Title: **Nitrate Contamination in West-Central Wisconsin with Emphasis on Mill Run First Edition Subdivision (Study No. 12)**

Investigators: Principal Investigator

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Objectives: To map usable nitrate data and to compare the nitrate mass balance model of Wehrman (1984) to the BURBS model, earth resistivity data and groundwater data for the subdivision.

Background/Need: Previous laboratory analyses for nitrate-nitrogen for private wells in the Town of Union in Eau Claire County, Wisconsin have indicated nitrate-nitrogen levels in excess of the drinking water standard of 10.0 milligrams per liter (mg/l).

Methods: 17 glacial and sandstone wells were sampled monthly for nitrate-nitrogen, volatile organic compounds (VOCs), chemical oxygen demand (COD) and chloride in a subdivision in Eau Claire County. Earth-resistivity measurements were conducted and a mass balance model was used to simulate the natural interactions between septic system discharge, rainfall infiltration, groundwater pumped, volume of groundwater in area and volume leaving the elemental volume. A field investigation of the groundwater flow system included measurement of the static water level in the wells. The location of each nitrate value was mapped for each township and range in Eau Claire County.

Results: Average nitrate-nitrogen levels in most of the glacial and some of the sandstone wells sampled in the subdivision exceeded the 10 mg/l standard and showed little monthly variation. The highest levels were detected in close proximity to duplexes with septic systems. Comparison of the BURBS versus Wehrmann model revealed greater flexibility of input for water recharge data with the BURBS model, though this model may not account for all of the available nitrogen.

Conclusions: The septic systems in the subdivision are thought to be the main source of nitrate-nitrogen in groundwater. Dilution of nitrate-nitrogen from the septic systems by groundwater is not a sufficient mechanism to meet the drinking water standard. The nitrate mass balance model predicted comparable nitrate-nitrogen values to the mean for the wells immediately downgradient of the subdivision. Accurate input data is required to apply this model to the subdivisions. VOCs, COD and chloride contamination were not found to be significant groundwater quality problems for the subdivision.

Recommendations/ Implications: The investigator recommends notification of nitrate results to all residents of the subdivision. A cleaner drinking water supply should be found as well as origins of the high nitrate-nitrogen concentrations. New nitrate-nitrogen values should continue to be mapped and related to well depth, well construction and geology. Groundwater observation wells should be installed in the vicinity of the subdivision to determine and monitor monthly groundwater flow directions and hydraulic conductivity, as well as a piezometer to determine vertical hydraulic gradient. Methods should be investigated and implemented to reduce the loading of nitrate-nitrogen to

groundwater, including the extension of sewer lines to eliminate septic systems and the construction of a central wastewater treatment facility for the subdivision to include both aerobic and anaerobic digestion processes. Research is also suggested to design a septic system which includes the process of denitrification.

Availability of Report: This report is available for viewing and loan at:

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Related Publications: Tinker, Jr., John R., 1986. Nitrate Contamination in West-Central Wisconsin with Emphasis on Mill Run First Edition Subdivision: Report Submitted to the Wisconsin Department of Natural Resources.

Tinker, Jr., John R., 1989. Impact of Nitrate-Nitrogen from Unsewered Subdivisions on Groundwater: Report to be Submitted to the Wisconsin Department of Natural Resources.

Key Words: Models, nitrate-nitrogen, septic system, wastewater

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