



## Nitrogen: A concern for Puget Sound and Washington's drinking water supplies

Domestic sewage contains high amounts of nitrogen. On-site sewage systems often are not designed to reduce nitrogen levels in treated wastewater. This can result in increased nitrate concentrations, or "nitrogen loading" in ground and surface water.

In some areas of Washington, nitrogen can contaminate drinking water supplies. Nitrogen in its nitrate form is recognized as an acute chemical contaminant in drinking water. High levels of nitrate in drinking water can cause serious problems for bottle fed infants who can develop [methemoglobinemia](#) or [blue baby syndrome](#).

Nitrogen loading also has environmental effects on coastal marine ecosystems such as Hood Canal and south Puget Sound. Excess nitrogen fuels the growth of algae. As algae die and decay, they consume oxygen. This process can reduce levels of dissolved oxygen in Puget Sound that can harm aquatic life.

### Denitrification (Nitrogen Reduction) Verification Project

Our Wastewater Management Section is partnering with the University of Washington's Department of Civil and Environmental Engineering to evaluate the denitrification performance of some existing on-site sewage technologies. The goal of the project is to expand the list of affordable treatment options available for use in areas where nitrogen is identified as a contaminant of concern.

The US Environmental Protection Agency is paying for this project using funds from the National Estuary Program's (NEP) Toxics and nutrients reduction and prevention grant. About \$620,000 in NEP funds have been allotted for the project. Construction of the systems chosen for evaluation was completed in June 2012 and evaluation has begun. The project is scheduled for completion by December 2013.

#### Sponsors





## Systems Technology Evaluation

We are evaluating three cost-effective and low maintenance technologies that have been used successfully in other parts of the United States to remove high levels of nitrogen from sewage. Because the microbially-driven processes for denitrification are temperature dependent, we need to test these systems in Washington. The information we gain from the tests will help us improve the design and management of these systems and, if test results are positive, will allow us to approve their use in Washington.

Using the [EPA Environmental Technology Verification \(ETV\)](#) protocol for nutrient reduction, we are testing the following systems:

- A vegetated recirculating gravel filter system that is comparable to a recirculating vertical flow constructed wetland.
- A passive two-stage denitrification system that includes a recirculating gravel filter followed by a vegetated denitrifying woodchip bed.
- An enhanced recirculating gravel filter that is also designed to maximize nitrogen removal efficiencies.

These technologies will be tested and evaluated over a one-year period.

The ETV protocol requires a consistent source of domestic wastewater. The technologies are being tested on the grounds of the Snoqualmie Wastewater Treatment Plant. We selected this site because it has residential strength influent (diverted to the three systems at the WWTP headworks), adequate space to locate the three systems, reasonable proximity for DOH and UW personnel, and support from the City of Snoqualmie. The systems will be removed at the project's conclusion.

A [stakeholder advisory committee](#) has been formed to help in the evaluation process. If the ETV results indicate the technologies are effective and reliable, then we will develop recommended standards and guidance for their use in Washington.

To learn more about the project go to  
[www.doh.wa.gov/CommunityandEnvironment/Shellfish/EPAGrants/Denitrification.aspx](http://www.doh.wa.gov/CommunityandEnvironment/Shellfish/EPAGrants/Denitrification.aspx)

Or contact:

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