Portland Air Toxics Solutions Report and Recommendations

State of Oregon
Department of
Environmental
Quality

Together with the Portland Air Toxics Solutions Advisory Committee, DEQ developed a ground-breaking study of air toxics problems and potential solutions in the Portland region. This fact sheet summarizes the Portland Air Toxics Solutions Report and Recommendations. For more information, to contribute your ideas and to sign up for Portland Air Toxics Solutions project updates go to: http://www.deq.state.or.us/aq/toxics/pats.htm

Is the air in Portland healthy to breathe?

There are many different pollutants in Portland's air and what people breathe depends in part on how close they are to pollution sources such as woodstoves, busy roadways and industrial facilities.

Overall, air pollution in the Portland area has decreased dramatically over the last 30 years. Important success stories include reducing lead, carbon monoxide and ozone (smog) to meet federal clean air standards.

Despite this progress, DEQ is concerned about levels of other pollutants called air toxics, which are known or suspected to cause serious health problems including cancer, nerve damage and respiratory irritation. Much of our scientific knowledge about air toxic is still emerging. However for many pollutants and sources, there is currently enough information to understand problems and prioritize emission reductions.

Air toxics include diesel soot, benzene, polycyclic aromatic hydrocarbons (tar-like by-products from auto exhaust and other sources commonly called PAHs), and metals including manganese, nickel, and lead. Air toxics come from a variety of sources including cars and trucks, all types of burning including burning wood in fireplaces and woodstoves, businesses and industries of all sizes, and consumer products such as solvents and pesticides. There are no federal air concentration standards for air toxics.

How does the air in Portland compare with other locations?

Compared to other areas of the state, the Portland region has the highest risk to the population from air toxics. This is because the region has the most people and development. Air toxics in Portland are comparable to levels in other similarly sized cities across the country. Along with national estimates of air toxics emissions, Portland monitoring studies confirm the presence of air toxics at levels that can cause adverse health effects. The map below shows estimated total cancer risk from air pollutants from a study released by the U.S. Environmental Protection Agency. The majority of toxic air

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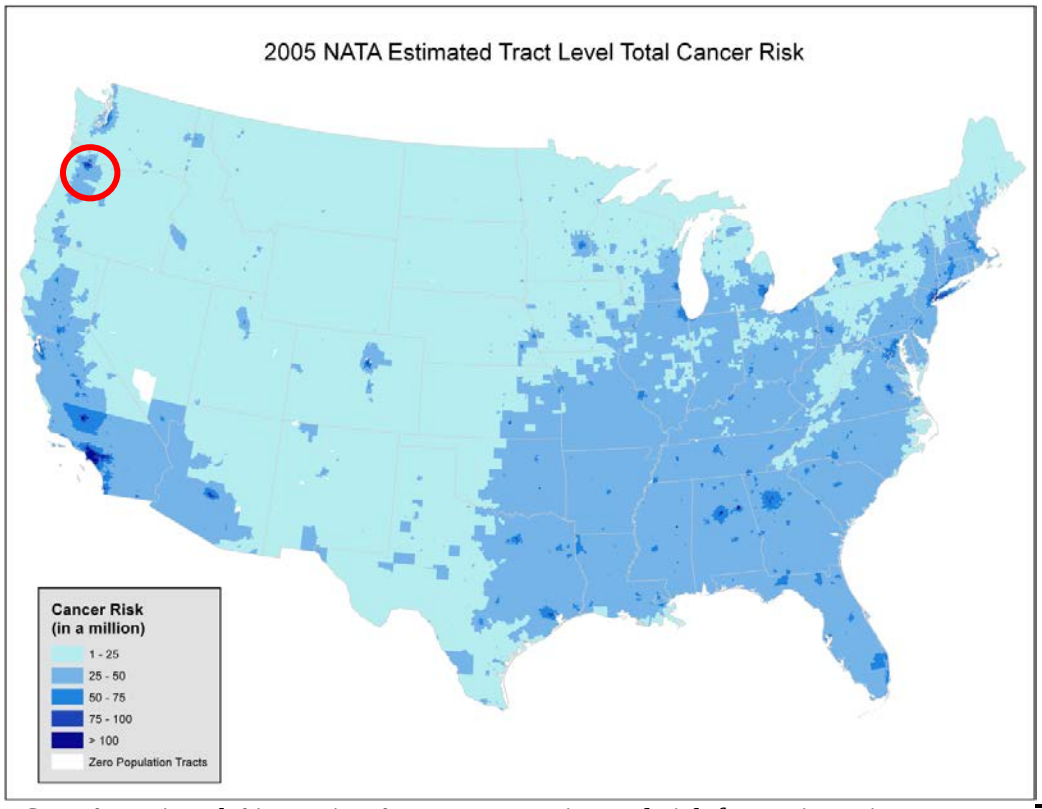
pollutants are associated with cancer risk. The darker blue areas have higher estimated cancer risk, and a red circle marks the location of Portland.



US EPA National Air Toxics Assessment estimated risk from air toxics

How does DEQ evaluate air toxics levels?

Monitoring and modeling

DEQ collects information about air toxics by sampling and analyzing air quality and also by estimating levels through computer modeling studies. These levels are compared to ambient benchmark concentrations, which serve as DEQ's clean air health goals for air toxics. A summary of air toxics monitoring is available at: http://www.deq.state.or.us/aq/forms/annrpt.htm .

Air pollution monitor

Ambient benchmark concentrations

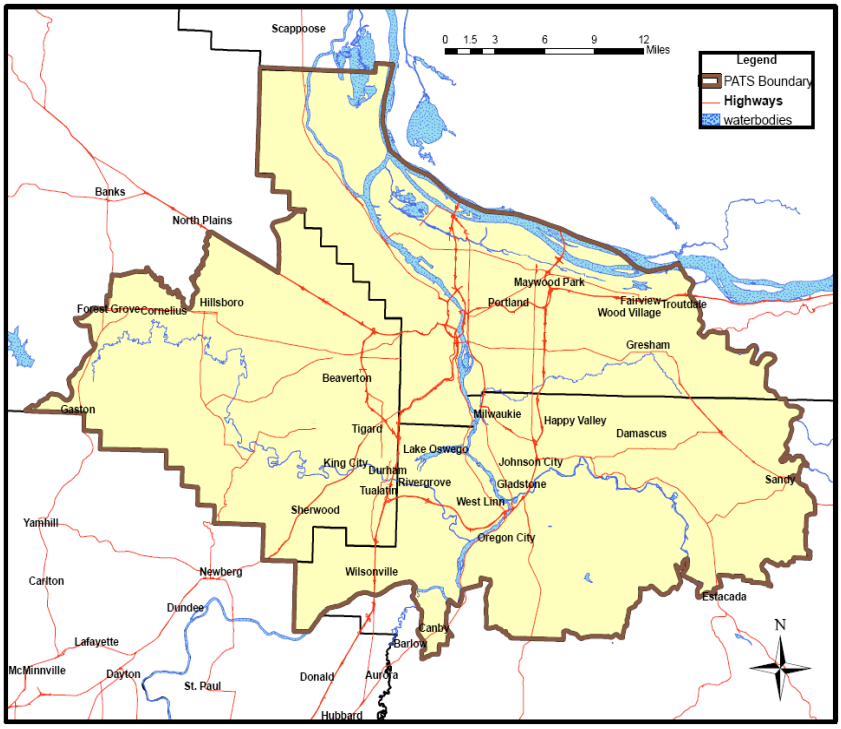
Oregon has adopted ambient benchmark concentrations that serve as clean air goals for 52 air toxics known to be present in the state. Each air toxic of concern has a benchmark set based on its non-cancer or cancer causing effects, whichever level would be more protective. An ambient benchmark concentration is the annual average concentration of a toxic chemical in air that individuals, including more sensitive groups such as children or the elderly, could breathe continuously for a lifetime without experiencing any non-cancer health effects or without

increasing their risk above the background cancer rate by greater than one chance in a million. Oregon's benchmarks are available at: http://www.deq.state.or.us/aq/toxics/benchmark.htm .

What is DEQ doing to reduce air toxics in the Portland region?

Portland Air Toxics Solutions Project

DEQ created the Portland Air Toxics Solutions project to work with the local community to develop air toxics reduction strategies for the Portland region, including portions of Multnomah, Washington and Clackamas Counties. Because many of the same sources produce air toxics, particulates, greenhouse gases and ozone, Portland Air Toxics Solutions links with other ongoing and future regional air pollution reduction efforts. The map below shows the Portland Air Toxics Solutions Study Area.



Portland Air Toxics Solutions study area

Between August 2009 and October 2011, DEQ collaborated with the Portland Air Toxics Solutions Advisory Committee, made up of diverse stakeholders, to consider a technical study and recommend a framework for an air toxics reduction plan. The technical study included an analysis of available monitoring information from the past several years and computer model estimates of Portland's expected pollutant levels in the year 2017. Together with the advisory committee, DEQ developed the Portland Air Toxics Solutions technical study, providing ground-breaking analysis and a new understanding of air toxics problems and potential solutions in the Portland region.

The Portland Air Toxics Solutions modeling study greatly advanced our knowledge about air toxics in Portland.
DEQ used this study to estimate air toxics concentrations for 19 pollutants projected for 2017. The model included the most current and detailed emissions information from hundreds of emission sources across the Metro area, including industrial sources, mobile sources like cars and trucks, and residential activities. The model also factored in economic conditions, population growth, topography, weather and new regulations to reduce pollution. The study allowed DEQ and the advisory committee to understand significant pollutants, their sources, how they are distributed across the Portland region, and how best to prioritize potential reduction strategies. Results of the Portland Air

Toxics Solutions modeling study are available at:
http://www.deq.state.or.us/aq/toxics/pats.htm .

What pollutants are above clean air health goals?

The Portland Air Toxics Solutions modeling study assessed 19 pollutants and identified 14 of them that are above clean air health goals, or benchmarks. Eight of the 14 pollutants cause the most risk. These pollutants are: 1, 3 butadiene, benzene, diesel particulate, 15 PAH, naphthalene, cadmium, acrolein, and formaldehyde.
The largest sources of air toxics are gasoline and diesel engines that produce 1, 3 butadiene, benzene, diesel particulate, arsenic and chromium 6. Another large source of air toxics is residential wood burning that produces 15 PAH (polycyclic aromatic

Pollutant	Top Source	Impact Area
More than 10 times over benchmark		
1,3 butadiene	Cars and trucks	Region wide/neighborhood
Benzene	Cars and trucks	Region wide/neighborhood
Diesel Particulate	Cars and trucks	Region wide/neighborhood
15 PAH	Residential wood burning	Region wide
Naphthalene	Residential wood burning	Region wide/neighborhood
Cadmium	Industry	Neighborhood
Formaldehyde	Chemical formation in atmosphere	Region wide
Acrolein	Chemical formation in atmosphere	Region wide/neighborhood
Between 1 and 10 times over benchmark		
Arsenic	Cars and trucks	Region wide/neighborhood
Manganese	Industry	Neighborhood
Nickel	Industry	Neighborhood
Chromium VI	Cars and trucks	Region wide/neighborhood
Dichlorobenzene	Solvents and pesticides	Region wide/neighborhood
Acetaldehyde	Chemical formation in atmosphere	Region wide

Portland Air Toxics Solutions estimates of air toxics in 2017

hydrocarbons which are tar-like by-products) and naphthalene. The model shows that emissions of metals including manganese, nickel and cadmium are concentrated in or near some industrial areas.

Where are the highest concentrations of air toxics?

The study shows that air toxics are found throughout the Portland region. Higher concentrations are found in densely populated neighborhoods, near busy roadways and in areas with higher levels of business and industrial activity. The chart below shows pollutants estimated above Oregon's air toxics benchmarks, the top source of each pollutant and the general locations of concentrations in the Portland region.

How do air toxics impact minority and low income people in the Portland region?

As part of the Portland Air Toxics Solutions Study, DEQ used its modeling estimates to conduct an environmental justice analysis of air toxics impacts. Environmental Justice entails the fair treatment and meaningful involvement of all people regardless of race, age, gender, national origin, education or income level, in the development, implementation and enforcement of environmental laws, regulations and policies. DEQ's environmental justice analysis demonstrated that disproportionate impacts from air toxics do occur for minority and low-income populations in the Portland region. Different minority groups are affected by different types of emission sources.

In general, DEQ found that the Hispanic/Latino population experienced the highest impacts from residential wood combustion emissions, the Asian population from car and truck emissions, and the African American/Black population from commercial solvent and fuel use emissions. In addition, we found that the general population (all races) living below the poverty level is disproportionally affected by toxic air pollution from cars and trucks. Emissions from construction and other non-road engines also significantly impact minority populations, while industrial and business sources disproportionately impact populations of all races living below the poverty level. This information will be incorporated into emission reduction strategies and used by communities and local government to prioritize efforts to improve public health. The chart below summarizes DEQ's statistical analysis of air toxics impacts on minority and low income populations in the Portland region.

Disproportionate impact from all sources:

Higher → Lower

Disproportionate impact by source category: Higher → Lower

Hispanic/Latino	Asian	African American/Black	Below Poverty
Residential Wood Burning	Cars and Trucks	Commercial Solvent and Fuel Use	Cars and Trucks
Construction and Non-Road Engines	Construction and Non-Road Engines	Construction and Non-Road Engines	Commercial Solvent and Fuel Use
Cars and Trucks	Residential Wood Combustion		Point Sources
Commercial Solvent and Fuel Use	Commercial Solvent and Fuel Use		

Summary of minority and low income air toxics impacts in the Portland region

What are the next steps to reduce air toxics in the Portland region?

DEQ and its advisory committee identified five high priority emission categories for follow up action, along with potential emission reduction recommendations for each category. While the emission recommendations reflect the advisory committee's best efforts at consensus, they were not endorsed by all members. The prioritization is based on total estimated risk from air toxics, practicability of emission reductions, and the directive in Oregon air toxics regulations to address both region wide and localized risk.

The five priority categories are:

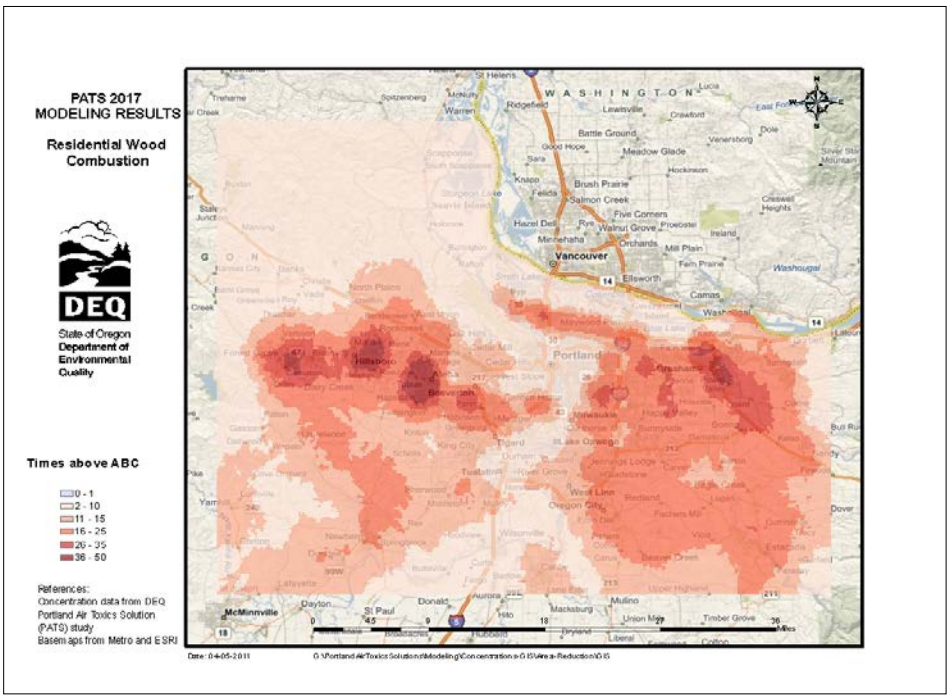
- Residential wood combustion
- Cars and trucks
- Heavy duty vehicles
- Construction equipment
- Industrial metals facilities

For all priority categories, DEQ is further consulting with local governments, affected people and businesses to develop emission reduction actions. This consultation includes doing a more detailed technical analysis and more thorough investigation of emission reduction considerations including cost effectiveness, feasibility and benefits analysis. DEQ and partners will implement the emission reduction recommendations by integrating them into DEQ's ongoing emission reduction work.

What are the recommendations to reduce emissions from the priority categories?

Residential wood burning

In the Portland region, roughly two percent of homes are heated by wood. Many people burn woodstoves and fireplaces as an additional heat source or for aesthetic reasons. Old uncertified woodstoves and conventional fireplaces contribute the bulk of toxic pollution in this category. The pollutants causing the most risk from wood burning are 15 PAH, 1, 3 butadiene and formaldehyde. The map below shows estimated risk from wood combustion in the Portland area. Darker red areas have higher estimated concentrations of pollutants from wood burning, many of which are Environmental Justice communities.

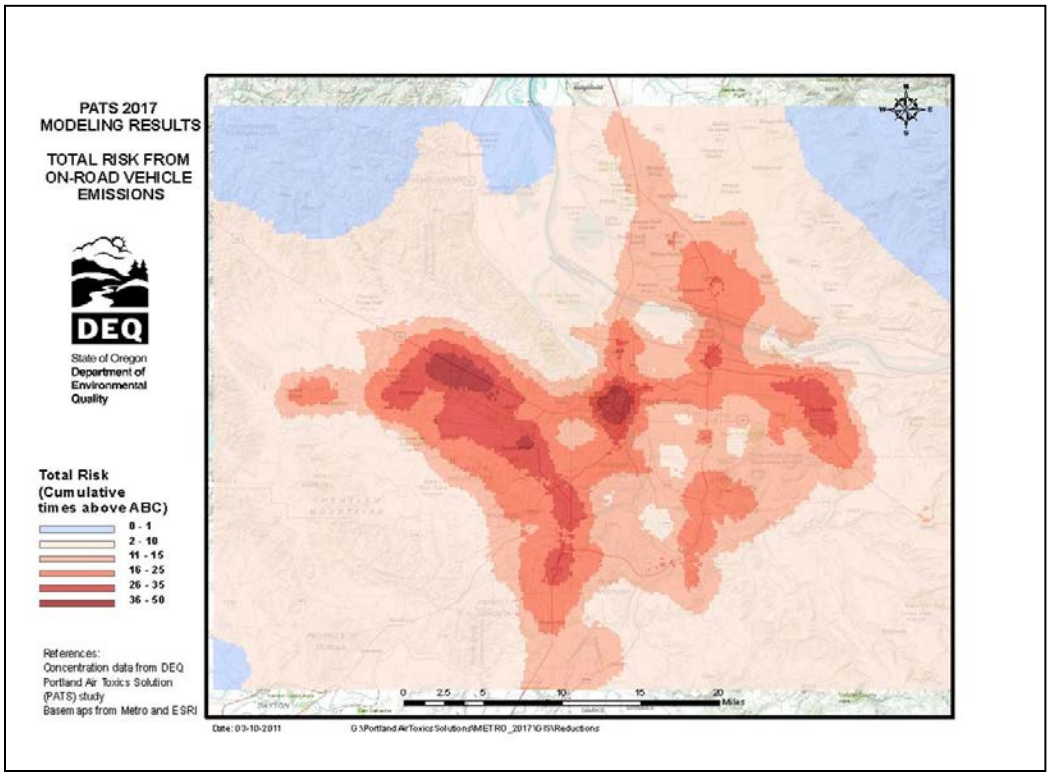


In addition to emitting air toxics, residential wood burning emits fine particulate pollution that contributes to violations of national clean air standards. DEQ plans to coordinate efforts to reduce air toxics from residential wood burning with ongoing work to meet the fine particulate standard. Recommendations for next steps to decrease pollution from residential wood burning include:

- Conduct a residential wood heating survey to refine DEQ emission estimates
- Implement a regional public awareness campaign to promote cleaner burning techniques
- Improve DEQ's uncertified woodstove change out program, with emphasis on assistance to low income communities
- Find long term funding for woodstove change outs
- Evaluate the effectiveness of setting smoke density limits
- Support stronger national standards for new wood heating devices

Cars and trucks

Vehicles have both gasoline and diesel engines. For emission reduction recommendations, there are two categories: light duty vehicles, which are mostly use gasoline, and heavy duty vehicles, which are mostly use diesel. The map below shows the estimated risk in 2017 from both categories together. Darker red areas have higher estimated concentrations of pollutants from cars and trucks. Higher concentrations of pollution from cars and trucks follow major highways.



Light duty cars and trucks

Air toxics from light duty vehicles occur throughout the Portland region with the highest concentrations occurring in high traffic areas. Emissions are highest within 500 yards, the length of five football fields, of roadways with high traffic. However, because much of the study area is developed, on road gasoline emissions influence risk in much of the Portland Air Toxics Solutions study area.

Gas powered vehicles are subject to federal and state regulations that limit new car and truck emissions. To meet emission requirements, automakers developed better engine designs, computerized engine controls and pollution control technology such as catalytic converters. These efforts reduced the emission of traditional pollutants to a fraction of what they were thirty years ago. In the Portland region, vehicle inspection requirements ensure proper vehicle maintenance, further controlling emissions. Both the federal Corporate Average Fuel Economy standards and Oregon's greenhouse gas emission limits reduce the amount of gasoline vehicles use. This reduces metallic air toxics that may be naturally present in gasoline and which are not reduced by pollution control equipment. The pollutants causing the most risk from light duty cars and trucks are 15 PAH, benzene, 1, 3 butadiene, formaldehyde, arsenic and chromium.

In addition to emitting air toxics, light duty cars and trucks emit greenhouse gases and pollutants that contribute to ozone. DEQ is coordinating efforts to reduce air toxics from

light duty cars and trucks with Metro's ongoing work to reduce vehicle miles travelled and DEQ's work to reduce greenhouse gas emissions and prevent a recurrence of unhealthy ozone levels. Recommendations for next steps to decrease pollution from light duty vehicles include:

- Use the ongoing regional transportation planning process to reduce vehicle use
- Target a 20 percent person per person reduction in vehicle emissions by 2035
- Improve traffic signals to reduce congestion
- Support strong national standards for clean vehicles
- Adopt the latest California clean car standards
- Promote electric vehicle charging stations
- Work with Metro and other partners to incorporate environmental justice considerations into transportation and land use planning

Heavy duty vehicles

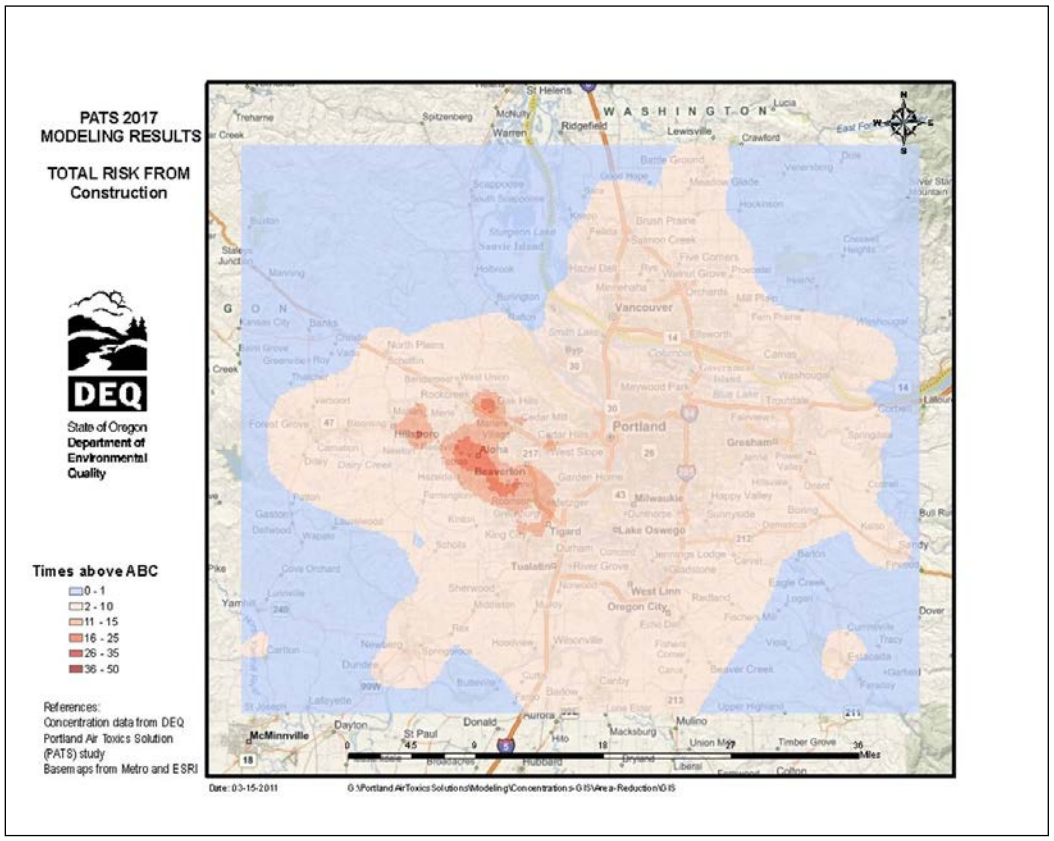
Air toxics from on-road heavy duty vehicles occur throughout the Portland region, with the highest concentrations occurring in areas of high vehicle traffic. Heavy duty vehicles include trucks that make deliveries within the Portland area and trucks that are used mainly in interstate freight. The majority of these vehicles have diesel engines. Like light duty vehicles, heavy duty vehicles have become cleaner over the last decade with tighter federal emission standards. However, because diesel engines are long lasting, the turnover from older dirtier engines to newer cleaner engines is much slower. Pollutants from heavy duty vehicles causing the most risk are diesel particulate matter, 15 PAH, benzene, and 1, 3 butadiene.

DEQ has an active clean diesel program to reduce diesel particulate emissions from heavy duty vehicles. Recommendations for next steps to decrease pollution from heavy duty vehicles include:

- Identify opportunities for financial support of clean diesel projects
- Identify the most effective use of education and outreach
- Accelerate engine turnover, repowering, and retrofits
- Evaluate requirements for clean diesel fleets at publically funded projects
- Evaluate alternative fuels and the need for a fuels technical clearinghouse
- Evaluate efficiency measures, and current idling restrictions in Oregon and other jurisdictions
- Work with Metro and other partners to incorporate environmental justice considerations into transportation and land use planning

Construction equipment

Construction equipment emissions are caused mainly by diesel engines. These engines power non-road equipment such as backhoes and graders. Construction equipment emissions are widely dispersed across the Portland area associated with construction projects. Compared to light and heavy duty on road engines, construction equipment engines have the slowest rate of turnover to cleaner engines. The pollutants causing the most risk in the construction category are diesel particulate matter and 15 PAH. The map below shows the estimated risk in 2017 from construction equipment. Darker red areas have higher estimated concentrations of pollutants from construction engines. Because construction projects can occur in many locations, elevated concentrations as shown on the map will fluctuate throughout the region.



While DEQ's clean diesel program has focused on trucks, buses and barges, it can also be used to reduce diesel particulate emissions from construction equipment. Recommendations for next steps to decrease pollution from construction include:

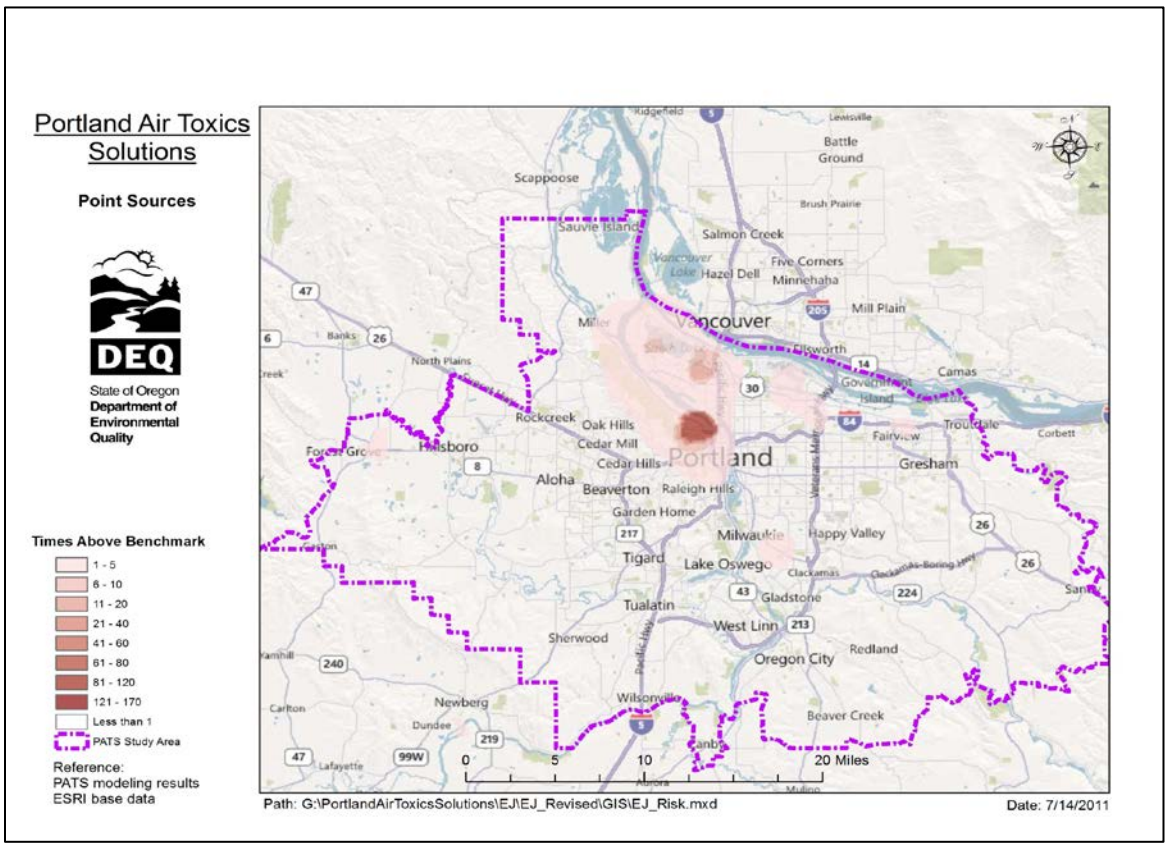
- Conduct a survey to better understand the universe of construction equipment
- Evaluate an equipment registration system
- Evaluate the impacts of higher emission equipment imported from California, which has more stringent standards for construction equipment
- Identify opportunities for financial support of clean diesel projects

- Accelerate engine turnover, repowering and retrofits
- Evaluate requirements for clean diesel equipment on publically funded projects
- Evaluate alternative fuels and the need for a fuels technical clearinghouse
- Evaluate efficiency measures and the feasibility of idle reduction for construction equipment

Industrial Metals Facilities

Metal casting equipment

Industrial metals facilities account for most of the documented cadmium, manganese and nickel concentrations estimated above benchmarks in the Portland Air Toxics Solutions Study. These pollutants occur fairly close to industrial facilities, with concentrations decreasing greatly at the distance of a quarter mile. DEQ needs to further investigate emissions from industrial metals facilities for a full understanding of their impacts. In particular, DEQ is working to identify the sources of cadmium in the Portland region. Monitored levels of cadmium are considerably higher than modeled levels, indicating that there are additional unknown sources that were not included in the model. The map below shows the estimated risk in 2017 from industrial facilities, the majority of which comes from metals processing. Darker red areas have higher estimated concentrations of pollutants from industrial facilities.



DEQ's industrial permitting program ensures that industrial facilities comply with federal and state air toxics emission limits. Recommendations for next steps to decrease pollution from industrial metals facilities include:

- Refine emission estimates using facility-specific models and improved emission characteristics
- DEQ to encourage facilities with modeled impacts above benchmarks to make voluntary early reductions

How is DEQ implementing the recommendations for the high priority categories?

DEQ is incorporating the recommended air toxics reduction strategies into ongoing ozone, particulate, clean diesel and green house gas reduction work. DEQ is also coordinating with local government partners to bring current air toxics considerations into the transportation and land use planning process.