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Central Coast Regional Water Quality Control Board

**CENTRAL COAST AMBIENT MONITORING PROGRAM –  
GROUNDWATER ASSESSMENT AND PROTECTION**

**FACT SHEET:  
NITRATE/NITRITE IN DRINKING WATER  
December 16, 2013**

***What is nitrate (NO<sub>3</sub>)?***

Nitrate is a common contaminant found in groundwater that can have serious health effects if consumed at high levels. Nitrate is colorless, odorless and tasteless. Low levels of naturally occurring nitrate can be normal, but excess amounts can pollute groundwater. In pristine areas, shallow groundwater that is unaffected by human activities commonly contains less than 2 milligrams per liter (mg/L) of nitrate (as nitrogen) or no measurable nitrate. Common sources of nitrate in groundwater are fertilizers, livestock waste, and human waste associated with septic and municipal wastewater systems. Excess nitrate in the soil is most often found in rural and agricultural areas. Nitrate travels easily through the soil carried by rain or irrigation water into groundwater. Wells in agricultural areas that are shallow, placed in sandy soil, or wells that are improperly constructed or maintained are more vulnerable to nitrate contamination. Some agricultural areas of the Central Coast region have high concentrations of nitrate in groundwater and drinking water wells may be affected.

***What is nitrite (NO<sub>2</sub>)?***

Although typically absent or present in groundwater to a much lesser extent because it is rapidly converted to nitrate, nitrite (NO<sub>2</sub>) is a related contaminant with similar physical properties to nitrate that is associated with nitrate and the sources of nitrate. As noted below, drinking water standards also exist for nitrite and nitrate plus nitrite in addition to nitrate. For drinking water quality purposes nitrate plus nitrite concentrations are considered to be representative of nitrate concentrations.

***What are the drinking water standards for nitrate, nitrite and nitrate plus nitrite?***

The California Department of Public Health (CDPH) set the state drinking water standard or maximum contaminant level (MCL) for nitrate at 45 mg/L as Nitrate (this is roughly equivalent to the Federal drinking water standard of 10 mg/L as Nitrogen). CDPH also set a state drinking water standard for nitrite at 1 mg/L. Since the toxicity of nitrate and nitrite are additive, CDPH also established a standard for the sum of nitrate and nitrite at 10 mg/L as nitrogen. Drinking water containing nitrate above the MCL is not safe for human consumption, especially for infants six months of age and younger, and pregnant and nursing women. The Water Board uses the MCL (and other water quality limits) as a basis for its regulatory actions regarding the protection of drinking water.

### ***What are the health effects from drinking water impacted by nitrate?***

Nitrate in drinking water poses an acute health risk at certain levels of exposure. Unlike most drinking water MCLs, the nitrate MCL is based upon an observed human effect in highly sensitive persons. There is no safety factor incorporated into the standard. Infants six months of age and younger, and pregnant and nursing women should avoid consuming water containing elevated levels of nitrate (i.e., above the MCL). Potential serious health effects associated with consuming water containing nitrate above the MCL, include:

- Infants below the age of six months who drink water containing nitrate in excess of the MCL may quickly become seriously ill and, if untreated, may die because high nitrate levels can interfere with the capacity of the infant's blood to carry oxygen, causing a condition called Methemoglobinemia ("blue baby syndrome"). This is an acute disease and the symptoms can develop rapidly in infants. In most cases, health deteriorates over a period of days. Symptoms include shortness of breath and blueness of the skin, especially around the eyes and mouth.
- High nitrate levels may also affect the oxygen-carrying ability of the blood of pregnant women.

The good news is that doctors can treat Methemoglobinemia and babies can make a full recovery if treated right away. In addition, health risks are reduced for children older than six months of age and adults. For more information on the risks of nitrate consumption, consult your doctor.

### ***Do I have to test my private well?***

Private domestic well owners are responsible for ensuring that their well water is safe to drink. Unlike for public drinking water systems, statewide drinking water testing requirements for nitrate do not exist for private domestic wells and local small water systems with two to four service connections. However, varying county level requirements and well sampling assistance programs may exist. Please contact your local water district or County Environmental Health Department directly to obtain information concerning any available well testing assistance programs in your area. A list of county contacts is provided at the end of this fact sheet. A list of state certified laboratories who can analyze your drinking is available through the following State Water Board Groundwater Ambient Monitoring and Assessment (GAMA) Program website address:

[http://www.waterboards.ca.gov/water\\_issues/programs/gama/domestic\\_wells\\_testing.shtml](http://www.waterboards.ca.gov/water_issues/programs/gama/domestic_wells_testing.shtml)

### ***Do I have to notify and provide safe drinking water to well users?***

Anyone providing drinking water should make sure the water is safe to drink, especially in higher risk locations, such as farming areas. As the owner/operator of a private domestic supply well, you are responsible for all necessary water quality testing, providing this information to people who may drink water affected by nitrate or other pollutants, and ensuring that the water is safe to drink. The Water Board has the authority and responsibility to protect drinking water supplies, and may require responsible parties to provide replacement water to users in certain circumstances pursuant to Water Code Section 13304.

### ***What type of treatment is available?***

Nitrate is easily dissolved in water and there is no simple way to completely remove nitrate from water. Although it is common to think of boiling, softening, or filtration as a means of purifying

water, none of these methods reduce nitrate contamination. Boiling the water before drinking it does not remove nitrate. In fact, boiling causes some of the water to evaporate, which increases the nitrate concentration. Softening and filtration do nothing at all to remove nitrate. Some available solutions are presented below. It is up to the individual well owner to evaluate the specific situation that affects his or her well and determine the appropriate solution.

**Immediate Solution** - If the nitrate concentration in your water is high, an immediate solution is to use an alternative source of water for drinking, cooking, and mixing baby formula (such as bottled water). DO NOT BOIL the water that is high in nitrate – it makes the problem worse.

**Long-term Solution** - For a long-term solution, you can treat the water to remove the nitrate. Treatment technologies that remove nitrate include reverse osmosis, ion exchange, and distillation. Each type of system has advantages and disadvantages, and no single system will correct all water quality problems. A list of “Certified Residential Water Treatment Devices” for various contaminants, including nitrate, is available on the CDPH website at:

<http://www.cdph.ca.gov/certlic/device/Pages/watertreatmentdevices.aspx>

Water treatment system vendors are listed in the yellow pages or on the Internet by searching "Water Filtration & Purification Equipment." Treatment systems are also available at some department stores for the do-it-yourself installers. When you purchase a system, be clear about the type of system that you need, and ask for a guarantee that the system will remove nitrate contamination (i.e., is the system rated for nitrate concentrations consistent with your source water quality and will it reduce nitrate to levels below the drinking water standard discussed above). The effectiveness of certain types of treatment devices to remove nitrate is also dependent on the presence of various minerals and other contaminants. It is the well owner's responsibility to select an appropriate treatment device and to properly operate and maintain it, including periodic testing, to ensure it is functioning properly. It is suggested to test both your untreated and treated well water periodically to ensure the treatment device is effectively removing nitrate. Also, some systems require proper disposal of waste so that it does not re-contaminate the groundwater supply.

Public water system (i.e., water system with fifteen or more service connections) owners/purveyors are required to treat the water to meet the MCL for nitrate and to properly dispose of the treatment waste, if the groundwater sources exceed the nitrate MCL. These water systems are also required to be operated by a certified water treatment plant operator, and be tested routinely for water quality. This is not a feasible option for private domestic well owners.

### ***Are other options available for domestic well owners?***

Many options are available to help reduce the vulnerability of your domestic well to pollution, including the following:

- Evaluate the well location. Are livestock or animal enclosures located within 100 feet of the well? If so, relocate these enclosures at least 100 feet away from the well.
- Is stockpiled manure stored within 100 feet of the well? If so, relocate the stockpiles at least 100 feet away from the well.
- Is the septic system located less than 100 feet from the well? If possible, consider relocating the septic system.
- Is the well located in an area of heavy agricultural or fertilizer use? Consider restricting or controlling the use of fertilizers near the well. Also, make sure irrigation water does not flow towards or accumulate near the well.

- If nitrate exceeds the MCL, test for nitrate through a state certified lab quarterly to determine if any preventative measures have any effect on the nitrate contamination levels.
- Nitrate may be confined in shallow fractures or aquifers. In some situations it may be possible to reconstruct an existing well to extend the casing and annular seal to a depth sufficient to avoid drawing water from the zones contaminated with nitrate. This can be a very expensive process, which still has a possibility of not correcting the problem.
- Another option may be to drill a new well in a more suitable location, and destroy the contaminated well.
- Consider drinking and cooking with bottled water if the nitrate contamination levels cannot be reduced.

For more information about domestic wells and addressing water quality problems, including “A Guide for Domestic Well Owners”, please go to the Water Board’s website at:

[http://www.waterboards.ca.gov/gama/wq\\_privatewells.shtml](http://www.waterboards.ca.gov/gama/wq_privatewells.shtml)

### ***Where else can I get assistance?***

For specific questions regarding the safety of your domestic well and information concerning human health risks associated with drinking water containing elevated levels of nitrate or other contaminants, please contact CDPH or your local County Environmental Health Office using the contacts provided in the following table. In addition, if you have concerns regarding your health or require additional information about the risks of nitrate consumption, you should consult your doctor.

### **Public/Environmental Health Contacts**

<b>California Department of Public Health (CDPH)</b> Drinking Water Program 916-449-5600 <a href="http://www.cdph.ca.gov">www.cdph.ca.gov</a>	
<b>Monterey County Env. Health</b> 831-755-4500 <a href="http://montereycountyhealth.org/">http://montereycountyhealth.org/</a>	<b>Santa Barbara County Env. Health Services</b> 805-346-8460 <a href="http://www.countyofsb.org/phd/environmentalhealth.aspx?id=1444">http://www.countyofsb.org/phd/environmentalhealth.aspx?id=1444</a>
<b>San Benito County Public Health Division</b> 831-637-5367 <a href="http://www.sanbenitoco.org/">http://www.sanbenitoco.org/</a>	<b>San Luis Obispo County Env. Health Services</b> 805-781-5544 <a href="http://www.slocounty.ca.gov/health/publichealth/ehs.htm">http://www.slocounty.ca.gov/health/publichealth/ehs.htm</a>
<b>San Mateo County Env. Health Services</b> 650-372-6200 <a href="http://smchealth.org/">http://smchealth.org/</a>	<b>Santa Clara County Dept. of Env. Health</b> 408-918-3400 <a href="http://www.sccgov.org/sites/deh/Pages/DEH.aspx">http://www.sccgov.org/sites/deh/Pages/DEH.aspx</a>
<b>Santa Cruz County Env. Health Services</b> 831-454-2022 <a href="http://www.scceh.com/">http://www.scceh.com/</a>	<b>Ventura County Environmental Health</b> 805-654-2813 <a href="http://www.ventura.org/rma/envhealth/">http://www.ventura.org/rma/envhealth/</a>

For more information about the Central Coast Ambient Monitoring Program – Groundwater Assessment and Protection (CCAMP-GAP), please visit the Water Board’s Internet site at:

[http://www.waterboards.ca.gov/centralcoast/water\\_issues/programs/gap/index.shtml](http://www.waterboards.ca.gov/centralcoast/water_issues/programs/gap/index.shtml)