Linnton neighborhoods often smell bad from foul odors that come from the petrochemicals tanks located nearby. Huge volumes of hazardous chemicals including ammonia and chlorine are transported in our neighborhoods by rail, tankers, and trucks to more than 538 active storage tanks. Air emissions from these sources affect 200 oil industry workers and 1,500 residents, often families with children.

For the past two years, LNA has requested DEQ:

- 1) Measure emissions from heated asphalt and heated residual oil tanks with EPA Method 204;
- 2) Conduct fence-line monitoring of Internal Floating Roof Tanks emissions of benzene, ethylbenzene, toluene, and xylene with EPA Method 325;
- 3) Provide Summa canisters to residents to measure neighborhood exposure of airborne petrochemicals.

**April 29, 2021:** LNA sent our report to Keith Johnson at DEQ documenting that tank farm emissions are likely much higher than are being reported, online here: <http://portlandcleanair.org/files/reports/Tank%20Farm%20v8%20web.pdf>

At that time, LNA sent DEQ a November 2020 EPA Enforcement Alert recommending monitoring and stack testing of tanks and that "AP-42 emission factors should only be used as a last resort":

"The Environmental Protection Agency (EPA) is concerned that some permitting agencies ... may incorrectly be using AP-42 ... Direct emissions testing of No. 6 fuel oil tanks and true vapor pressure testing in 2012 and 2013 ... resulted in emissions estimates that were understated by a factor of 100 for permitting and reporting purposes ... Applying VOC

testing results rather than AP-42 estimates [resulted in] a settlement with the United States and the Commonwealth of Massachusetts that required [Sprague Resources LP] to pay \$350,000 civil penalties, obtain revised state air pollution control permits, limit the amount of asphalt and No. 6 fuel oil stored in and passed through the tanks at six facilities, and provide odor controls on tanks at two facilities ... Global Partners LP [in South Portland, Maine] entered into a [similar] settlement with the United States."

LNA provided the Oregon Seismic Safety Policy Advisory Commission report to DEQ that concludes "some [Linnton] tanks contain non-petroleum hazardous chemicals such as ammonia and chlorine that are lethal if released ... If a Cascadia earthquake were to occur today ... aftereffects would be as devastating as the 2011 Fukushima nuclear meltdowns in Japan."

In response, Keith Johnson told LNA that they had set up a workgroup to review our research and that we would be invited to attend. We were never invited and DEQ did not share this workgroup's results.

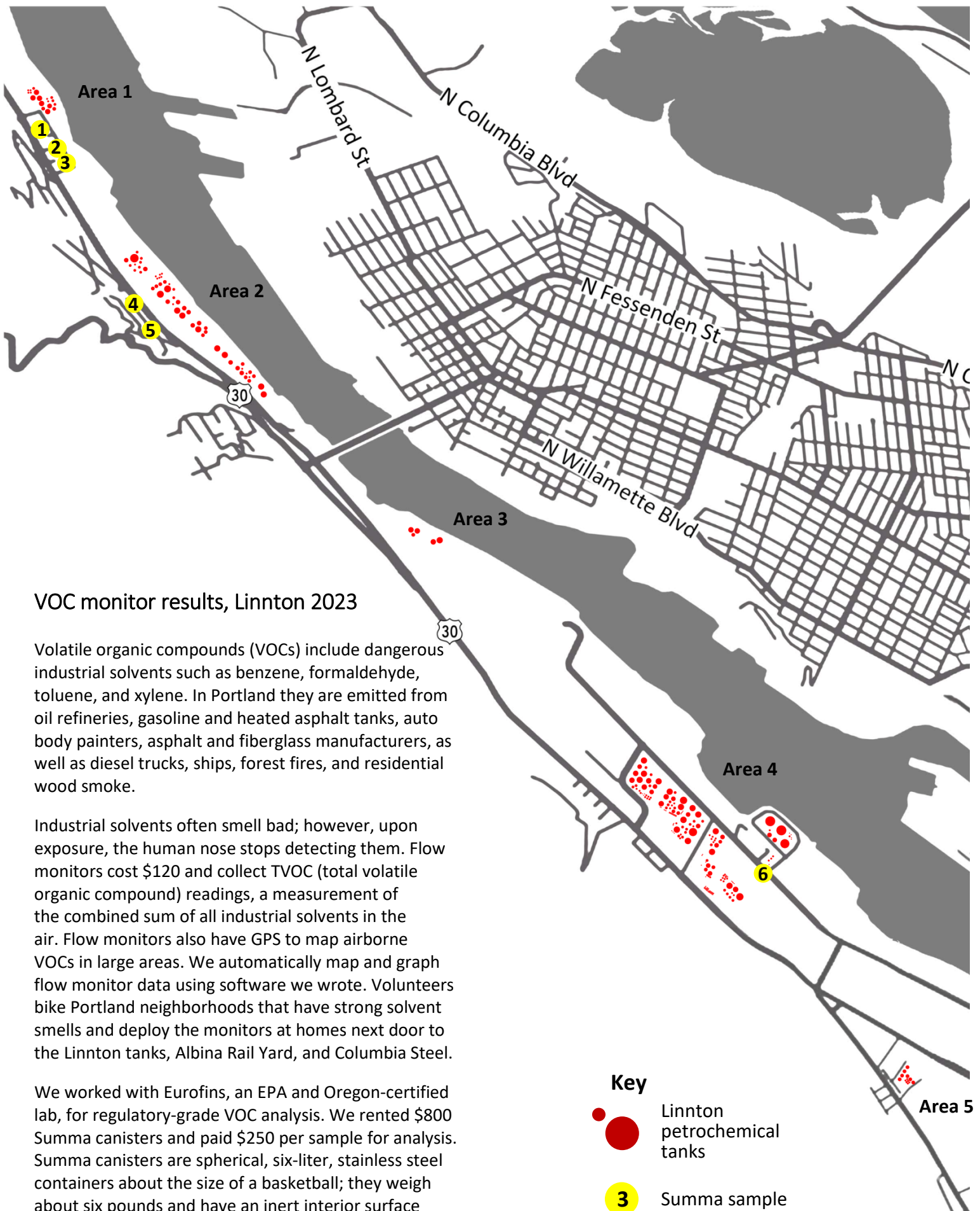
**January 14, 2022:** We sent a letter asking for an update and again requested monitoring and stack testing to measure tank emissions. In response, DEQ met with us on February 22, 2022, refused to monitor the tank farms or order the industries to test, and told LNA to wait at least three years for neighborhood air monitoring.

**March 2, 2022:** LNA re-submitted our requests by letter. On April 5<sup>th</sup>, Keith Johnson, Director of Cleaner Air Oregon, again refused to source test or monitor.

**December 6, 2022:** LNA made the same request of Matt Davis, the new Director of Cleaner Air Oregon; Matt Davis responded right away and arranged a meeting for February 7, 2023.

**February 7, 2023:** DEQ representatives heard and refused our request for source testing and monitoring.

This report is the result of LNA residents doing our own monitoring. We lack DEQ's well-funded lab, staff of experts, and regulatory-grade testing equipment. A small grant award allowed us to purchase stationary and mobile volatile organic compound (VOC) monitors and regulatory-grade Summa canister tests. We compared monitor data from a similar sized tank farm in South Portland, Maine, a state that banned AP-42, and chose monitors and source tests instead.



### VOC monitor results, Linnton 2023

Volatile organic compounds (VOCs) include dangerous industrial solvents such as benzene, formaldehyde, toluene, and xylene. In Portland they are emitted from oil refineries, gasoline and heated asphalt tanks, auto body painters, asphalt and fiberglass manufacturers, as well as diesel trucks, ships, forest fires, and residential wood smoke.

Industrial solvents often smell bad; however, upon exposure, the human nose stops detecting them. Flow monitors cost \$120 and collect TVOC (total volatile organic compound) readings, a measurement of the combined sum of all industrial solvents in the air. Flow monitors also have GPS to map airborne VOCs in large areas. We automatically map and graph flow monitor data using software we wrote. Volunteers bike Portland neighborhoods that have strong solvent smells and deploy the monitors at homes next door to the Linnton tanks, Albina Rail Yard, and Columbia Steel.

We worked with Eurofins, an EPA and Oregon-certified lab, for regulatory-grade VOC analysis. We rented \$800 Summa canisters and paid \$250 per sample for analysis. Summa canisters are spherical, six-liter, stainless steel containers about the size of a basketball; they weigh about six pounds and have an inert interior surface

- Key**
- Linnton petrochemical tanks
  - 3 Summa sample

manufactured for air sampling. Summa canister lab analyses report the airborne concentrations of 63 VOCs.

Twelve Summa canister samples were taken near four Portland industries – the CEI Hub tank farms in Linnton, Albina Rail Yard, Columbia Steel Mill, and Ecolube. We also sent Summa canisters to Corrales, New Mexico where neighbors monitor emissions next door to an Intel factory. Summa canisters were deployed at six Linnton locations and four came back with detectible VOCs. The Linnton results are shown at the right.

Total tank capacity for South Portland Maine is **279,671,489 gallons**. This is close to Linnton’s total tank capacity of **232,371,100 gallons**.

Using DEQ tank content data obtained, compiled, and mapped by Tony Schick at OPB, Dr. Peter Dusicka, and Gregory Norton, we calculated five Linnton tank areas’ **average contents**:

**Area 1: Kinder Morgan Linnton:**

Diesel	2,971,552
Gasoline	5,322,341
Waste/Water	95,962
<b>Total</b>	<b>8,293,893 gallons</b>

**Area 2: British Petroleum & Nustar:**

Cutter	242,718
Diesel	14,258,118
Ethanol	3,537,114
Gasoline	45,631,131
Oils	3,382,554
Additives	251,980
<b>Total</b>	<b>63,669,081 gallons</b>

**Area 3: NW Natural (Pacific Terminal Services)**

Oil	<b>98,256 gallons</b>
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**Area 4: Chevron, Kinder Morgan (Willbridge), Phillips 66, McCall**

Asphalt	4,591,860
Bunker	3,629,766
Diesel	11,644,041

Ethanol	3,557,668	Unrecognized	11,775,751
Gasoline	36,009,749	Additives	1,280,640
Jet Fuel	11,553,792	Waste/Water	810,529
Misc	873,571	<b>Total</b>	<b>71,860,447 gallons</b>
Oils	6,437,534		

**Portland CEI Hub Summa test results**

1	Area 1: Kinder Morgan Linnton	VOCs Detected	ppbv	ug/m <sup>3</sup>
	Sample Date: 4/5/2022	Ethanol	8.4	16
	Location: 45.60241, -122.78689	Acetone	15	36
	100 feet from tanks / fenceline	2-Propanol	8.4	21
	Stability: E – Slightly Stable	Hexane	0.96	3.4
		Toluene	0.82	3.1

2	Sample Date: 11/12/22	Toluene	0.94	3.5
	Location: 45.604, -122.79			
	100 feet from tanks / fenceline			
	Stability: G - Extremely Stable			

3	Linnton Community Center Between Area 1 & 2	VOCs Detected	ppbv	ug/m <sup>3</sup>
	Sample Date: 11/12/22	Ethanol	23	60
	Location: 45.599, -122.785			
	Between Area 1, 1600 feet & Area 2, 1800 feet			
	Stability: E - Slightly Stable			

4	Area 2: British Petroleum & Nustar	VOCs Detected	ppbv	ug/m <sup>3</sup>
	Sample Date: 3/6/22	None Detected	ND	ND
	Location: 45.590, -122.778			
	600 feet from tanks/ fencelines. Across Hwy 30.			
	Stability: D - Neutral			

5	Sample Date: 4/5/22	None Detected	ND	ND
	Location: 45.588, -122.772			
	100 feet from tanks			
	Stability: E - Slightly Stable			

		VOC's Detected	ppbv	ug/m <sup>3</sup>
6	Area 4: Chevron, Kinder Morgan (Willbridge), Phillips 66, McCall, & Zenith	Ethanol	19	36
	Sample Date: 3/6/22	Hexane	2.8	9.8
	Location: 45.561429, -122.735815	Cyclohexane	0.96	3.3
	300 feet from tanks / fencelines.	2,2,4-Trimethylpentane	1.2	5.7
	Stability: E - Slightly Stable	Benzene	0.69	2.2
		Heptane	0.71	2.9
		Toluene	2.2	8.4
		m,p-Xylene	1.1	4.9

## Comparing Portland, Oregon & South Portland, Maine's VOC monitor results

The most direct way to compare data from Portland, Maine and Portland, Oregon is to use Maine's annual average data. This data is from nine sites but Bug Light Park is the sample site with a tank proximity that is comparable to our Portland sample locations. All our tank distance data is obtained from Google maps by measuring the distance from the sample area to the nearest tank. Tank proximity is included in this report as an estimated distance from measured VOCs diffusing from a specific tank cluster. Gulf Oil and the nearby Portland Pipe Line Corporation (PPLC) tanks have a total capacity of around 65 million gallons of gasoline, distillates, and petroleum; this is comparable in size to Linnton's Area 2 at around 69 million gallons of mostly gasoline, diesel, and ethanol. Below is the average data for Bug Light Park for the past two years taken from Maine's DEP website, mainly focused on benzene, naphthalene, and toluene.

### South Portland, Maine Bug Light annual mean:

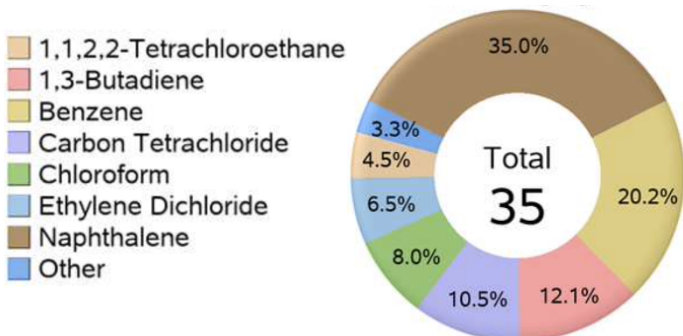
43.6523, -70.2344 700 feet from tanks.

**Capacity nearby: 65,113,403 Gallons**

VOCs	2020 ppb	2021 ppb	Current Year*
Benzene	0.287	0.317	0.334
Naphthalene	0.079	0.073	0.070
Toluene	0.528	0.793	0.828
Total aliphatics	21.602	22.730	25.147
Total aromatics	1.356	1.793	1.880

\*Current year is September 2021-August 2022.

Dr. Andrew Smith, Maine's State Toxicologist, authored a report in 2020 that calculated a cumulative lifetime risk of 35 people out of a million people getting cancer from these chemicals for residents living as close as the Bug Light site to the tanks.



**Bug Light site cancer risk per million**  
- Maine Dept of Health and Human Services

Using Cleaner Air Oregon Prioritization Risk Values, Cascadia Action calculated noncancer risk for average annual concentrations at Bug Light except chloroform which lacked sufficient data. Each chemical's hazard index was below one, meaning no noncancer health effects are expected.

Areas 2 and 4 are the only locations in the CEI Hub that store ethanol. Area 2 stores ethanol in internal floating roof tanks. Area 4 has ethanol stored in a combination of fixed roof, welded steel, and internal floating roof tanks. This suggests that the Area 1 samples showing a lot of ethanol were picking up emissions from the tanks in Areas 2 or 4.

Toluene was found near Area 1 at 0.82 ppb and 0.94 ppb, and near Area 4 at 2.2 ppb. Maine's highest yearly average for toluene was lower, at just .828 ppb. Linnton's Area 1 (13.8 million gallons) is roughly 1/5<sup>th</sup> the volume of the Gulf Oil/ PPLC terminal near Bug Light Park (65.1 million gallons). Yet Linnton's Area 1 showed toluene levels above average compared to a larger tank farm. Perhaps this toluene in Area 1 drifted from Area 4, which has a much larger capacity, roughly twice the size of the Gulf Oil/ PPLC terminal.

Benzene was only detected in our sample near Area 4 (149.2 million gallons) at a concentration of 0.69 ppb. This is double or more the yearly average reported near Bug Light Park (65.1 million gallons). Again, as with toluene, our Summa results near Area 4 seem to report more than 2x the concentrations as Bug Light's yearly averages, perhaps because of Area 4's larger size or particularly unfavorable wind direction or inversion.

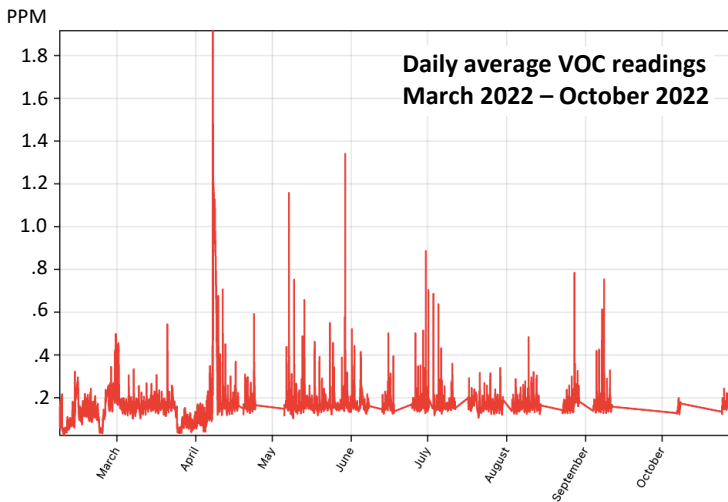
### Linnton Neighborhood Association request to DEQ

Linnton Neighborhood Association (LNA) requests that DEQ use EPA method 204 on heated asphalt tanks. This involves encapsulating the tank in plastic to measure all emissions. LNA requests DEQ use EPA Method 325 which involves passive steel sorbent tubes at facility property boundaries to measure VOCs. Lastly, LNA requests DEQ provide Summa canisters so residents using total TVOC monitors, explained on the next page, can capture air samples in neighborhoods at times of high concentration. LNA has collected all of the Summa canister samples funded by a recent grant award.

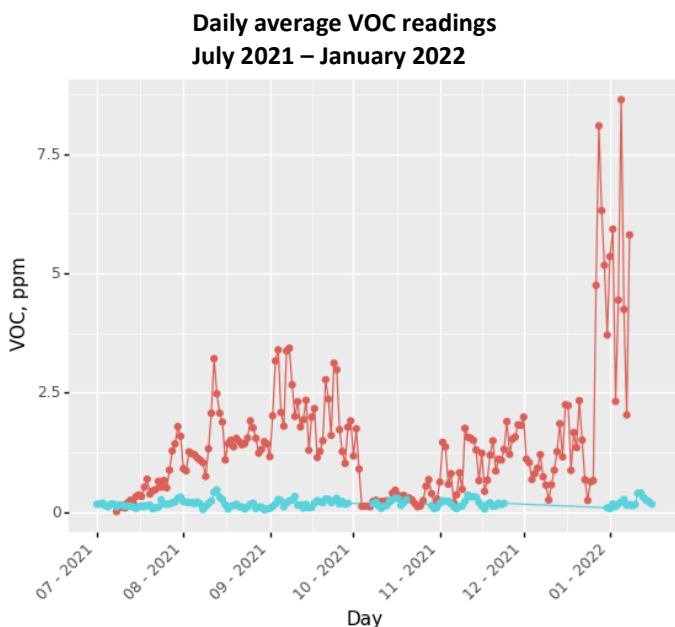
If you have questions or would like to donate to LNA's monitor fund contact:  
[greg@portlandcleanair.org](mailto:greg@portlandcleanair.org)

### Flow Total VOC monitors:

Linnton is now working with Cascadia Action to install \$120 Flow VOC monitors at several sites near the tanks. Flow uses Bluetooth to connect to a \$100 smartphone where software shows the results in real time and records all data collected. This portable, battery powered monitor has GPS and can be used to locate the source of airborne VOCs by walking or bicycling toward the source. The following graph was generated using Cascadia Action's auto-graphing software. This data is from a stationary Overlook neighborhood in Portland, Oregon and shows spikes of VOC concentrations presumably coming from the nearby Albina Rail Yard.



The Atmotube is a discontinued TVOC monitor nearly identical to the Flow monitor. This graph shows results from a Linnton site that is relatively far from the tanks, in blue, and much higher readings from a site next door to Columbia Steel in North Portland, in red:



Data analysis by Teodoro Holt and Greg Bourget  
02/14/2022, Cascadia Action

### Works Cited:

All Documents below can be found at:

[https://drive.google.com/drive/folders/1d9sTM44VOzLDt4bi0gY604jXFYRsunrz?usp=share\\_link](https://drive.google.com/drive/folders/1d9sTM44VOzLDt4bi0gY604jXFYRsunrz?usp=share_link)

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