INVESTIGATION OF COAL-TAR DERIVITIVES IN GROUND WATER IN THE ST. LOUIS PARK AREA, MINNESOTA

US EPA RECORDS CENTER REGION 5
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A Progress Report

by

THE U.S. GEOLOGICAL SURVEY, WRD

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Introduction

The objectives of the study are to develop a detailed understanding of the ground-water flow system and the transport of organic contaminants in the vicinity of the former Republic wood-preservative and coal-tar distillation plant in St. Louis Park, Minnesota. This report summarizes the progress made to date in the study. A report on multiaquifer wells in the area was submitted to the cooperator on February 6, 1979 which included information on 114 wells known to exist in the immediate vicinity of the site. The Minnesota Department of Health is currently engaged in a program of permanently sealing those wells which provide pathways for the movement of contaminants between aquifers.

Data Collection

Collection of existing geologic data is nearly completed. Data from approximately 3,000 well logs and 1,000 soil borings has been obtained and maps showing the areal extent, thickness, and structure of geologic units are being prepared.

Ground-water levels are being measured at 43 stations at 2-week intervals and 8 water-level recorders have been installed to continuously monitor water-level changes. In addition, a mass measurement of approximately 50 wells completed in the Prairie du Chien-Jordan and Hinckley aquifers was made on January 30, 31, 1979, and maps showing water-level elevations on this date prepared.

Fourteen piezometers, three bedrock, and one drift monitoring well have been installed; an additional monitoring well is under construction. It is anticipated that a total of approximately 25 observation wells and 40 piezometers will be installed.

As of April 3, 1979, 19 water-quality samples have been taken with analyses being made by the Minnesota Department of Health and U.S. Geological Survey. Parameters measured in the field include pH, temperature, specific conductance and alkalinity. Laboratory analysis of organic compounds includes High Performance Liquid Chromatography to determine the concentration of individual PAH compounds, MBTH phenols, and total, dissolved, and suspended organic carbon. Inorganic parameters include dissolved solids, major cations and anions, nutrients, and precision determination of selected trace metals.

Chemical analysis of four drift cores was performed by the USGS using Flame Ionization and GC/MS methods. Napthalene and PAH compounds were found to be the major contaminants present with napthalene comprising 90% of the contaminants in one core.

A subcontract has been awarded to Dr. Pfannkuch of the University of Minnesota to conduct laboratory column experiments. Geologic materials from the site have been made available for packing and the initial compound for testing has been selected. The columns have been set up and are being calibrated using conservative inorganic tracers.

Data Analysis

Based on the data collected to date, it appears that the buried bedrock valley to the east of the site is considerably deeper than previously reported. Additional testing will be conducted to evaluate the geometry of the valley and the concentration and composition of contaminants entering the bedrock aquifers through the valley.

Water level data collected by the USGS in August 1977, and January 1979 indicate that during those periods the ground-water gradient in the Prairie du Chien-Jordan aquifer permitted water to move northward from the site towards the municipal wells. These wells were found to be contaminated by the Minnesota Department of Health in November 1978. It appears likely that the source of much of the contamination measured at the municipal wells is the "Hinckley well on the site" (W23) which is known to be partially filled with coal-tar deriviatives.

Analysis of short-term pumping tests, chemical analyses, and inspection of fluids withdrawn from wells in the area of greatest contamination in the glacial drift suggest that at least two fluid phases exist: an aqueous phase enriched in highly soluble contaminants such as napthalene and phenolic compounds, and a hydrocarbon phase composed predominantly of PAH compounds. The areal extent of each is as yet unknown.

Construction of a preliminary digital flow model of the glacial drift, and Platteville and St. Peter aquifers has begun. The area modeled extends approximately from Minnehaha Creek to the west to the Minneapolis chain of lakes to the east. This preliminary model will be used to guide data collection and to test our current understanding of the operation of the hydrogeologic system. In the second year of the study, it will be expanded to include contaminant transport.