



Central Michigan District Health Department

Promoting Healthy Families, Healthy Communities



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August 25, 2021

David Udy
Gerrish Township Supervisor
2997 E Higgins Lake Dr
Roscommon, MI 48653

RE: Higgins Lake Area Public Sewer Development and Drinking Water Wells, Roscommon County, Michigan

Dear Mr. Udy:

In the CMDHD correspondence of June 4, 2021, it was stated that water wells in the Higgins Lake area could be at higher risk of contamination from onsite sewage disposal systems (OSDS) due to density, isolation issues, and well depth. Drinking water wells are known to be shallow and unprotected by a clay layer in many places around Higgins Lake. This puts these wells at higher risk for contamination through surface and subsurface discharge of wastewater.

The engineering plan for the Higgins Lake Public Sewer identified onsite sewage disposal systems as the main source of nutrients flowing into Higgins Lake. While onsite sewage treatment systems are designed to reduce harmful bacteria, they are less effective in removing nutrients, certain chemicals, medications, and viruses. Much of the research on onsite sewage systems impacts on groundwater have focused on nitrates because it is easily monitored. We know from prior studies at Higgins Lake that the upper springs feeding the lake are rich in nitrate and phosphorus due to the influence of onsite sewage disposal. Drinking water wells in the same aquifer as the springs would be impacted as well. We can observe this through high nitrates identified in shallow water wells around the southern half of Higgins Lake. A water well with nitrate contamination is being impacted by onsite wastewater disposal.

The following studies and papers that discuss the impact that onsite wastewater disposal can have on groundwater were reviewed and found to be relevant for the Higgins Lake area.

- A study conducted by the University of Florida for the Florida Department of Health in 1984 had several key findings. Soil limitation in removing nitrates from onsite wastewater disposal, especially in coarse sandy soils, resulted in 60 to 80 percent of the discharged nitrates being mixed into the groundwater. Phosphorus removal was good in aerobic conditions but poor when there is high groundwater. The report also established an increase in the density of OSDS increases the potential for groundwater contamination due to decrease in dilution. *Impact of On-site Sewage Disposal Systems on Surface and Ground Water Quality, Report to Florida*

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Department of Health and Rehabilitative Services under contract number LC170, November 1984, Thomas J. Sicki, Randall S. Brewn, Mary E. Collins, Robert S. Mansell, and Donald F. Rothwell. Soil Science Department, G-159 McCarty Hall, Institute of Food and Agricultural Sciences, University of Florida, Gainesville, Florida 32611

- A research paper published in the Groundwater Journal looked at drinking water illness outbreaks reported to the CDC's Waterborne Disease Outbreak Surveillance System between 1971 and 2008. Human wastewater was identified as the main cause of groundwater contamination accounting for 33% of identified cases of disease. The report identified improper design, maintenance, location of the water source, or nearby wastewater disposal systems as contributing to 67% of illness cases. *Contributing Factors to Disease Outbreaks Associated with Untreated Groundwater*, by Erika K. Wallender, Elizabeth C. Ailes, Jonathan S. Yoder, Virginia A. Roberts, Joan M. Brunkard, First published: 03 October 2013, <https://doi.org/10.1111/qwat.12121>
- A 1998 study by the Minnesota Pollution Control Agency (MPCA) looked at groundwater in the unsewered portion of Baxter, Mn. Plumes from onsite sewage disposal systems were found to be detectable up to 328 feet from the source. Nitrate concentrations exceeded the drinking water standard throughout most of the plume. The top 15 to 20 feet of the aquifer saw the most impact from nitrates. A one-acre lot would be expected to have about 7 percent of the shallow aquifer exceed the drinking water standard for nitrate. As lot size decreased a greater portion of the groundwater would be affected. *Effects of Septic Systems on Ground Water Quality - Baxter, Minnesota, May 1999*, Published by Minnesota Pollution Control Agency Ground Water and Toxics Monitoring Unit Environmental Monitoring and Analysis Section Environmental Outcomes Division, 520 Lafayette Road North, St. Paul, Minnesota 55155-4194
- A study published in 2016 looked at OSDS density that would minimize the impact of wastewater on local groundwater. The report identified OSDS as effective in removing some but not all pollutants. The remaining pollutants were left for dilution in the groundwater. The researchers listed multiple studies on septic system densities and impact of nitrate on the groundwater. All of the cited studies identified a direct relationship between OSDS density and elevated nitrate concentration in the groundwater. *Tooele County Septic System Density Study*, Hansen Allen & Luce Inc, May 2016.
- In 2008 and 2009, the Wisconsin Geological and Natural History Survey studied viruses in the Madison Wisconsin municipal water wells. Six wells were studied ranging in depth from 700 feet to 900 feet. Three of the wells were grouted through a confining layer which is thought to be protective from surface contamination. Human enteric viruses were detected 61% of the samples in the deep water wells, while virus was detected in 75% of the samples in local lakes. Pathways for viral transport were identified to include porous soil media and transport down failed or abandoned well casings. Wastewater was identified as the source of viral contamination in both the lakes and municipal wells. *Human viruses as tracers of wastewater pathways into deep municipal wells*, Final report to the Wisconsin Department of Natural

Resources, Kenneth R. Bradbury, Wisconsin Geological and Natural History Survey University of Wisconsin-Extension. Published 2010.

While these studies were not done in the Higgins Lake area, there is ample evidence dense concentration of OSDS impact groundwater and increase the risk of exposure to unacceptable levels of nitrates, bacteria, and viruses. Recent research has identified medication transport through groundwater and surface water as an emerging concern.

Much of the Higgins Lake area was developed decades ago as a vacation community when lot size was not a major consideration for onsite sewage disposal and water supplies. Many of these properties have since become permanent homes and those that remain vacation homes are heavily used, increasing the amount of wastewater being discharged in a concentrated area. We see the impacts now with the nutrient loading in the lake and residential wells with high nitrate levels. The construction of a municipal sewer system is strongly encouraged to protect the health of Higgins Lake and the health of the residents who depend on a clean and safe groundwater source for their drinking water.

Sincerely,

A handwritten signature in black ink, appearing to read "Steve King". The signature is written in a cursive, flowing style.

Steve King, R.S.
Director of Environmental Health
Central Michigan District Health Department
2012 E. Preston St
Mt. Pleasant, MI 48858