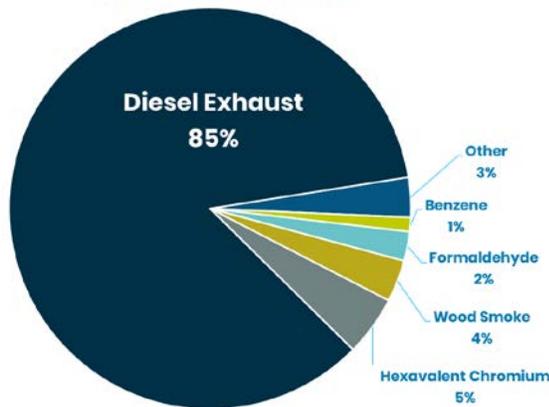


# Short Summary of the 2023 Tacoma and Seattle Air Toxics Study

The Puget Sound Clean Air Agency recently completed an EPA-funded study on air toxics in Tacoma and Seattle, measuring substances in the air that may pose health risks. The study's purpose was to update air toxics health risks and track trends dating back to 2003. Its findings are important in understanding changes over time and guiding public health responses.

**Diesel exhaust, specifically the tiny particles released from diesel engines, was identified as the biggest air pollution concern in our region.** It accounts for about 85% of the potential risk for cancer. In industrial areas, hexavalent chromium, a harmful chemical, poses the next highest potential cancer risk at 5%. To improve our estimates, we plan to conduct a follow-up study starting in 2024 specifically to measure hexavalent chromium.

Sources of Potential Cancer Risk from Air Pollution  
in the Puget Sound Region



Acrolein, another pollutant, was found to be the only air toxic exceeding safe levels for non-cancer health issues. Produced by burning wood, tobacco, or fossil fuels, acrolein irritates the lungs, eyes, and nose.

Although our region's population has grown by 30%, we have observed a **50% reduction in air toxics levels since monitoring began in 2003**. This significant decrease can be attributed to improved technology standards, including the adoption of cleaner trucks and fuels.

We also found **Black, Indigenous, and other people of color and lower income households in our region have**

**higher potential cancer risks from air toxics due to living near major roadways.**

A community-led portion of this study involved air sampling to follow up on the Duwamish Valley community's areas and pollutants of concern. Community members were most interested in metals and identified five locations for sampling: two industrial locations and two residential locations in South Park and Georgetown as well as the King County International Airport. We found that overall, **metals levels at these sites were similar to our existing Duwamish Valley air monitoring site**. Of the 11 metals measured, only hexavalent chromium and arsenic exceeded the one per million health threshold for cancer risk.

Overall, **we expect continued reductions in diesel exhaust**. The largest reduction comes from replacing diesel engines with newer, cleaner engines and electrification. Diesel engine replacement is typically very expensive, and old diesel engines can work for a long time. The Agency leverages grant funding to replace old diesel engines to help speed the transition to improved air quality. New state and federal climate regulations and programs will further decrease air toxics pollution over the next few years.

In addition to our work to reduce diesel exhaust, we also actively work on other sources of air toxics pollution. This includes our regular work with industry to comply with regulations through our inspection, permitting, and complaint response programs, as well as programs aimed at reducing wood smoke emissions.

**Full study report:** <https://pscleanair.gov/2023ToxicsReport>



# 2023 Tacoma and Seattle Air Toxics Trends Study

Community Report



## Overview

With funding from the US Environmental Protection Agency, the Puget Sound Clean Air Agency studied toxic air pollutants (“air toxics”) in the Tacoma and Seattle area. Air toxics comprise a group of hundreds of pollutants, which are known or suspected to cause serious health problems. Potential health effects include cancer, lung damage, heart disease, and nerve damage.<sup>1</sup>

Understanding the primary sources of air toxics can help regulatory agencies and policymakers form programs and policies to reduce emissions and protect public health.

**The study confirmed that diesel exhaust (from trucks, ships, trains, etc.) contributes most of the health risk from air toxics.** Hexavalent chromium (in industrial areas) and wood smoke were the next highest, each contributing about 5% of the total risk.

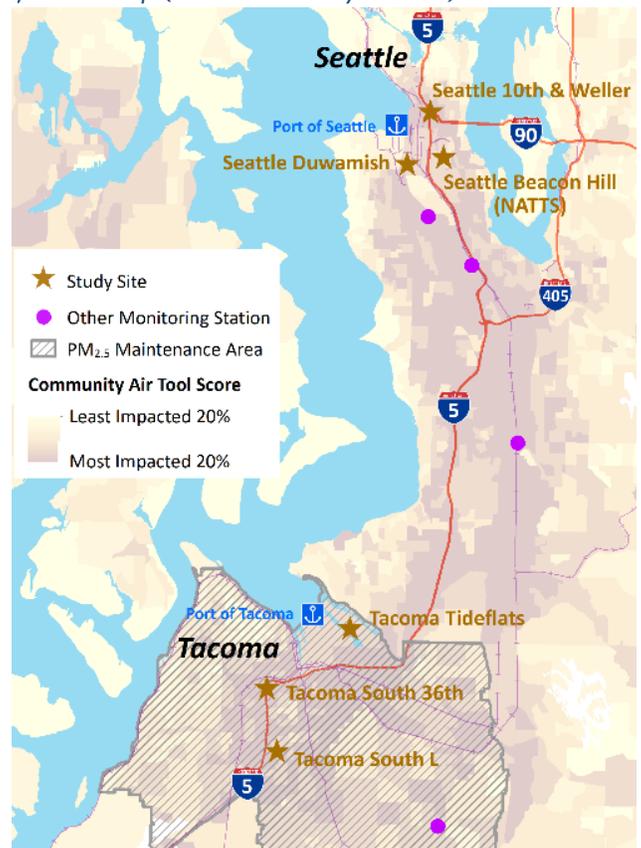
Although more needs to be done to reduce the public’s exposure to health risk from air toxics, the results of the study confirm that the Clean Air Agency should continue to target reducing diesel emissions to reduce air toxics risk from air pollution.

## Scope of the Study

This study is an update to help us track air toxics health risks and trends going back to 2003. This study also included community-directed air monitoring, which focused on metals at the Duwamish Valley community’s request.

We sampled at six sites over the course of a year spanning 2021–2022. These sites, which are in our routine regulatory network, were equipped with instruments that measure volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), PM<sub>10</sub> metals, and metal and ion speciated fine particles (PM<sub>2.5</sub> speciation).

Figure 1. Map of study sites, Tacoma–Pierce PM<sub>2.5</sub> maintenance area, and an Agency environmental justice map (the Community Air Tool) scores.



<sup>1</sup> US EPA “What are Air Toxics” Module, visited Oct 2023, [https://airknowledge.gov/Mod/What\\_Are\\_Air\\_Toxics/Web/index.html#/](https://airknowledge.gov/Mod/What_Are_Air_Toxics/Web/index.html#/)

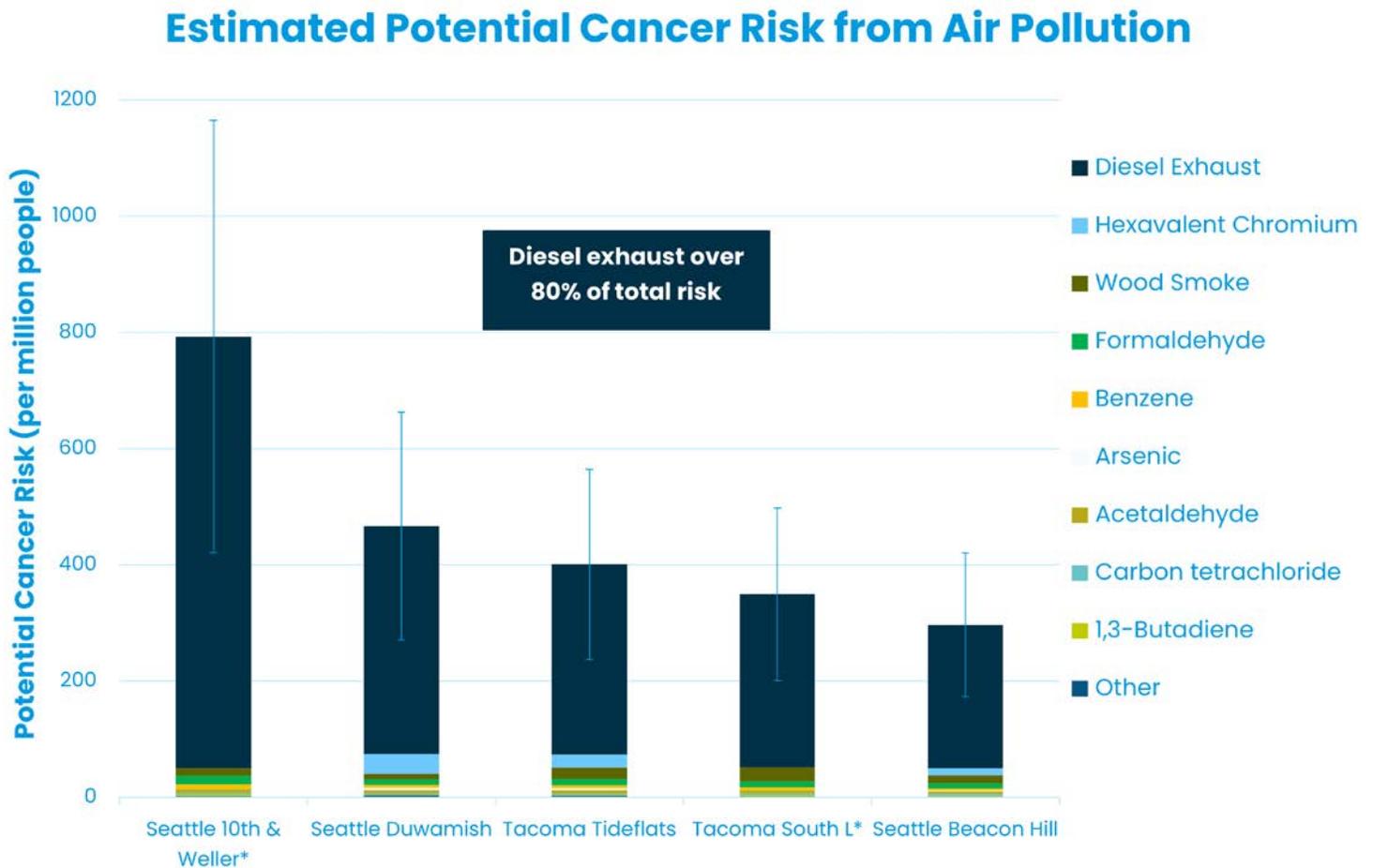
## Key Findings

**Our study's main finding was that overall cancer risk from air toxics continues to be dominated by the fine particles in diesel exhaust**, with around 85% of the risk across all sites. The other 15% is split between estimated hexavalent chromium (~6%), wood smoke (~4%), and other compounds. A total of 12 compounds had a risk over our health screening cancer threshold of one-per-million potential cancer risk. One compound, acrolein, was above the non-cancer health threshold. All other air toxics monitored (26 other types) were below both the cancer risk and non-cancer risk screening thresholds.

**Acrolein was the only compound above the non-cancer health threshold.** Levels of acrolein in our region are similar to other sites across the country. Acrolein is produced by vehicles and any type of burning. While acrolein does not pose any cancer risk, exposure to this pollutant can cause upper respiratory irritation.

Figure 2 below is a comparison of air toxics contributions to potential cancer risk at our study sites. Diesel exhaust is over 80% of the risk across all the sites, and the potential cancer risks range from 300 to 800 per million people. Diesel exhaust was highest at the near-highway site (10<sup>th</sup> and Weller), followed by the two port industrial valleys in Seattle and Tacoma (Duwamish Valley and Tideflats, respectively).

Figure 2. Estimated total potential cancer risk from air pollution at 5 Sites.

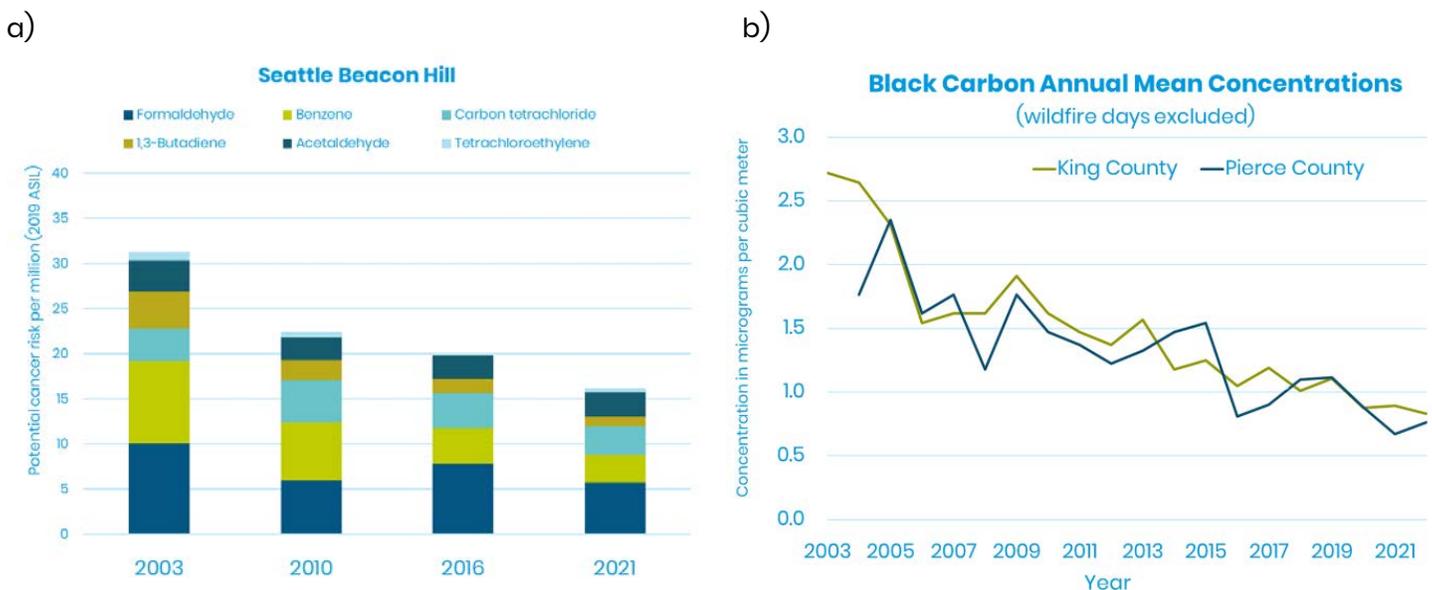


\* These sites do not have metals or VOC sampling and may be slightly underestimating potential

These air toxics contributions are consistent with our previous studies in our region dating back to 2003, showing that diesel particulate matter was and continues to be the major contributor to cancer risk from air pollution. We also found **wood smoke is still a contributor to air toxics risk in the region**, with levels of benzene and other air toxics at wood smoke sites comparable or higher than industrial sites.

Despite our region growing 30% in population, **air toxics levels have dropped by half since we started monitoring for them in 2003**. Improved technology standards, especially cleaner engines, fuels, and wood stoves have resulted in significant reductions in air toxics, particularly in diesel particulate matter. Figure 3a shows declines in measurable air toxics (excluding diesel exhaust). Figure 3b shows the trend in black carbon, which is a marker for diesel exhaust.

Figure 3. (a) Historical trend of VOCs and aldehydes at Seattle Beacon Hill. (b) Annual black carbon trend (a marker for diesel exhaust).

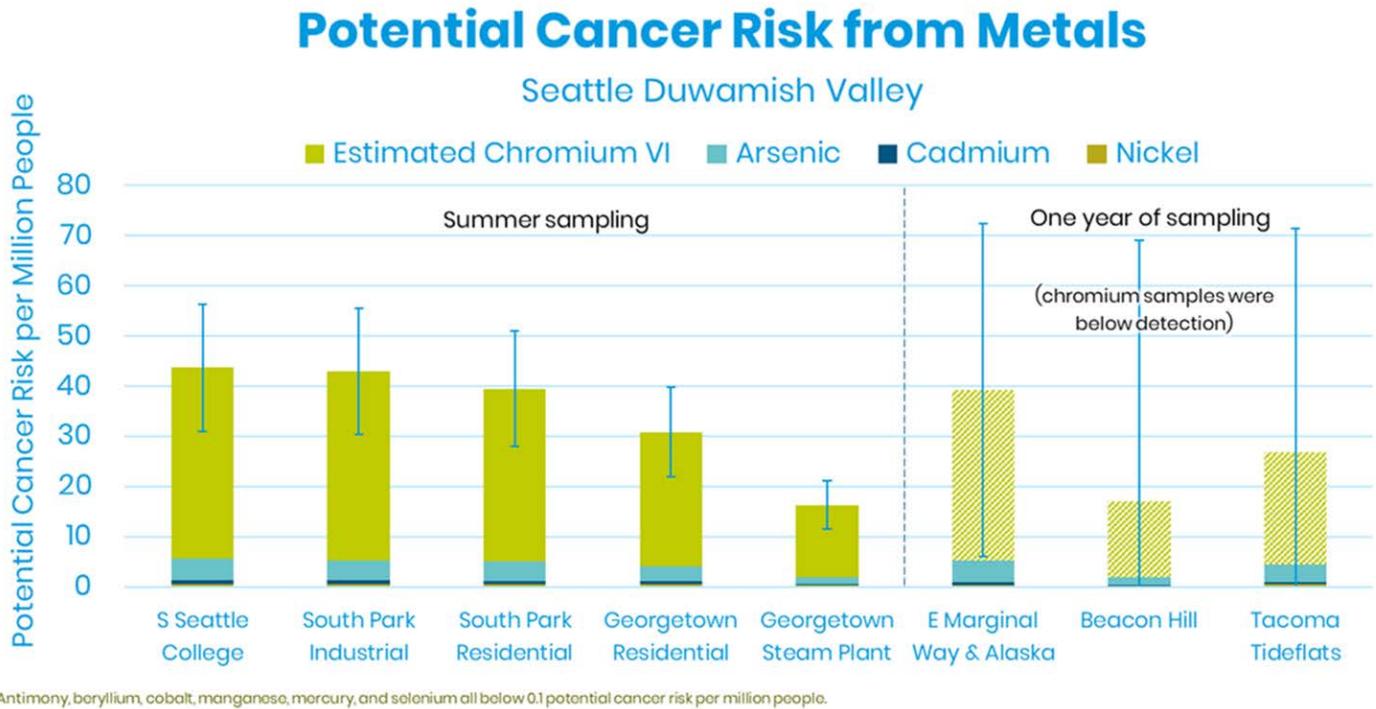


Also in our full report, we identified that on-road diesel particulate matter exposure is not distributed equitably. **We found Black, Indigenous, and other people of color and lower income households have higher potential cancer risks from air toxics from living near major roadways**. Targeting diesel particulate matter can have an impact on addressing socioeconomic differences in pollution exposure and health outcomes.

Through the community-led portion of this study, we were able to perform air sampling for PM<sub>10</sub> metals in areas that the Duwamish Valley community identified to be of concern. The community chose five sites, two in industrial areas and two in residential areas in Georgetown and South Park and one next to King County International Airport (Boeing Field). Overall, **metal levels at these sites were similar to or below our longstanding Duwamish Valley air monitoring site**. Of the 11 metals monitored, only hexavalent chromium and arsenic were above our health screening threshold of one-per-million cancer risk.

As shown in Figure 4 below, we estimated that **hexavalent chromium (in green) has the highest potential cancer risk of PM<sub>10</sub> metals in ambient air in the Duwamish Valley**. Arsenic was next highest, with risks of 5 per million or less. The remaining 9 metals were all below the one-per-million potential cancer risk screening level, and none were over non-cancer screening levels. To estimate hexavalent chromium, we applied the best available ratio based on previous local sampling and other studies. **We will conduct a follow-up study starting in 2024 to measure current hexavalent chromium to total chromium ratios**.

Figure 4. Estimated potential cancer risk from metals with risks over 0.1 per million.



**Measured ambient air lead concentrations were 8 to 15 times lower than the EPA health-based air quality standard and WA state air health screening level (150 and 83 ng/m<sup>3</sup> respectively).** Additionally, lead levels were lowest at our near-airport site. Community and others have expressed recent concerns with leaded fuels from propeller planes still used at King County International Airport. The Duwamish Valley sites showed higher lead levels than other study sites, but still far below health benchmarks.

## What the Agency is Doing to Reduce Air Toxics Health Risk

### Transportation & Diesel Exhaust:

As part of our Strategic Plan<sup>2</sup>, we have ambitious targets to reduce diesel pollution, especially in overburdened communities. The Agency leverages grant funding to switch diesel vehicles to cleaner and electric vehicles. You can find a [list of recent diesel projects](#) with rail yards, marine vessels, trucking companies, and others on our website.

New state and federal climate regulations and programs will further decrease air toxics pollution over the next few years. Regulations will introduce cleaner fuels and shift new engines in passenger cars, light duty trucks, and medium duty vehicles to electric.<sup>3,4</sup> We are helping the switch to electric vehicles by co-hosting the Regional Electric Vehicle Collaborative<sup>5</sup> and coordinating the first phase of the regional Climate Pollution Reduction Grants.<sup>6</sup>

## Wood Stoves:

Efforts to reduce wood smoke emissions include our Wood Stove Reduction Program, which offers a cash incentive for people to recycle their old wood stoves; air quality burn bans; and our outdoor burning regulations.<sup>7,8,9</sup>

## Hexavalent Chromium:

We will conduct a follow-up study to monitor hexavalent chromium directly and to calculate the percent of total chromium that is hexavalent. We routinely work with industry to comply with regulations through our inspection, permitting, and complaint response programs.

## Air Pollution Disparities:

Our 2030 Strategic Plan embeds equity in our all work, and we will use the information from this study to prioritize projects that address the most harmful air pollutants and reduce socioeconomic disparities in air pollution health risk.

## Ways that Individuals Can Reduce Air Toxics and Protect Their Health:

### Transportation & Diesel Exhaust:

Transportation, and especially diesel exhaust, is the greatest contributor to health risk from air toxics. While most of us don't drive diesel trucks or buses, any way to reduce emissions from tailpipes (even cars) reduces harmful air toxics. Actions to do this, small and large, include:

- Choose transportation methods that reduce cars on the road – carpooling, public transit, walking or biking if applicable and available to you.
- Combine errands to reduce the number of trips you take.
- Keep your car in good condition, with tires properly inflated.
- Don't idle when waiting at pick-ups/drop-offs or things like ferry lines or bridge openings.
- Consider a zero-emission vehicle for your next car – there are discounts available now for both new and used vehicles.

When driving in heavy traffic, consider rolling up windows and putting air on “recirculate” to reduce the amount of air toxics you and your passengers breathe.

### In and Around your Home:

In and around homes, actions that reduce the amount of harmful air toxics going into the air include:

- If heating with wood, use only dry seasoned wood. Right now, there is **\$500 available** to remove old, polluting wood stoves in our region.
- Understand and follow burn bans to not pollute on stagnant days. Follow us on social media or [subscribe to receive burn ban alerts](#).

- Understand [rules](#) and dispose of yard debris appropriately – burning it is prohibited in many areas.
- Upgrade gasoline yard equipment to electric.

Typically, it is healthy to let outdoor air into your home. If you live very close to large sources of air toxics pollution (like a major highway), consider periodically shutting windows and doors and filtering your air to reduce the amount of air toxics you breathe. There are many options available, including cheap and effective [DIY ones](#). These options are also effective for poor air quality days (like wildfire smoke days).

While our Agency and this study focuses on outdoor air toxics, there are often sources of air toxics that can come from inside your home that you can avoid or minimize. Our state and local health departments have great information on how to reduce exposure to these air pollution sources. Find them here:

- Tacoma-Pierce County Health Department: <https://tpchd.org/healthy-homes/>
- Washington State: <https://doh.wa.gov/community-and-environment/air-quality/indoor-air>
- Seattle King County: <https://kingcounty.gov/en/legacy/depts/health/environmental-health/toxins-air-quality/indoor-air-quality.aspx>

## Full report

You can find all the full analyses and data in the link below. If you need any other information, please contact us.

<https://pscleanair.gov/2023ToxicsReport>

## Contact information

### **Graeme Carvlin**

Air Resources Specialist  
206-689-4082

[graemec@cleanairpugetsound.net](mailto:graemec@cleanairpugetsound.net)

### **Erik Saganic**

Technical Analysis Manager  
206-689-4003

[eriks@cleanairpugetsound.net](mailto:eriks@cleanairpugetsound.net)

### **Puget Sound Clean Air Agency**

206-646-8800 | 800-552-3565  
1904 Third Ave, Ste 105, Seattle, WA

[www.pscleanair.gov](http://www.pscleanair.gov)

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PUGET SOUND  
Clean Air Agency

**WEBSITE**  
[pscleanair.gov](http://pscleanair.gov)

**MAILING**  
1904 3rd Ave #105  
Seattle, WA 98101