

**Title:** Designs for Wellhead Protection in Central Wisconsin: Case Studies of the Town of Weston and City of Wisconsin Rapids

**Project I.D.:** DNR Project No. 63

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**Background/Need:** These studies are the first to monitor efforts of wellhead protection areas in Wisconsin pursuant to the 1986 Federal Safe Drinking Water Act Amendments. This legislation established a new Wellhead Protection Program for areas surrounding wells and wellfields supplying public water.

**Objectives:** To examine the wellhead protection areas of the City of Wisconsin Rapids and the Town of Weston in relation to defining zones of contribution (ZOC), identifying and mapping potential contaminant sources, and developing management strategy options to be used in the implementation of a wellhead protection program.

**Methods:** The zones of contribution for the wellfields were defined using incremental applications of the uniform flow equation modified by consideration of hydrogeologic boundaries and the balance between pumping rate and natural recharge. Within the ZOC, time of travel zones were calculated to show the time of travel of groundwater from certain areas to the well. This can be used in wellhead protection to allow for early warning of contamination, time-dependent degradation of pollutants, dilution of contaminants or as reasonable setback distances for various contaminant sources.

Point sources were identified using state inventories and other available resources, field checked to the most thorough extent possible, and mapped. Wellhead protection management options were created through review of literature and meetings with community advising panels.

**Results:** Underground fuel storage tanks and spills of hazardous materials have resulted in extensive contamination of the groundwater supply of Weston, which is located in an alluvial sand and gravel aquifer. Nonpoint sources include pesticides, fertilizers, septic systems, and chloride from road salt, though these substances are considered less of a threat in the ZOC. Forest lands and unirrigated, primarily dairy agricultural lands surround the outer extent of Weston's ZOC.

Wisconsin Rapids faces the greatest threats to groundwater quality from underground storage tanks and businesses using or generating hazardous substances. Unsewered residential development within the five-year time of travel presents another major threat to wellhead protection. Nonpoint sources consist of pesticides, fertilizers, septic systems and chloride from road salt. The groundwater is also stored in a vulnerable sand and gravel aquifer. Forested and undeveloped land uses dominate outlying areas of the ZOCs, though agriculture also occurs in these areas.

**Conclusions/  
Implications/**

**Recommendations:** Management options suggested for Weston include presenting the community with educational material and encouraging community involvement concerning WHP issues, including spills, landfills, salvage yards, deicing salts, residential and agricultural areas. Administrative options proposed involve regulation and zoning efforts of local government.

Management is recommended for Wisconsin Rapids as a cooperative effort with the town of Grand Rapids because city wells and recharge areas are located outside city boundaries. Educational and administrative options similar to those presented for Weston are proposed for both citywide and area-wide techniques.

Both Weston and Wisconsin Rapids have numerous sources of contamination in the zones of contribution for their municipal wells. Similar educational, administrative and regulatory management options were outlined for both areas on a local level, as well as interjurisdictional suggestions for Wisconsin Rapids and neighboring Grand Rapids.

**Related**

**Publications:** Osborne, Thomas J., Sorensen, Jenifer L., Knaack, Mark R., Mechenich, David J., and Travis, Michael, J., 1989. Designs for Wellhead Protection in Central Wisconsin: Case Studies of the Town of Weston and City of Wisconsin Rapids.

**Keywords:** wellhead protection, groundwater protection, zone of contribution, underground storage tanks, spills, pesticides, fertilizer, septic systems, chloride, landfill

**Funding:** DNR, U.S. Environmental Protection Agency

**Project Report:** A report on this project is available for loan from Wisconsin's Water Library, University of Wisconsin - Madison, 1975 Willow Drive, Madison, Wisconsin 53706, (608) 262-3069.