

## Diesel-powered Backup Generators for Data Centers in Grant County

Data centers house the servers that provide e-mail, manage instant messages, and run applications for our computers. In 2006, data center companies started to become interested in Grant County as a good place to build. Grant County has a low-cost, dependable power supply. Also, in 2010, the Washington State Legislature approved a temporary sales tax exemption for data centers building in Grant County and other rural areas. To qualify for the tax exemption, the data center must have at least 20,000 square feet dedicated to servers and start construction before July 1, 2011.

To build or expand, a data center company must first apply to the Washington Department of Ecology (Ecology) for a permit called a “notice of construction approval order” (NOC). Its purpose is to protect air quality. The NOC is needed because data centers use large, diesel-powered backup generators to supply electricity to the servers during power failures. Diesel exhaust contains toxic air pollutants. As part of the permit review process, Ecology carefully evaluates whether the diesel exhaust from a data center’s backup generators cause health problems.

### Health effects of diesel engine exhaust

The toxic air pollutants in diesel engine exhaust include nitrogen dioxide, carbon monoxide, organic compounds and tiny particles called diesel engine exhaust particles. Ecology evaluates the levels of all these pollutants during the permit review process. The ones most likely to be produced in high enough amounts to potentially affect health are diesel exhaust particles and nitrogen dioxide (NO<sub>2</sub>). The possible health issues caused by these pollutants are discussed in this document.

When Ecology staff review the permit application for a data center, they look very carefully at how much the project will add to the air pollutants in the area. Ecology cannot approve a permit that allows pollutants to be emitted often enough or in high enough levels to cause health problems.

### Diesel exhaust particles

The tiny particles in diesel exhaust are too small for our noses and upper respiratory systems to filter from the air we breathe. The particles go deep into our lungs, where they can cause damage and chemical changes. Studies show that certain levels of these particles can cause immediate health problems, including inflamed and irritated lungs and breathing passages, which may lead to coughing, chest tightness, wheezing, and difficulty breathing in some people.

### WHY IT MATTERS

Data centers need an Ecology permit to install diesel-powered generators that emit diesel exhaust.

Diesel engine exhaust is a toxic air pollutant that, at high enough levels, can cause health problems.

As part of the permit process, Ecology reviews emissions of diesel engine exhaust and other air pollutants to see if they are a health concern.

This focus sheet gives information about the health effects of diesel exhaust, and how Ecology assesses health risk.

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The particles increase the chance of a person getting a lung infection, such as pneumonia or bronchitis, and they can cause more frequent and more severe asthma attacks in people who already have asthma. Among people who have allergies, the particles can cause allergic reactions to be worse than usual, and they can cause heart disease and stroke in people who already have heart disease. Other conditions that might occur because of the particles are male infertility, birth defects, and reduced lung growth in children. Even small amounts of particles, breathed over a long period of time, can cause lung cancer and other forms of cancer.

### **Nitrogen dioxide (NO<sub>2</sub>)**

Short exposures – 30 minutes to 24 hours – to NO<sub>2</sub> above a safe level can cause breathing problems for some people. In addition, NO<sub>2</sub> may make breathing harder for people who already have trouble with their lungs, such as people with asthma.

When NO<sub>2</sub> combines with other gases and sunlight, ground-level ozone forms. Health effects of ground-level ozone are similar to those for diesel exhaust particles. They include inflamed and irritated lungs and breathing passages, which may lead to coughing, chest tightness, wheezing, and difficulty breathing. This reduced lung function may limit a person's ability to exercise. Ozone can also cause allergic reactions to be worse than usual. If a person is exposed to ground-level ozone day after day for a long time, the lungs can be permanently damaged.

NO<sub>2</sub> also hurts the environment. It contributes to acid rain and to smog.

## **How Ecology evaluates diesel engine exhaust**

### **How the evaluation is done**

1. Ecology's air quality experts rely on computer models to estimate where the wind will carry the pollutants in the exhaust from diesel-powered backup generators. They predict the amount of toxic air pollutants that could be in the air.
2. Ecology toxicologists review the information from the computer models. (Toxicologists specialize in understanding how pollution and chemicals affect people's health.)
3. The toxicologists then use risk assessment (see the heading "Risk assessment" below) to estimate possible health problems. They base these estimates on the predicted amounts of toxic air pollutants in the areas studied.

## **Risk assessment**

Ecology toxicologists use risk assessment as a tool to estimate increased risk to human health. The purpose is to identify any potential health effects so we can prevent illness. Risk assessment is best used as a ruler to help us decide how we can best protect people's health. Risk assessment can't predict exact rates of a certain disease in an exposed community. However, it is a good tool for estimating potential risk and is based on current medical knowledge.

### **How the results are evaluated**

The risk assessment divides health risk into two broad categories: cancer risk and non-cancer health risk. These two categories are evaluated differently. When Ecology staff assess diesel engine exhaust, they look at cancer risk from exposure to the particles in diesel exhaust.

They also look at non-cancer health risk caused by breathing these particles over a long time and by breathing the nitrogen dioxide in diesel exhaust over shorter times.

### Cancer risk

When assessing cancer risk, Ecology assumes that any exposure to a cancer-causing chemical results in some degree of risk. The highest acceptable risk that Washington State regulations allow from any one project is a rate of 10 additional cancers in one million people. The highest risk usually allowed by the U.S. Environmental Protection Agency (EPA) for cancer-causing chemicals is 100 additional cancers in one million people exposed.

### Non-cancer health risk

For non-cancer health risks, toxicologists calculate a “hazard quotient.” This is a mathematical way to estimate how harmful a chemical might be to human health over a given period of time. The hazard quotient is the comparison of the estimated concentration of a chemical to what toxicologists term a “reference concentration.” The reference concentration of a chemical is the amount below which health problems are not likely to occur. A hazard quotient of more than 1 means that a chemical has the potential to cause health problems. It does not mean that the chemical will definitely cause health problems, but the higher the hazard quotient, the more likely there will be health effects.

For NO<sub>2</sub>, the hazard quotient is based on the amount of NO<sub>2</sub> that would cause some – but not all – people with asthma to have trouble breathing. The risk assessment takes into account the size of the hazard quotient, the severity and likelihood of a health effect, and the likelihood of exposure to NO<sub>2</sub>.

### What does health risk really mean?

Health problems like cancer and asthma may be due to many factors in addition to pollution, such as lifestyle, age, and exposure to viruses. But this does not mean there is no risk at all, even if pollution levels are within acceptable limits. Because there are many uncertainties involved in risk assessments, Ecology’s estimate of increased health risk is not exact. To account for uncertainty, we design our risk assessments to use cautious assumptions – we are careful not to under predict human health risk. Actual health risks from diesel exhaust produced by any data center may be lower than our estimates, but we want to make sure we don’t underestimate the risk when we make decisions based on health risk.

For more information, see Ecology’s report, “Concerns about Adverse Health Effects of Diesel Engine Emissions” available online at <http://www.ecy.wa.gov/pubs/0802032.pdf>. Information about Washington data centers and air quality is available online at <http://www.ecy.wa.gov/programs/air/quincydatacenter/>.