Focus on: Boeing Auburn Site Monitored Natural Attenuation

Wetlands help break down contaminants over time.

More information

Please visit the project website for more information: ecology.wa.gov/BoeingAuburn.

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Special accommodations

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6700 or visit ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with speech disability may call TTY at 877-833-6341.

What is monitored natural attenuation?

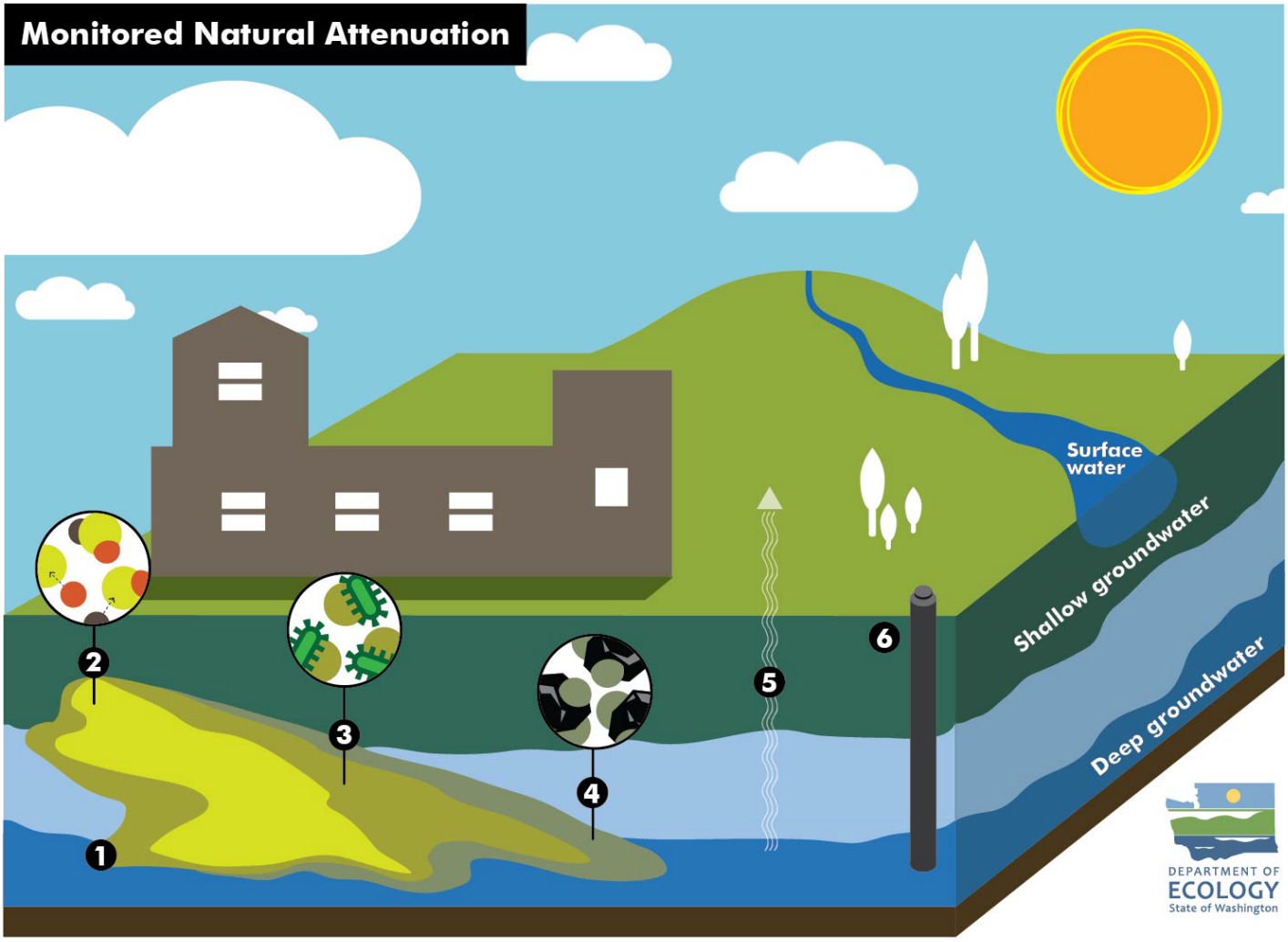
Monitored natural attenuation (MNA) involves closely monitoring the natural breakdown of chemicals on a contaminated site until reaching cleanup standards.

These processes occur in the soil and groundwater (the water that flows beneath the surface of the earth) at the same time:

- **Dispersion and dilution.** The chemicals are spread out (dispersed) and watered down (diluted) as they travel with the flow of groundwater, away from the contamination source over time.
- **Chemical reactions.** The chemicals on the Boeing Auburn site, trichloroethylene (TCE) and vinyl chloride (VC), break down through chemical reactions in the soil and groundwater.
- **Biodegradation.** Living bacteria naturally found in soil and water consume contaminants over time.
- **Sorption.** As groundwater flows through soil, chemicals stick to carbon in the soil. This removes them from the groundwater.
- **Evaporation.** TCE becomes vapor and moves into the small air pockets around soil particles. These soil gases eventually reach the surface, reducing the amount of TCE in the groundwater.

Why use this cleanup method?

Ecology and Boeing measured chemicals in the groundwater and used computer models to understand how TCE travels in the groundwater at the Boeing Auburn site. The model and groundwater sampling indicated that MNA, paired with a treatment called enhanced bioremediation,[1] would effectively reduce contaminants in soil and groundwater, because the TCE has reached **low levels** that are naturally decreasing. Also, **Ecology is directing Boeing to carefully monitor the contamination**.



1 Dispersion and dilution
The contaminants are spread out (dispersed) and watered down (diluted) in groundwater as the pollutants travel further away from the source over time.

2 Chemical reactions
The contaminants on the Boeing Auburn site, trichloroethylene (TCE) and vinyl chloride (VC), break down through chemical reactions in the soil and groundwater.

3 Biodegradation
Living bacteria naturally found in soil and water consume contaminants over time. Microorganisms such as bacteria are most effective at breaking down pollutants when pollutant concentrations are low.

4 Sorption
As water flows through the site, pollutants stick to carbon in the soil, which removes it from the groundwater.

5 Evaporation
TCE evaporates into the small air pockets around soil particles, and these soil gases eventually reach the surface, reducing the concentration of TCE in the soil and groundwater.

6 Monitoring well
Natural attenuation processes are observed in groundwater using monitoring wells with screens in each zone for "monitoring" of contaminants.

Figure 1. A monitoring well on the Boeing Auburn Site. Boeing will take samples from monitoring well access points to track the concentration of TCE on the site over time.

How long will the process take?

There are two clean water standards: one is for groundwater and one is for surface water. Surface water cleanup standards for TCE and VC are about ten times stricter than groundwater standards for TCE. The impacted groundwater isn't a source for drinking water in this area. See the cleanup standards infographic for TCE at ecology.wa.gov/BoeingAuburn.

The model predicts that using **only** MNA on the Boeing Auburn Site would take about **30 years to clean the site to groundwater standards** and **about 100 years to clean the site to surface water standards.** However, we will also use enhanced bioremediation (injecting contaminant-eating bacteria into groundwater) with MNA to reach cleanup levels faster. Read more about bioremediation in our Focus on: Boeing Auburn Site Enhanced Bioremediation[1] publication.

[1] https://bit.ly/BoeingAuburnBio