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Groundwater Problem in the Vicinity of Lime Kiln Park, Grafton, Ozaukee County

The Wisconsin Department of Natural Resources and the U.S. Environmental Protection Agency are investigating chemical contamination in private wells in the Town of Grafton. Concern is limited to an area south of the Village of Grafton along the Milwaukee River. About 30% of the wells tested contained low levels of chemicals posing no immediate health hazard, but for which long term exposure might increase the risk of developing certain health problems. Bottled water or treatment units have been provided to affected residents. Federal, state and local officials are considering extension of a public water utility as a permanent solution.

Exactly where are the affected wells?

All the affected wells serve residences in the Town of Grafton. The largest group is along Manchester Drive west of the intersection with Nantucket Court. Another cluster is along the east side of Green Bay Road north of the intersection with High Knoll Drive up to Lime Kiln Park. No contaminated wells have been found south of Lakefield Road. Properties in the Village do not use private wells but have public water service from the Grafton Water Utility. The utility treats, blends and tests its water so all customers receive a safe water supply.

What is the source of the chemicals?

There are several potential sources. Groundwater moves southeasterly across this area, so the origin of the contaminants is expected to be found northwest of the affected wells. Improper handling and disposal of degreasing solvents by local industry contaminated several Village of Grafton utility wells in the early 1980's. Some of the chemicals now being found in private wells may originate from these or other industrial spills. Another source could be leaching of waste buried in the old quarry under Lime Kiln Park. This site operated as the village and town dump from the 1940's until 1970. DNR is installing special monitoring wells around the park to determine if this is a source.

Who is responsible for the damage?

This can be difficult to establish and is often litigated over many years. Eventually, any responsible parties could be liable as a result of civil action for damages. This could include industries that had a spill, owners of the dump when it was operated, owner of the dump property today, and major industrial or commercial users of the dump when it was in operation.

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Exactly what chemicals have been found in the well water?

Testing has been limited to a class of chemicals known as Volatile Organic Chemicals (VOC's). This screening looks for 72 compounds commonly used in fuels, solvents, industrial and commercial processes and their breakdown products. The following have been found:

- Chloroform
- Chloromethane
- 1,1 Dichloroethane (1,1 DCA)
- 1,2 Dichloroethane (1,2 DCA)
- Dichloroethylene (DCE)
- cis-1,2 Dichloroethylene (cis 1,2 DCE)
- trans-1,2 Dichloroethylene (trans 1,2 DCE)
- Tetrachloroethylene
- Toluene
- 1,1,1 Trichloroethane (1,1,1 TCA)
- Trichloroethylene (TCE)
- 1,1,2 Trichlorotrifluoroethane (Freon)
- Vinyl Chloride

What type of health problems are associated with these chemicals?

These chemicals when found above a drinking water standard are of health concern. Drinking or inhaling high levels of these chemicals over a lifetime may increase a person's risk of getting some types of cancer. For the levels of contaminants found in area wells the risk is very low. However, these risks are avoidable by discontinuing use of the water for drinking. No health problems are expected from use of water with chemicals at lower levels. The Wisconsin Division of Health (DOH) publishes Toxic Chemical Fact Sheets for most of these chemicals which discuss specific health effects at different levels of exposure. These are available from the DOH contacts listed below.

Could other contaminants be present?

The well water has not been tested for all possible contaminants. VOC's are used as *indicators* of groundwater pollution. VOCs can pose a direct health risk, but the source of any VOCs must be considered for its potential to include other substances. Leachate from dumps is usually a complex mixture which could include acids, bases, heavy metals, inorganics such as cyanide and nitrate, pesticides, herbicides, and PCBs. On the other hand, industrial spills can consist of one or two chemicals. Comprehensive testing will cost over \$1000 per sample. Limited testing may be done later in the investigation to assess the likelihood of other chemicals being present.

What about the water test when you buy a house or get a new pump?

The water test done for real estate loans and when contractors service a pump is only for coliform bacteria. This is an important test, but it does not show any chemicals.

How many wells have been tested?

Fifty-one (51) wells have been sampled to date. Sixteen (16) wells contain one or more VOCs. Twenty-two (22) wells tested free of any VOCs. Two (2) wells were tested for heavy metals. Lab results are pending for thirteen (13) wells. Eleven (11) wells have been retested to confirm initial results. Five (5) of the wells containing VOCs had levels considered "unsafe" to drink. One (1) of these wells also had a level considered "unsafe" to touch or breathe water vapor.

Will my well be tested?

If your property is adjacent to another property which tested positive for any VOCs you will *probably* be tested by the DNR or EPA. Because testing is very expensive, and the hazard to health is not immediate, sampling has been limited and systematic. If you wish to test your well at your expense it can be done thru a private certified lab for VOCs by an EPA approved method such as 502.2 or 8021. You can expect to pay \$200-\$400. Call DNR for a list of certified labs.

How deep are the contaminated wells?

The average well depth is about 200 feet. Well depth is not a major factor in determining contamination in this case. The most critical factor is proximity to the contamination plume. All the wells in this area use the same aquifer (underground source of water). This is a layer of sedimentary rock known as the Niagara Dolomite, or "limestone bedrock" by local well drillers. The top of this rock formation is visible in Lime Kiln Park and was excavated for the quarry. This layer is about 600 feet thick and is saturated with water which fills all cracks and crevices. Wells are vertical holes drilled into this rock which intersect crevices. The general direction of underground water flow in this region is southeasterly, also strongly influenced by of the river, but due to the water flowing thru crevices local irregularities can occur in the actual path of contamination This is called "crevice flow" and can result in neighboring wells of identical depths having different water quality.

Is drilling a deeper well a solution?

It is considered a very bad risk, especially considering the cost. The most dangerous chemical found, vinyl chloride, sinks because it is heavier than water. Unlike petroleum or lighter contaminants which float on the water table, vinyl chloride continues to migrate downward if there are vertical crevices in the rock. Since there are no deeper wells in the affected area it is unknown whether any unfractured rock layers might prevent downward migration. A 400 foot deep residential well with cement-grouted casing would cost about \$15,000. After pumping it is possible that pump drawdown would induce water to migrate from above with vinyl chloride. Periodic testing of the water would be essential.

Below 600 feet and extending to about 850 feet there is another formation of sedimentary rock known as the Maquoketa shale. This is lithified "mudstone" which is impervious to downward water migration and does provide a barrier from sinking contaminants. However, it contains no water so it is necessary to drill to depths exceeding 1000 feet to obtain water from what is called the "sandstone aquifer". This aquifer has poor quality water high in iron, sulfate and naturally-occurring radioactive radium. It requires treatment to be usable. A residential well of this depth would cost about \$25,000.

Will a water filter remove chemical contaminants?

Some treatment systems make unfounded claims or the units are not capable of removing complex combinations of chemicals. The Wisconsin Department of Commerce reviews manufacturer's claims and independent lab reports to publish a list of state-approved name-brand treatment units. The DNR may allow use of an approved unit based on the type and amount of contamination. Treatment is viewed as temporary or a last resort since it often fails due to lack of proper maintenance.

Carbon filtration, Reverse Osmosis (RO) and air stripping are three types of treatment each of which will remove some, but not all, of the contaminants found. The treatment units being approved for installation at this site are a combination of air stripping followed by carbon filtration. Some of the less contaminated wells may have carbon filters only. Proper sizing and maintenance of carbon filters is essential to contaminant removal. Fabric or paper filters, water softeners and iron filters are ineffective in removing the chemicals found. Boiling water will evaporate most of the chemicals.

How was this problem discovered and how long has it existed?

A plumber who installed a treatment system notified DNR of a potential problem in April 1996. Systematic sampling has since included 51 wells. It is likely that the contaminants have been present in the groundwater for at least 10 years, and possibly as long as 40 years, dating from the middle years of operation of the quarry dump. Groundwater usually travels slowly, but when flowing thru creviced rock it can travel a quarter mile in just months or sooner.

Why is the U.S. Environmental Protection Agency involved?

The EPA has an excellent program for providing emergency relief to owners of contaminated drinking water. If chemicals are present above a certain level, EPA can provide federal funds for bottled water, treatment units and installation of public water to all potentially affected properties. Because determining liability for groundwater contamination can take many years, this emergency approach to protect citizen health is very beneficial. In similar cases, such as the 5-Corners landfill in Cedarburg in 1991, EPA completed installation of water mains within a few months. The EPA was invited by DNR and a legal firm representing 10 of the affected well owners to provide similar relief when it became apparent that alternatives might take longer and be more difficult to achieve.

Doesn't the Village of Grafton Water Utility have contaminated water too?

The Village owns seven high capacity wells feeding a network of water towers and mains. Four of these wells contain VOCs. In the 1980's large air stripping towers were installed on two of these wells to remove the VOCs. Another well is shut-down completely because VOCs are too high to treat. The fourth well has low levels of VOCs and is used for emergency demand only after it is blended with clean water to produce acceptable water quality. The remaining two wells are naturally free of contamination. By a process of centralized treatment and blending, all the water delivered to utility customers is "safe". Public utilities are considered to provide the safest and most reliable water supply because they are constructed to high engineering standards, maintained by professional certified operators, and are sampled frequently for a wide range of contaminants to comply with strict federal and state regulations.

Has it been decided that Village water will be extended?

A decision has not been made. DNR and some affected residents support this as the best permanent solution, and EPA is willing to manage and pay for the initial cost of construction. But the Village and the affected property owners must agree on several key issues including annexation, assessment fees and the metered cost for the water.

Will annexation into the Village be required to obtain utility water?

A number of affected property owners oppose annexation as a condition of receiving Village water. A Village ordinance prohibits sale of water to properties not annexed. The EPA will not construct water mains unless they are assured that the Village will actually supply water once the mains are built, and also that most affected properties will hook-up. In similar cases in other communities, water has been provided without annexation. This major issue will determine future progress on a long term solution.

If I hook-up to Village water can I keep my well for other uses?

No. It is a strict policy of DNR, based on administrative code rules, to require abandonment of contaminated wells even if they are used for non-potable purposes. Even if the well is on a property designated "at risk", and hasn't been tested or tests free of VOCs, it will be required to be permanently sealed. This is to prevent the possibility of unauthorized future use, the need for future testing, and to protect the aquifer from damage caused by downward movement of contaminants within a well.

Who will pay for well abandonment, water service laterals and landscaping damage?

If EPA manages the water main extension, these costs will be included in the project. If EPA does not construct the water system, this will depend on any negotiated settlement between the Village, the parties responsible for the contamination and affected property owners.

Who exactly would be included in any Village water extension?

It is likely that all properties where VOCs were detected, and even adjacent properties which have tested free of VOCs or have not been tested, will be included in a "Health Advisory Area". This is based on DNR and EPA's analysis of a likelihood of being affected any time in the future. Typically a buffer zone is included around a contaminated area to avoid long term monitoring and concern.

What if the Village and affected properties do not come to an agreement?

The EPA will probably not proceed with water main construction using federal money. Long term solutions will depend on negotiated or litigated settlements with responsible parties or Village. Bottled water will continue to be provided for drinking, but treatment units will not be maintained by EPA after one year. Ownership and maintenance of any treatment unit will become the responsibility of the property owner.

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