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Person-Centered Behavioral & Physical Health Care Public Health & Prevention Regulatory and Population Health Health Management Services

February 19, 2019

From: Bill Emminger, REHS, Division Director Benton County Environmental Health

To: House Committee on Energy and the Environment

Subject: House Bill (HB) 2860 – Testing of Wells that Supply Ground Water for Domestic Purposes

A Few Facts:

Currently under state law no testing of domestic wells is required during the well construction phase for total coliforms, nitrate, or arsenic. Also, under state law no routine testing of domestic wells is required for total coliforms, nitrate, or arsenic. There is a limited requirement for testing of domestic wells during real estate transactions for total coliforms, nitrate, and arsenic, but little provisions for enforcement. 23% of Oregonians get their drinking water from domestic wells.

Results of Benton County Pilot Project on Domestic Well Safety:

It is estimated that Benton County has approximately 10,000 domestic wells. Many of these wells have never been tested for total coliforms, arsenic, or nitrates. From 2014 through 2018 under a small grant from Oregon Health Authority that was used to offer 189 homeowners free testing for total coliforms, arsenic, and nitrate. While not all wells exceeded health based standards for the three contaminants tested, we did find that many domestic wells were found to contain some level of contamination:

Test Performed	Percent of Total Wells Containing Some Level of Contamination
Nitrate	31% (58/189)
Arsenic	18% (34/189)
Coliforms	19% (36/189)
Wells with 2 or more contaminants detected	10% (19/189)
Wells with 3 or more contaminant detected	0.5% (1/189)

For homeowners and renters knowing if their drinking water well is contaminated will allow them to make informed decisions to protect their health by taking steps to reduce or eliminate the source of contamination on their property, drilling a new well, or using an alternative source of drinking water. Home owners may choose to install devices designed to remove or reduce contamination from their drinking water supply.

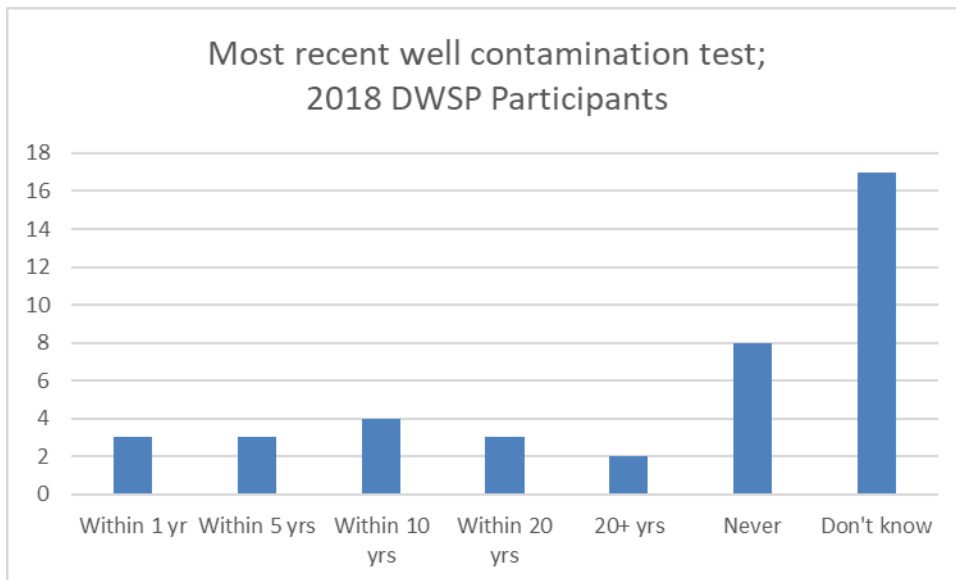
Communities can also benefit by knowing when, where, and the extent of groundwater contamination is affecting their aquifer. While some solutions can be done on an individual level in some cases ground water contamination may be so extensive that a broader community wide response is necessary to protect this shared resource.

The following table shows Benton County Domestic Well Safety results for four years by the percent of wells which exceeded safe drinking water standards and the percent of well which while contaminated did not exceed health base standards.

Test Performed	Percent of Total Wells Contaminated	Comment
Nitrate (0.5-9.9 ppm)	28%; (53/189)	0 to 2 ppm may indicate naturally occurring nitrates, 3 to 7 ppm indicate man made sources of nitrate are affecting the aquifer; 7 to 9.9 ppm indicate increasing level of concern and remediation should be considered.
Nitrate (≥ 10 ppm)	3%; (5/189)	Exceeds Safe Levels Established for Public Drinking Water Systems.
Arsenic (1 - 9 ppb)	15%; (28/189)	Any Level of Arsenic Exposure May Have Health Risks.
Arsenic (≥ 10 ppb)	3%, (6/189)	Exceeds Safe Levels Established for Public Drinking Water Systems.
Coliform (Present)	19%; (36/189)	May Indicate Faulty Well Design, Construction or Maintenance that is Allowing Surface Contamination to Enter the Well.
E.coli (Present)	<1%, (1/189)	Exceeds Safe Levels Established for Public Drinking Water Systems.

Testing History

The 2018 Domestic Well Safety Program (DWSP) compiled data about well testing history among participants and applicants. Only 25% (10/40) of 2018 DWSP participants knew that their well was tested in the past 10 years. Twenty percent of DWSP volunteers (8/40) had never tested their well, 43% (17/40) did not know if the well had been tested, and 13% (5/40) had not tested in over 10 years. Two households participating in the 2018 DWSP had inherited their property and never tested. Inherited properties are not subject to Oregon’s Real Estate Transaction law (RET). Additionally, numerous homeowners who had tested upon moving did so before arsenic testing was added to the RET. One man, whose well had never been tested for arsenic and who had been living at the property for decades said, “Are you saying you might tell me I’ve been drinking arsenic for the past 30 years?” Fortunately, his well did not have arsenic contamination. Although this testing history information is anecdotal and only represents a specific subset of well users (DWSP applicants), it does indicate that many BC well users do not adhere to recommended testing schedules.



Stories Based on Experiences with Domestic Well Testing Program

Story #1) The first story involves a family who purchased a home in Benton County a year before Oregon implemented testing wells for arsenic prior to a real estate transaction. Within a week of testing the client's home Benton County Environmental Health (BCEH) received results from Edge Analytical Laboratory stating the homeowner's well had levels of arsenic above the maximum contaminant level (MCL) of 10 ppb. The homeowner's were extremely concerned with results since they have young children (children are more susceptible to high levels of nitrates). After the initial shock of the results, the homeowner's discussed the possible abatement procedures. The last time a BCEH representative spoke with the homeowners, they were installing a reverse osmosis filter to decrease the amount of arsenic exposure to the family.

Story #2) Another story involved several renters who had been given permission to participate in the DWSP from their landowner. Similar to the first story, the results from the well water testing showed nitrate contamination above the MCL set by the Environmental Protection Agency. BCEH was able to conduct a meeting with a representative from the landowner and the renters to discuss the results, abatement procedures, and any concerns that anyone might have regarding the elevated levels of nitrates. Upon releasing the results to the landowner and the renters, the landowner was in contact with BCEH to determine the best action they would be able to take to make sure their tenants were taken care of. The company that owns these properties has installed a reverse osmosis system at each well on the property to decrease the amount of nitrates exposed to the renter's water.

Story #3) Shows the importance of this program is about two wells on one property. One well is in a well house with a concrete floor and has an in-ground storage tank located just off the well house. The access to this large 1500-gallon water tank was loose and the cows kept knocking it off exposing the reservoir. This well feeds the house, so this is where we took our sample. The results came back positive for coliform, but negative for e-coli. After discussing the needs to seal the tank and addressed the leak that was dripping inside the well house; the team observed a dry pond and took a look at the other well closer to the house. This well is very short and sits on the edge of this currently dry pond between a drainage pipe from the road and a grey water drainpipe. The well had the seal removed and pump disconnected, leaving it exposed; next to the pond that floods every year. As a result, surface water was likely contaminating the aquifer. The homeowner was not aware that

these two wells could cause any problems in the conditions that they were in. The participant was very happy to have the team out and do an assessment of their wells and to get recommendations for any corrective action that might be needed. They immediately started making the changes that were recommended at the visit.

Story #4) Several years ago at the Southern Willamette Ground Water Advisory meeting I was approached by a woman who relayed this story. She told me she had several miscarriages due to elevated nitrates in her drinking water. They had placed a reverse osmosis water treatment device at their kitchen sink, but she continued to have miscarriages. The reason why the miscarriages continued? She liked drinking cold water from the water dispenser on her refrigerator. The water supply line was not installed before not after the water treatment device. Once this was discovered and corrected she was able to deliver a healthy baby. The last story illustrates the importance that homeowners understand the treatment technology being installed in their homes for it to be effective.

Health Concerns:

- **Arsenic:**

- Drinking water that contains elevated levels of arsenic for a long period of time is linked to many health problems including skin lesions, high blood pressure, cardiovascular damage, bronchitis, impaired nerve functioning, and type 2 diabetes. The U.S. Department of Health and Human Services has determined that arsenic can cause cancer. Subsequently, drinking elevated levels of arsenic for a long period of time may increase the risk of bladder, lung, skin, kidney and liver cancer. Children are more susceptible to all environmental chemicals, including arsenic. Arsenic can cross the placenta and reach the developing child which makes pregnant women more susceptible to arsenic as well.
- **Reference:** Oregon State University, Institute of Water and Watersheds and Environmental Health Science Center

- **Nitrate:**

- Nitrate in drinking water is most dangerous for infants and pregnant women. It causes miscarriages, birth defects, and methemoglobinemia or "blue baby syndrome," which occurs when nitrate interferes with the blood's ability to carry oxygen. High nitrate levels can also increase risk of thyroid disorders and gastric or bladder cancer.
- Nitrate levels of up to 3 parts-per-million (ppm) in well water may be naturally-occurring or possibly indicates some low level of contamination, but are considered to be safe for consumption. The EPA has set an MCL of 10 ppm for nitrate (NO₃-N) for drinking water. Nitrate levels above 10 ppm may present a serious health concern for infants and pregnant or nursing women. Adults receive more nitrate exposure from food than from water. Infants, however, receive the greatest exposure from drinking water because most of their food is in liquid form. This is especially true for bottle-fed infants whose formula is reconstituted with drinking water with high nitrate concentrations. Nitrate can interfere with the ability of the blood to carry oxygen to vital tissues of the body in infants of six months old or younger. The resulting illness is called methemoglobinemia, or "blue baby syndrome".

- Pregnant women may be less able to tolerate nitrate, and nitrate in the milk of nursing mothers may affect infants directly. These persons should not consume water containing more than 10 ppm nitrate directly, added to food products, or beverages (especially in baby formula).
- Little is known about the long-term effects of drinking water with elevated nitrate levels. Some research has suggested that nitrate may play a role in spontaneous miscarriages, thyroid disorders, birth defects, and in the development of some cancers in adults. Recent human epidemiologic studies have shown that nitrate ingestion may be linked to gastric or bladder cancer. The most likely mechanism for human cancer related to nitrate is the body's formation of N-nitroso compounds (NOC), which have been shown to cause tumors at multiple organ sites in every animal species tested, including neurological system cancers following transplacental exposure. Nitrite, the reduced form of nitrate, reacts in the acidic stomach to form nitrosating agents that then react with certain compounds from protein or other sources such as medications to form NOCs. In humans, it is the nitrosamines and NOCs that are suspected brain and central nervous system carcinogens. Additional epidemiologic and research studies are needed to verify these links and identify any other potential nitrate-related cancer risks. Links to supporting information are provided at the end of this document.
- One associated human health concern is that water supplies showing nitrate contamination have the potential for other contaminants, such as bacteria and pesticides, to reach groundwater along with the nitrate. In a 2009 report on the quality of water in domestic wells, the U.S. Geological Survey found that contaminants such as nitrate (nutrients) co-occurred with other contaminants in 73 percent of wells tested in the study.
- **Reference:** Oregon Department of Environmental Quality Fact Sheet on Nitrates
- **Total coliforms:**
 - Water pollution caused by fecal contamination is a serious problem due to the potential for contracting diseases from pathogens (disease causing organisms). Frequently, concentrations of pathogens from fecal contamination are small, and the number of different possible pathogens is large. As a result, it is not practical to test for pathogens in every water sample collected. Instead, the presence of pathogens is determined with indirect evidence by testing for an "indicator" organism such as coliform bacteria. Coliforms come from the same sources as pathogenic organisms. Coliforms are relatively easy to identify, are usually present in larger numbers than more dangerous pathogens, and respond to the environment, wastewater treatment, and water treatment similarly to many pathogens. As a result, testing for coliform bacteria can be a reasonable indication of whether other pathogenic bacteria are present.
- **Fecal coliforms:**
 - Fecal coliforms are the group of the total coliforms that are considered to be present specifically in the gut and feces of warm-blooded animals. Because the origins of fecal coliforms are more specific than the origins of the more general total coliform

group of bacteria, fecal coliforms are considered a more accurate indication of animal or human waste than the total coliforms.

- **Escherichia coli (E. coli):**

- Escherichia coli (E. coli) is the major species in the fecal coliform group. Of the five general groups of bacteria that comprise the total coliforms, only E. coli is generally not found growing and reproducing in the environment. Consequently, E. coli is considered to be the species of coliform bacteria that is the best indicator of fecal pollution and the possible presence of pathogens.

Recommendations:

This is a good bill that could improve the safety of drinking water for many domestic well users:

1. All rural Oregonians deserve to drink clean, safe water that meets basic water quality standards and doesn't threaten their health.
2. Domestic well property owners will be able to take advantage of free or reduce cost of water testing.
3. Renters of properties will for the first time know if they are drinking water that met basic health standards. Especially important for renters who have preexisting medical conditions, pregnant women, or children.
4. Property owners will be able to take advantage of reduce cost for installing remediation devices especially for persons living on fixed or low income.
5. Grants offered through this program would build capacity for local health departments and others to address health concerns related to some of the more common groundwater contaminates and allow for targeted interventions appropriate for a community based on knowledge of local conditions.
6. Help communities to better protect their groundwater aquifers.
7. Any new domestic wells that are constructed should at a minimum be required to be test for total coliforms, arsenic, and nitrate by Oregon Water Resources before being placed into service. Samples could be collected by either the homeowner or the company responsible for installing the well. Test results should be sent by the water quality lab to Oregon Health Authority. Fees could be assessed that would cover the cost of OHA and local health departments to have staff review results and follow-up with appropriate education and recommendations for remediation.

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