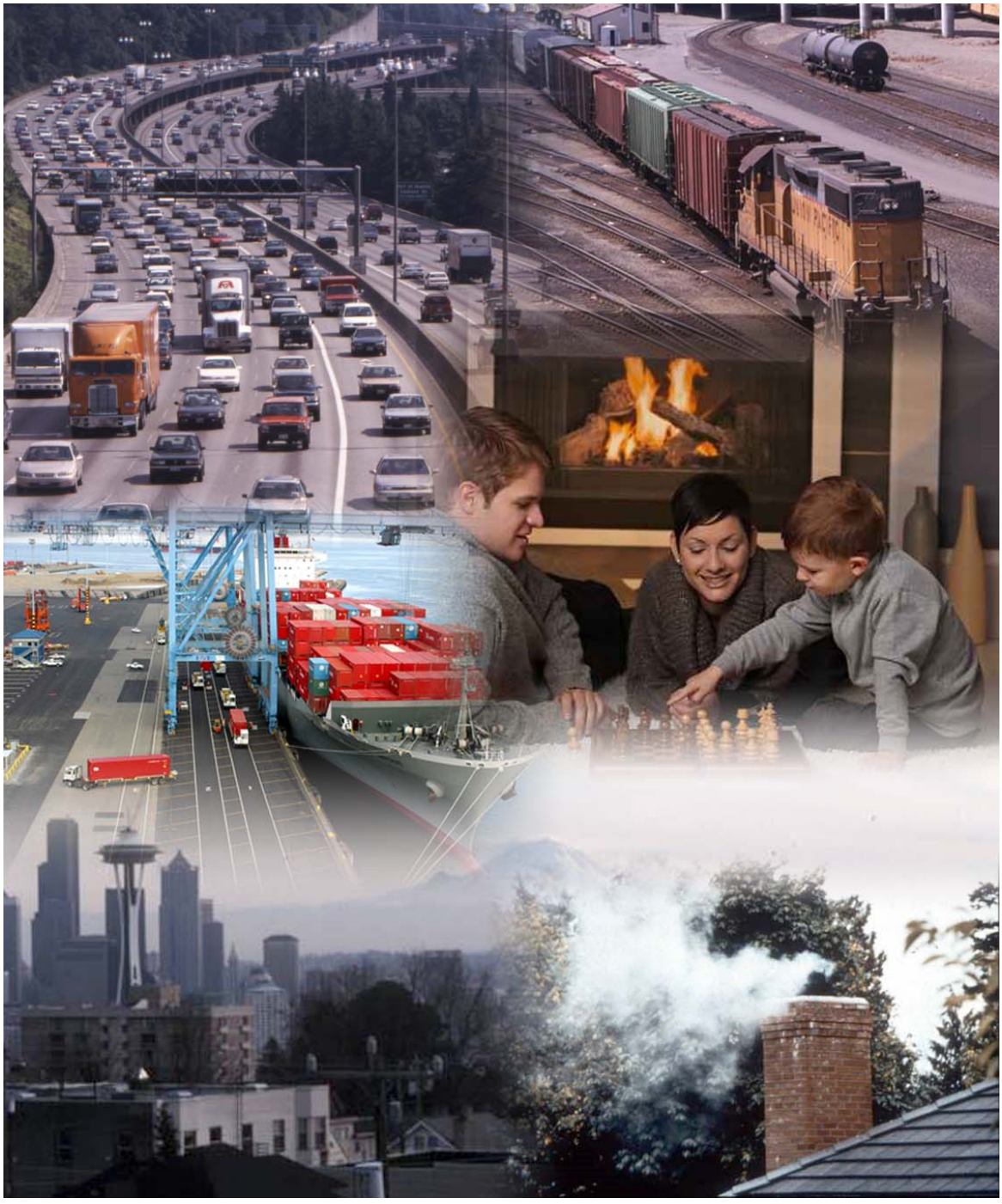
2010 Study of Air Toxics in Tacoma and Seattle



Executive Summary
February 2011

pscleanair.org
Puget Sound Clean Air Agency

2010 Study of Air Toxics in Tacoma and Seattle

Overview

With funding from the US Environmental Protection Agency, the Puget Sound Clean Air Agency and the University of Washington 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.

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 mobile sources (cars, trucks, ships, etc.) contribute most to health risk from air toxics. In Tacoma, wood smoke from home heating was also found to be an important air toxics contributor.

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's programs correctly target reducing diesel and wood smoke emissions in the Puget Sound area.

Scope of the Study

This project builds on a 2003 study of the Seattle area, which identified key air toxics that impact residents.[1] As Tacoma is also a major urban area impacted by air toxics, this study was designed to identify which air pollutants pose the greatest health risks in Tacoma, and compare these air toxics and risks to Seattle.

From 2008-2009, we sampled for over 100 different air toxics at four sites in Tacoma and two sites in Seattle. The results were compared to Washington state established levels to screen for possible harmful health risks.

Locations of Air Toxics Study Monitors

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Summary of Study Results

Of the sampled air toxics, we identified nine pollutants that were above the health screening levels and could potentially cause harm. Eight of these are known to increase the potential risk of cancer, and are listed in Table 1. The ninth pollutant with health risk is acrolein. While acrolein does not pose any cancer risk, exposure to this pollutant can cause upper respiratory irritation.

Although there is no specific way to directly measure diesel and wood smoke particulate in ambient air, we also used recent estimates from other studies[2,3] to support findings in this study.

Here is a summary of key findings on these nine pollutants, including their primary contributors, areas of greatest impact, and the implications of these findings:

Pollution from wood smoke contributes a higher proportion of potential cancer risk in residential Tacoma neighborhoods than at other sites.

This study found a strong correlation between wood smoke pollution and air toxics at residential Tacoma monitoring sites. Compared with national data, concentrations of air toxics linked to wood smoke were in fact much higher in Tacoma residential areas than in many other national sites.

Some Tacoma neighborhoods bear the highest risk of monitored air toxics.

The results of this study demonstrate that residential sites in Tacoma have the highest cancer risk from monitored air toxics (not including diesel and wood smoke particulate estimates) of all the sites in this study (see Figure A on next page). It is noteworthy that directly measured air toxics levels at this site are higher than the monitoring sites in the industrial/port centers like the Seattle Duwamish and the Tacoma Tideflats.

This finding differs from the 2003 Seattle study, which showed air toxics were lowest in the residential sites and highest in the industrial sites. This is due to the more widespread prevalence of wood burning in the Tacoma residential neighborhoods.

Table 1: Air Toxics that Contribute the Greatest Potential Cancer Risk in Tacoma and Seattle

#	Air Toxic	Primary Sources
1	Carbon Tetrachloride	Mostly Banned Since 1990 (has long atmospheric lifetime - was used in refrigerant production)
2	Benzene	Fossil Fuel/Wood Combustion, Solvents
3	1,3-Butadiene	Fossil Fuel/Wood Combustion
4	Formaldehyde	Fossil Fuel/Wood Combustion, Indoor/Construction Materials
5	Acetaldehyde	Fossil Fuel/Wood Combustion
6	Naphthalene	Fossil Fuel/Wood Combustion
7	Chloroform	Water Treatment Plants, Reservoirs
8	Tetrachloroethene	Dry Cleaners

Figure A: Air Toxics Contribution to Potential Cancer Risk (excluding Diesel and Wood Smoke Particulate)

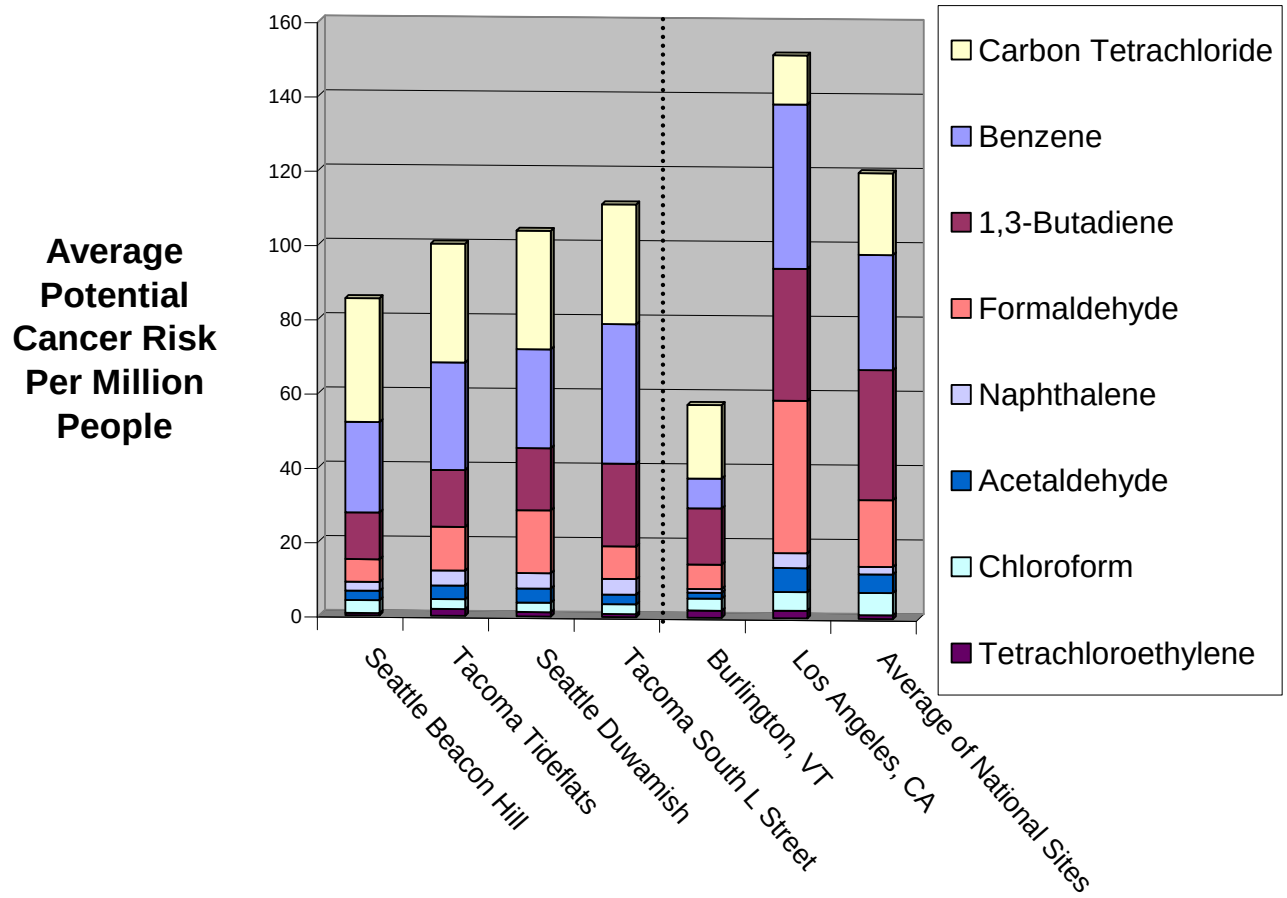


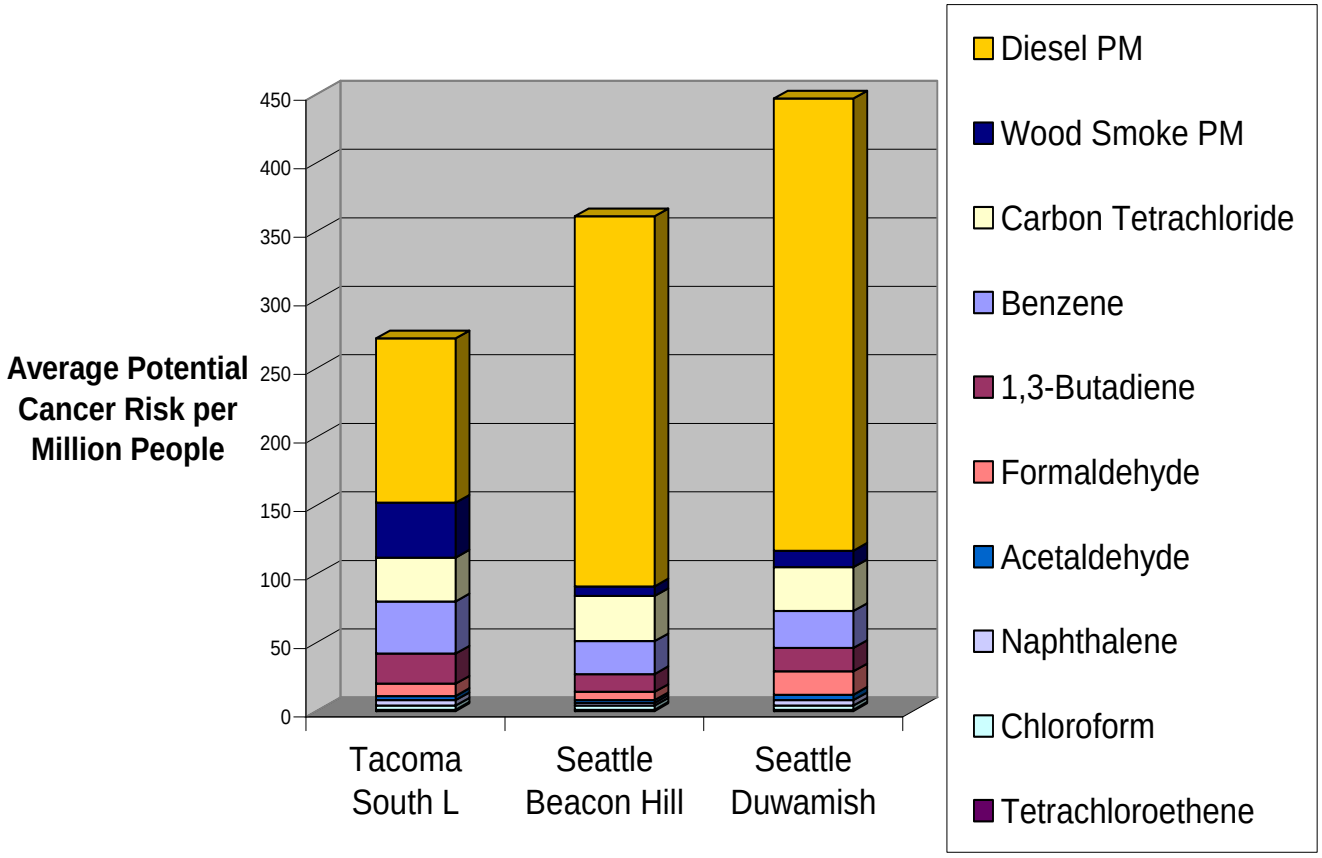
Figure A is a comparison of air toxics contributions to potential cancer risk at two Seattle and two Tacoma sites from this study. To the right of the dotted line, we compare sites from other parts of the country. Our air toxics concentrations were above small urban areas like Burlington, VT, below large cities like Los Angeles, and similar to an averaged mix of urban, suburban, and rural areas.

Diesel continues to contribute the most to potential cancer risk.

In Figure B, we added available diesel and wood smoke particulate matter risk estimates developed from other recent studies.[2,3] In our study, we did not measure diesel or wood smoke particulate as no direct monitoring method exists. Researchers estimated diesel and wood smoke particulate using mathematical models with multiple years of monitored data.

As seen below, diesel emissions (gold color in Figure B) remain the largest contributor to potential cancer risk in the Puget Sound area, contributing over 70 percent of the potential cancer risk from air toxics at the Seattle sites and over 40 percent at the Tacoma residential sites. In Tacoma, the wood smoke contribution is more pronounced when compared to Seattle. However, diesel exhaust remains the largest source of potential cancer risk in Tacoma as well.

Figure B: Potential Cancer Risks with Diesel and Wood Smoke



Diesel and wood smoke particulate matter results are based on recent estimates from other studies.[2, 3]

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Transportation and wood burning contribute most to the health risk from air toxics.

As shown in Figure C, the contributions of diesel and wood smoke emissions to potential cancer risk are different in the Seattle and Tacoma areas. Wood smoke in Tacoma makes up a larger percentage of the potential cancer risk when compared to Seattle. However, diesel remains the largest source of potential cancer risk in Tacoma as well.

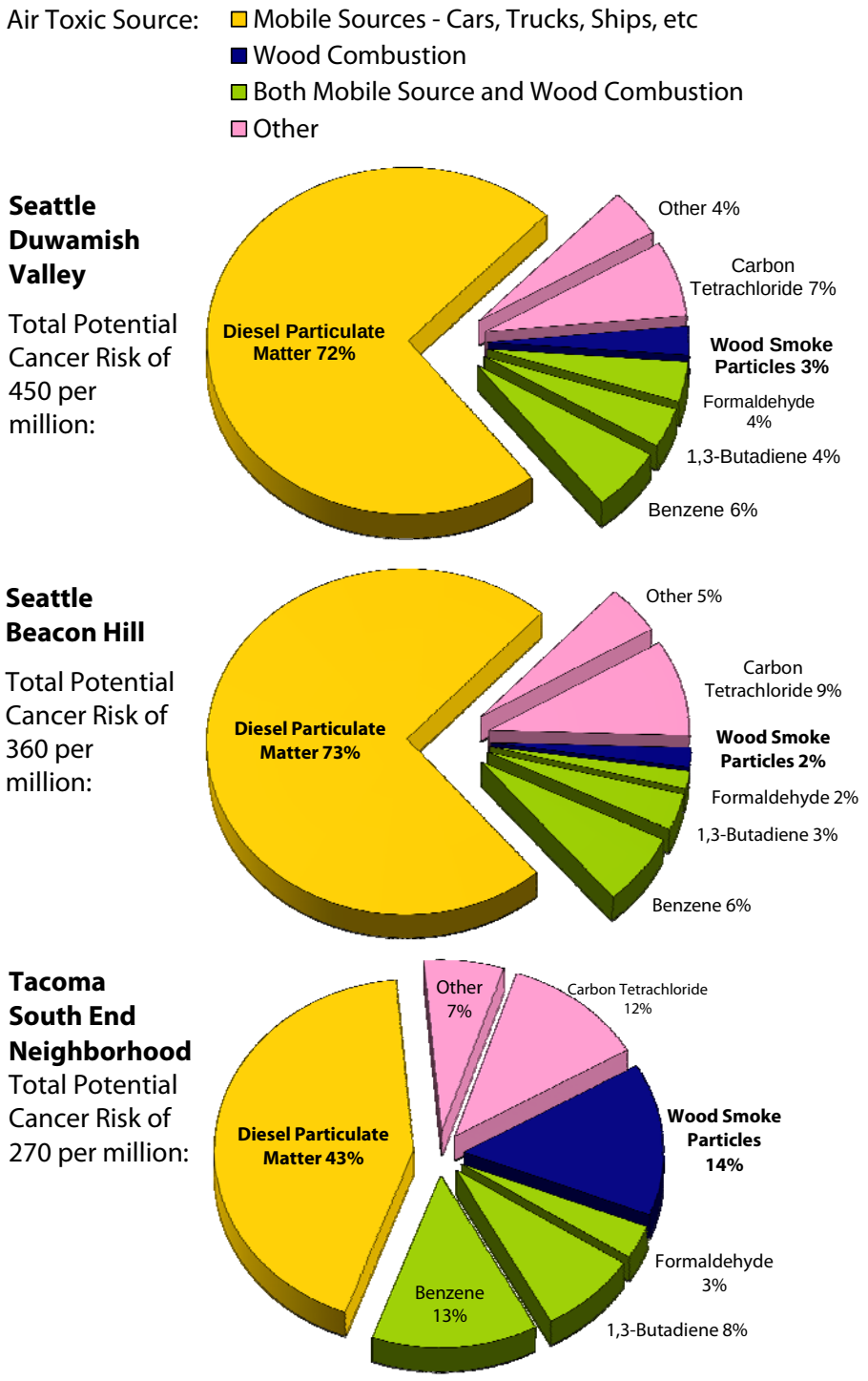
Overall, air toxics concentrations have decreased.

Since the 2003 study, most air toxics concentrations have decreased. This is due to a combination of federal, state, and local measures – both regulatory and voluntary – that have reduced air toxics emissions from a variety of sources.

Potential cancer risks from air toxics are consistent with other urban areas.

In this study, we gathered national data to compare Tacoma and Seattle with other urban areas. Overall, we are lower than the most populated cities like Los Angeles and New York. However, we found concentrations in our area are higher than the smaller cities like Burlington, Vermont. Due to a variety of factors, it was difficult to make clear comparisons to similar cities, but we found our sites are similar to many other urban areas across the country.

Figure C: Contributors to Overall Risk*



*Diesel and wood smoke particulate matter results are based on recent estimates from other studies.[2,3]

What We Are Doing to Reduce Potential Cancer Risk from Air Toxics

Although air toxics concentrations have declined since the 2003 study, the health risks remain substantial. This underscores the importance of sustaining support for programs that address emissions from transportation and residential wood burning. The Puget Sound Clean Air Agency has established a successful record of innovative, voluntary programs and initiatives:

Diesel Solutions

The Clean Air Agency and regional leaders launched the voluntary Diesel Solutions program in 2001 that promotes and incentivizes reductions in diesel emissions. We have partnered with transit agencies, public works departments, garbage haulers, as well as with other public and private partners to reduce diesel emissions by retrofitting vehicles with pollution control equipment, using cleaner fuels, replacing engines with newer, cleaner technology, and promoting reduced idling.

Additionally, the Agency and several other partners including the Ports of Seattle, Tacoma and Vancouver, developed the Northwest Ports Clean Air Strategy. The strategy outlines voluntary short-term and long-term measures that the ports will take over the next several years to reduce air emissions from goods movement.

Cars and Trucks

In 2005, our Agency, the Washington State Department of Ecology, and our partners helped lead the state's Clean Cars Initiatives, which led to the Washington State Legislature adopting the California Clean Car Standards. This made Washington the ninth state in the nation to adopt strong state standards for air toxics and smog forming pollution. These standards will reduce mobile source air toxics emissions as well as climate changing greenhouse gases.

In 2006, the Agency partnered with other West Coast partners to advocate for a strengthened mobile source air toxics rule. The result was a rule that will substantially lower the content of benzene – a harmful air toxic – in our region's gasoline.[4]

We have also had success reducing toxics from gasoline by working with local suppliers to provide gasoline with lower vapor pressure. Fewer air toxics are released into the air with this type of gasoline. Additionally, the Agency adopted new gas station rules in October 2004[5], with another update to take effect September 2011[6], to reduce evaporative emissions at gas stations.

Wood Smoke

The Agency has partnered successfully with the hearth products industry, local cities, counties, and utilities to reduce pollution from wood stoves and fireplaces. Wood smoke pollution is reduced through public outreach and education, as well as Washington State-funded programs which offer incentives for residents to replace older inefficient wood stoves with cleaner heat sources. To date, the Agency has replaced over 1,000 old, polluting wood stoves in the Tacoma-Pierce County area through these programs.

These wood smoke programs are designed to mainly reduce harmful fine particle emissions, especially important in Tacoma-Pierce County which is in nonattainment of federal air-quality standards for fine particle pollution. The results of this study highlight that many of our strategies to reduce harmful fine particles from wood smoke also reduce harmful air toxics emissions.

Related Resources

The Full Study Report:

www.pscleanair.org/news/library/reports/2010_Tacoma-Seattle_Air_Toxics_Report.pdf

Background on Air Toxics:

www.pscleanair.org/airq/basics/airtoxics.aspx

Wood Stoves and Fireplaces: Heat Smart – Heat Healthy:

www.pscleanair.org/actions/woodstoves/default.aspx

Our Diesel Solutions Website:

www.dieselsolutions.org

Health Effects of Wood Smoke:

www.ecy.wa.gov/pubs/92046.pdf

Concerns about Adverse Health Effects of Diesel Engine Emissions:

www.ecy.wa.gov/pubs/0802032.pdf.

What You Should Know About Diesel Exhaust:

www.epa.gov/otaq/retrofit/documents/f03021.pdf

Health Effects and Economic Impacts of Fine Particle Pollution in Washington State:

www.ecy.wa.gov/pubs/0902021.pdf

Washington State Department of Ecology Air Toxics Website:

www.ecy.wa.gov/toxics/air.htm

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References

[1] 2003 Puget Sound Air Toxics Evaluation: www.pscleanair.org/news/library/reports/psate_final.pdf
[2] Ogulei, D. WA State Dept of Ecology. (2010). "Sources of Fine Particles in the Wapato Hills-Puyallup River Valley PM2.5 Nonattainment Area". Publication number 10-02-009.
[3] Kim, E, Hopke, P. (2008). "Source characterization of ambient fine particles at multiple sites in the Seattle area", Atmospheric Environment, 42: 6047-6056.
[4] US EPA. (2007). "Control of Hazardous Air Pollutants from Mobile Sources: Final Rule to Reduce Mobile Source Air Toxics". EPA420-F-07-017.
[5] www.pscleanair.org/businfo/gas_stations/toolkit.shtml
[6] www.pscleanair.org/regulated/reg2/reg2.pdf