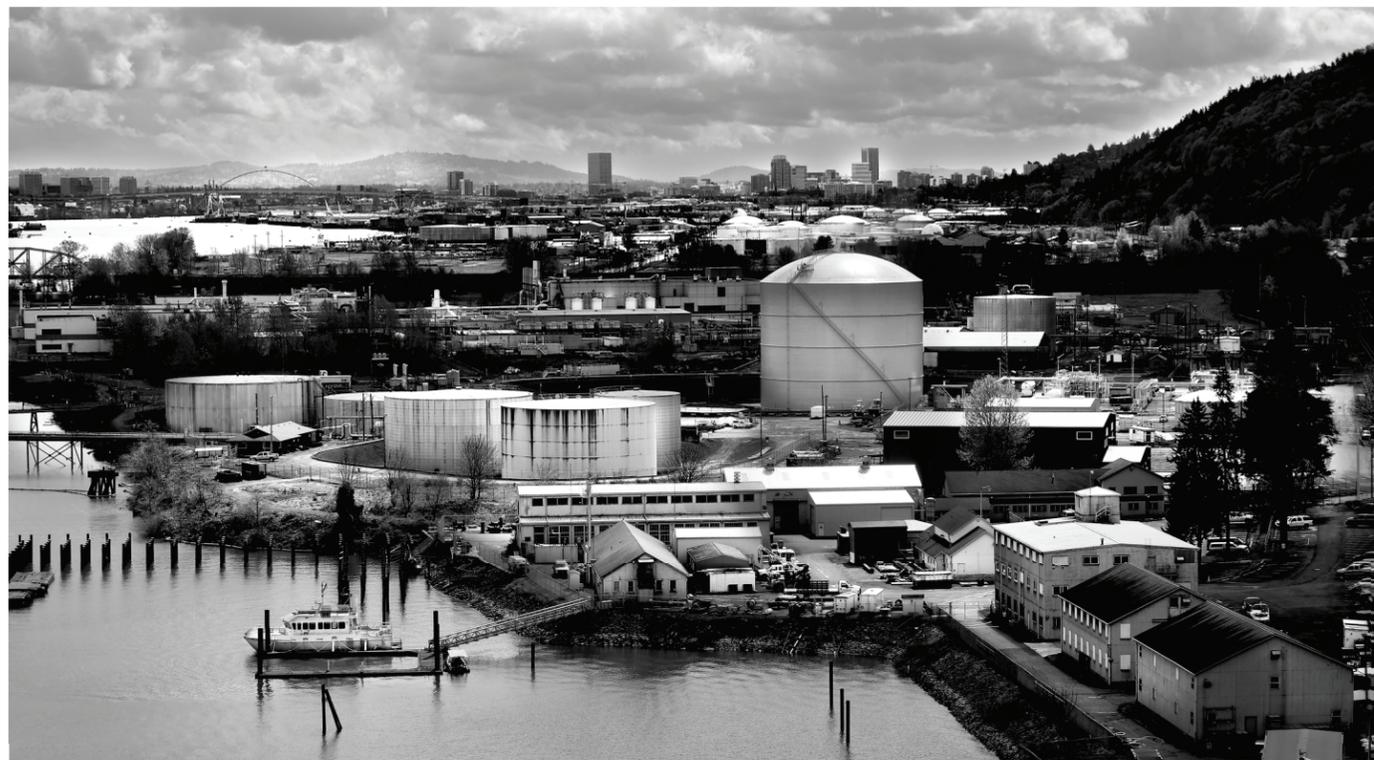




Linnton Tank Farm Report

V2, 3/16/21 Portland, Oregon



There are now 515 chemical storage tanks in NW Portland's Linnton neighborhood holding 90% of Oregon's petroleum supply. The tanks are built on fill prone to liquefy in an earthquake. These Linnton tank farms, AKA The Critical Energy Infrastructure (CEI) Hub, import three billion gallons of petrochemicals annually via pipeline, barges, and trucks according to the Oregon Department of Energy. Linnton has six hillside alcoves holding just under 1,500 people above St. Helens Road. These neighborhoods are surrounded by Forest Park, the ridge's 5,200-acre green gem.

Scientists predict the Cascadia earthquake will strike Portland with a magnitude of 8.7 – 9.2, as it has in the past. In December 2019, the Oregon Seismic Safety Policy Advisory Commission (OSSPAC) reported that "the CEI Hub is a major threat to safety, environment, and recovery after a Cascadia Subduction Zone earthquake on par with the 2011 Fukushima nuclear meltdown in Japan."

Tony Schick dubbed the CEI Hub "Oregon's Seismic Achilles Heel" in his 2015 OPB article which provided a map and database of the storage tanks, their contents, and the year they were built. Using Oregon Department of Environmental Quality (DEQ) and City of Portland data, OPB found 45 of the tanks currently being used were built between 1913 and 1920. The majority of tanks in use are over 50 years old, when seismic standards did not exist.

The OPB researchers compared historic topographic maps from 1905 that show where lakes, marshes, and the river used to be, but are now commercial and industrial areas. OPB found that the CEI Hub's fuel tanks, substations, pipelines, and transmission lines were built on fill instead of solid ground. Oregon's Department of Geology and Mineral Industries (DOGAMI) staff studied the CEI Hub and cited "major seismic vulnerabilities" due to "no or antiquated standards of building structure" and "soils susceptible to liquefaction."

OSSPAC's December 2019 report found that "Facilities like those at the CEI Hub have been damaged or destroyed in past earthquakes... A release of just a small portion of the liquid fuels at the CEI Hub would cause a spill of national significance, larger than any previous oil spill in US history...taking decades and tens of millions of dollars to clean up... Emergency response personnel would struggle to address the disaster occurring at the CEI Hub because roads, bridges, utilities, and communication systems would be damaged or destroyed."

In their publication on oil spill response, the EPA explains that if refined petroleum fuel products, crude oils, gases, and fuel additives spill or mix, they can ignite and release toxic chemicals. Also, some CEI Hub tanks contain non-petroleum hazardous chemicals such as ammonia and chlorine that are lethal, if released. These chemicals are transported regularly through the local area. This is especially dangerous to people working or living near the CEI Hub.

The CEI Hub contains a three- to five-day supply of fuel. Oregon Department of Energy testified that during a Cascadia earthquake event, "there will be no incoming fuel" due to widespread damage of pipelines. Alternative sources of fuel supply such as tankers and tanker trucks will be blocked due to disabled bridges and roads. Decentralizing and relocating our state's fuel storage onto bedrock is urgently needed to make the Cascadia earthquake less catastrophic for everyone in Oregon.

Who Can Act

A 2019 Oregon Senate Bill would have required owners and operators of bulk petroleum terminals to provide seismic vulnerability assessments to DEQ. This important first step toward regulation did not pass. The City of Portland and Multnomah County "have more direct control over the Hub than the state, but they have not used their authority to include seismic mitigation enforcement or require retrofits," according to OSSPAC.

In the Fall of 2019, Multnomah County passed a resolution to conduct a full risk assessment of the tank farms. John Wasitynski, Multnomah County

Director of Sustainability, said that we must hold the tank farm owners "accountable for the risks they pose to the community." The county pledged \$50,000 for the study and the city of Portland added another \$50,000. A contract was awarded in early August to assess the risk and monetary costs of a Cascadia event at the CEI Hub—an initial step toward a policy that makes companies pay upfront for the extensive damages that their infrastructure is likely to cause. This study is expected to be released in summer 2021.

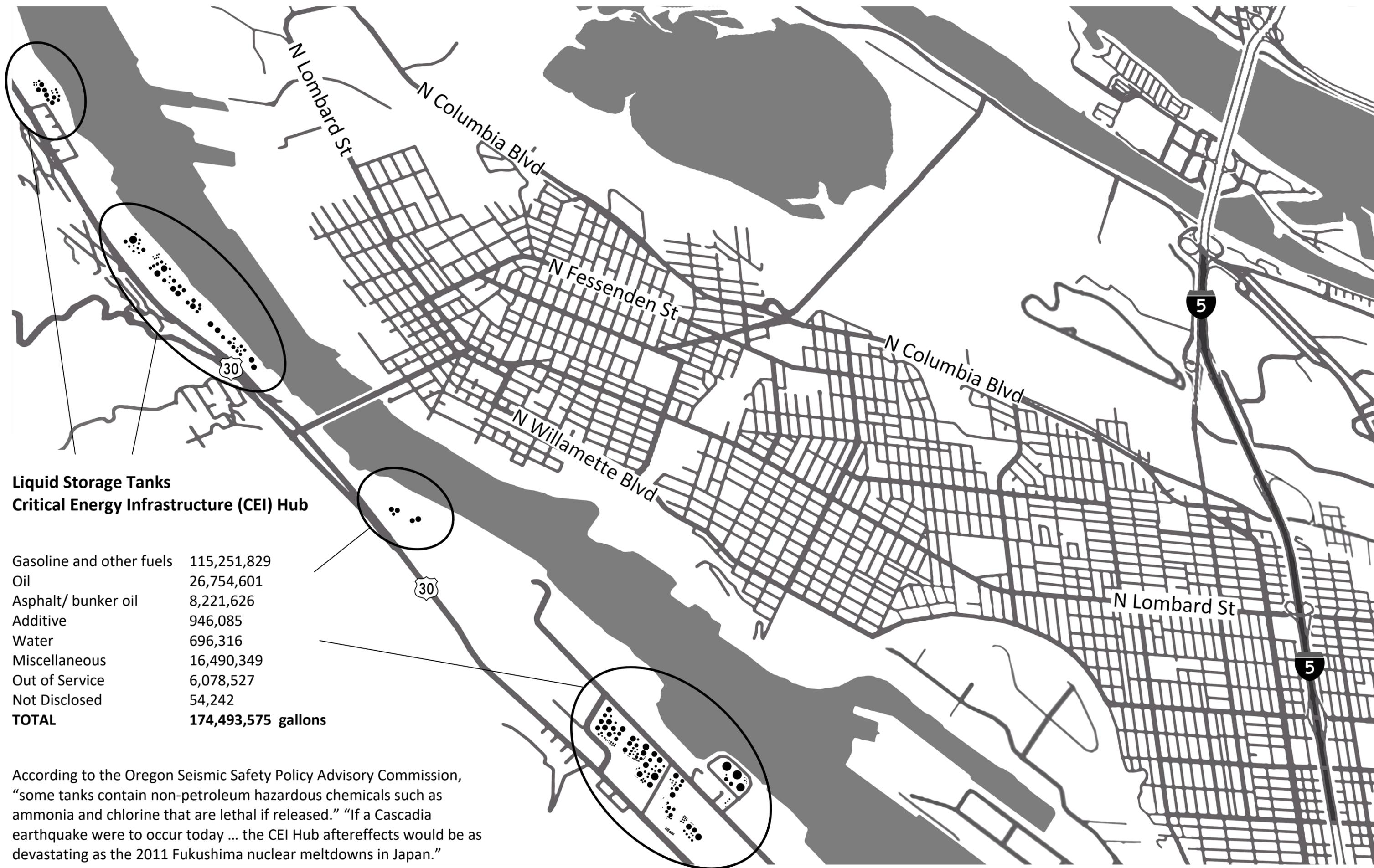
Better Examples

The Florida Department of Environmental Protection passed strict permitting and compliance regulations for liquid fuel storage in 1983 due to hurricane risks. These remain among the strictest laws in the US for both underground and above ground storage tank systems. Japan has successfully used mitigation strategies along shorelines. Mitigation of tank farm storage in New York includes constructing reinforced concrete containment walls around tanks at a facility which processes 1 million gallons of liquid fuel a day. Austin, Texas relocated its tank farms after community organizing pressure in 1993. In the fall of 2019, a Boise Idaho developer was negotiating with oil and gas companies to relocate "massive tank farms" because that property has become valuable for development.

How to Get Involved

Linnton Neighborhood Association is working with 30 local citizens' organizations to negotiate with oil and gas companies to voluntarily decentralize and relocate their tanks and infrastructure onto bedrock, and control their emissions. Volunteers are needed for research, editing, photography, and graphic design. Donations are needed to purchase monitors and to pay for lab analysis of air samples.

To volunteer or donate please email:
nancyhiser@comcast.net or
greg@portlandcleanair.org
or call (503) 995-5453



**Liquid Storage Tanks
Critical Energy Infrastructure (CEI) Hub**

Gasoline and other fuels	115,251,829
Oil	26,754,601
Asphalt/ bunker oil	8,221,626
Additive	946,085
Water	696,316
Miscellaneous	16,490,349
Out of Service	6,078,527
Not Disclosed	54,242
TOTAL	174,493,575 gallons

According to the Oregon Seismic Safety Policy Advisory Commission, "some tanks contain non-petroleum hazardous chemicals such as ammonia and chlorine that are lethal if released." "If a Cascadia earthquake were to occur today ... the CEI Hub aftereffects would be as devastating as the 2011 Fukushima nuclear meltdowns in Japan."

Hazardous tank farm air pollution

Hundreds of families in Linnton neighborhoods live within one to two thousand feet of giant gasoline and asphalt storage tanks. Yet the tank farm owners in Linnton have never reported measurements of petrochemicals being released into the air to DEQ. Instead they self-report by estimating their emissions using a model called AP-42 written by the oil industry. Recently the EPA ordered accurate measurements of tank farm emissions on the East Coast, finding that AP-42 vastly underestimated dangerous chemical releases.

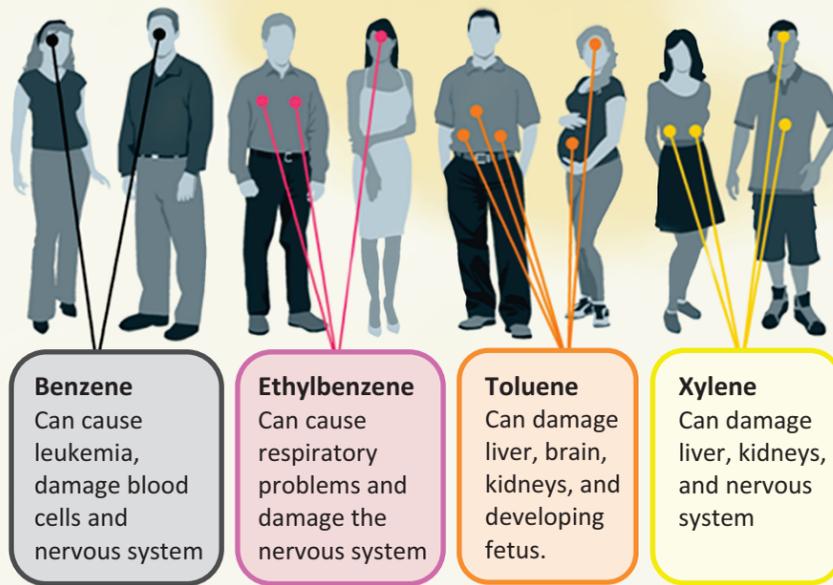
The types of tanks in Linnton that cause the most air pollution are internal floating roof tanks (IFRTs) containing gasoline and heated tanks containing asphalt and bunker fuel.

Asphalt and bunker oil is thinned with “cutter” so it can be transferred from tank to tank. Cutter stock can be any of dozens of chemicals including benzene, naphthalene, hexane, toluene, styrene, phenol. These hazardous chemicals evaporate from the tank during storage and transfer.

In 2012, the EPA ordered Global Companies to accurately measure emissions from a 3,360,000 gallon asphalt tank in South Portland, Maine and found 12,560 pounds of volatile organic compounds (VOCs) were being emitted annually from the tank’s exhaust vent. These results are similar to an EPA-ordered 2008 study of a Chelsea, Massachusetts asphalt tank. EPA fined both tank owners. McCall Oil in Linnton stores an average of 8,221,626 pounds of asphalt/bunker oil on site. Their numerous accidents include one spill of 8,400 gallons of bunker oil just a few hundred feet from the Willamette River. If the Global Companies study is predictive of Linnton asphalt tanks, then McCall would be emitting 30,733 pounds of VOCs annually.

When you store gasoline at home, those red plastic containers are tightly sealed. Otherwise your garage would reek of gasoline. Linnton IFRTs, which contain up to four million gallons of gasoline each, cannot be tightly sealed or they could implode or rupture due to the expansion or contraction of the contents. So, there is a gap at the edge of the floating roof. Enormous amounts of gasoline vapors collect and must be vented and removed so they do not accumulate above

Health effects of airborne tank farm chemicals



All four chemicals irritate the eyes, nose, throat, and skin to varying degrees. Headaches, dizziness, lightheadedness, nausea, and vomiting are also universal reactions to these chemicals.

Sources: National Institute for Occupational Safety and Health (NIOSH); Agency for Toxic Substances and Disease Registry (ATSDR); California’s Office of Environmental Health Hazard Assessment (OEHHA); health experts Celeste Monforton and Wilma Subra. Paul Horn/ Inside Climate News

the floating roof and explode. These emissions in Linnton could easily be mitigated with a control device but instead they are dumped into the air.

EPA’s documentation of AP-42 cites a “limited availability of actual tank test data” for IFRTs but includes a 1979 study by Radian Corporation that tested a 926,310-gallon IFRT gasoline tank. The IFRT in the Radian study was measured to emit 28,324 pounds per year — the AP-42 model underpredicted this tank’s emissions by as much as 59%.

BP and Kinder Morgan own almost half of the IFRT gasoline stored in Linnton. They both reported Emissions Inventories to DEQ’s Cleaner Air Oregon by estimating emissions using AP-42. The combined self-reported emissions for these two industries totaled 11,946 pounds of VOCs annually coming from over 30 million gallons of gasoline and jet fuel stored in IFRTs. This is very close to the amount the Radian study found was emitted from just a single IFRT holding almost a million gallons of gasoline, after adjusting for Portland’s lower annual temperature — except these two industries are reporting this amount for 30x as much gasoline stored in 22 IFRTs without any control devices that reduce emissions. Something is fishy here.

We obtained a spreadsheet of all Linnton tanks and their contents from Portland Bureau of Emergency Management in July 2020. Our analysis found IFRTs in Linnton store an average of over 80 million gallons of gasoline, and to a lesser extent diesel, ethanol, and solvents. If the Radian study is predictive of the Linnton IFRTs, then they would be emitting over a million pounds of VOCs per year — far more than any other Portland industry. This takes into account the 56.5 F average Portland temperature which would roughly halve the IFRT emissions of the Radian study.

Solutions

We request that DEQ immediately order measurements of Linnton asphalt tank and IFRT emissions as well as airborne benzene, toluene, ethylbenzene and xylene levels in Linnton neighborhoods. Similar testing is already underway at Owens Brockway, Precision Cast Parts, Ecolube, and Columbia Steel to complete Health Assessments required by Cleaner Air Oregon. The most potentially dangerous Oregon industries to human health are required to complete Health Assessments based on DEQ ranking of their self-reported emissions data. The Linnton tank farms should not be exempted from Cleaner Air Oregon due to underreported emissions.

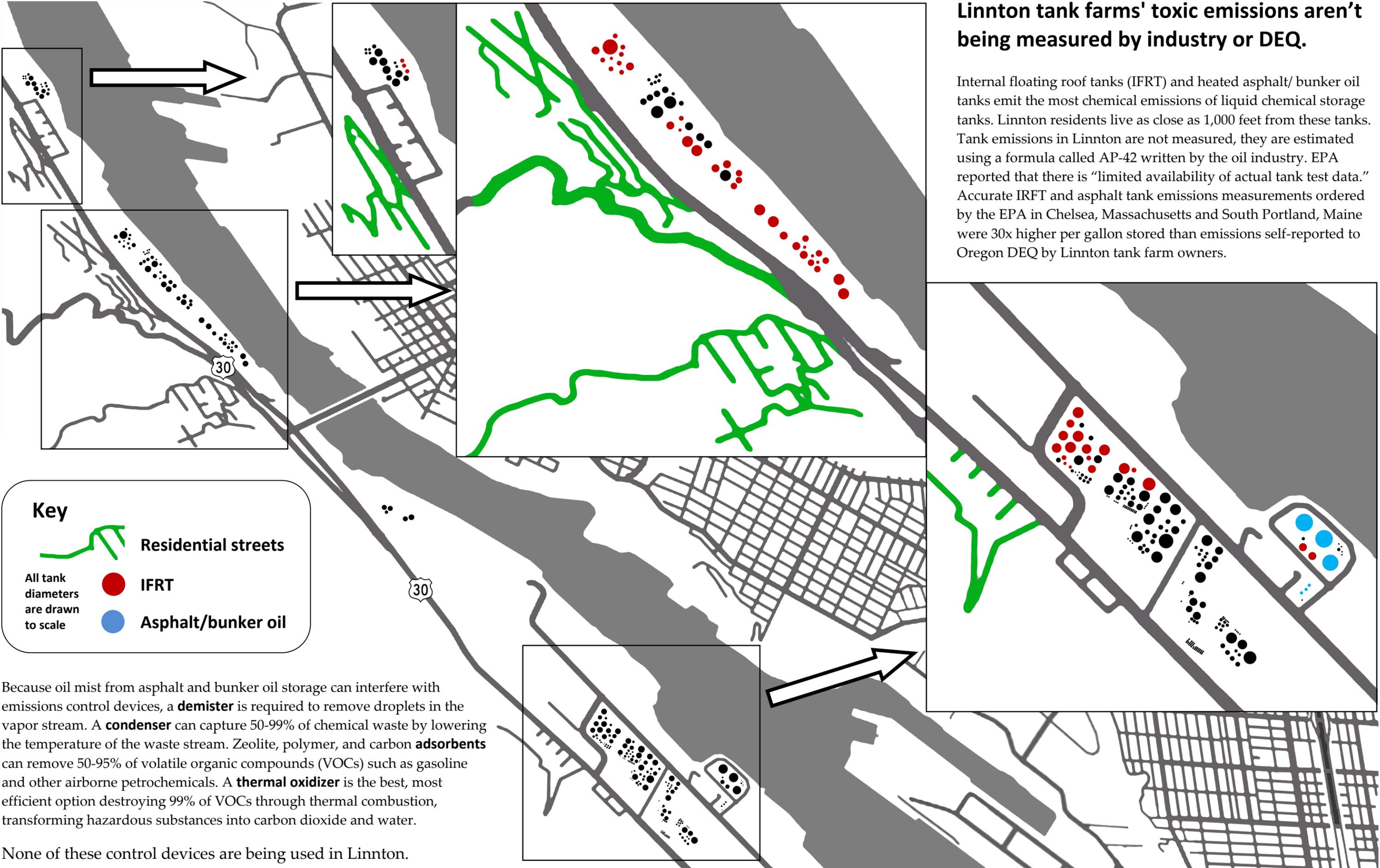
Linnton IFRTs and asphalt/bunker fuel tank owners should protect human health by installing thermal oxidizers on tank vents; these devices remove up to 99% of VOC emissions before they go airborne. Asphalt tanks also require a demister. The cost of controlling emissions is less than the hospital bills and other health-related costs of allowing the Linnton tanks to remain unregulated. And there is an incalculable cost to the quality of life when you smell dangerous industrial chemicals in the air by your home.

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Linnton tank farms' toxic emissions aren't being measured by industry or DEQ.

Internal floating roof tanks (IFRT) and heated asphalt/ bunker oil tanks emit the most chemical emissions of liquid chemical storage tanks. Linnton residents live as close as 1,000 feet from these tanks. Tank emissions in Linnton are not measured, they are estimated using a formula called AP-42 written by the oil industry. EPA reported that there is "limited availability of actual tank test data." Accurate IRFT and asphalt tank emissions measurements ordered by the EPA in Chelsea, Massachusetts and South Portland, Maine were 30x higher per gallon stored than emissions self-reported to Oregon DEQ by Linnton tank farm owners.



Key

-  Residential streets
-  IFRT
-  Asphalt/bunker oil

All tank diameters are drawn to scale

Because oil mist from asphalt and bunker oil storage can interfere with emissions control devices, a **demister** is required to remove droplets in the vapor stream. A **condenser** can capture 50-99% of chemical waste by lowering the temperature of the waste stream. Zeolite, polymer, and carbon **adsorbents** can remove 50-95% of volatile organic compounds (VOCs) such as gasoline and other airborne petrochemicals. A **thermal oxidizer** is the best, most efficient option destroying 99% of VOCs through thermal combustion, transforming hazardous substances into carbon dioxide and water.

None of these control devices are being used in Linnton.