Groundwater Management

Communities dependent on groundwater can support a broad range of land uses, while protecting the groundwater supply.

Over one million people in Southeast Michigan rely on groundwater for their drinking water supply. However, increased development in areas dependent on groundwater results in increased possibility of contamination. This contamination could result from a variety of new "sources" associated with various types of developments.

The *Water Quality Management Plan for Southeast Michigan* recognizes the interrelationships between groundwater protection and land use planning. The plan encourages incorporating groundwater protection into the community zoning, site plan review and master planning processes and developing local groundwater protection programs. An effective groundwater protection program has a number of benefits that transcend the protection of drinking water sources and include, protection of surface waters and wetlands as well as enhancing land values.

Keeping It Connected

Communities dependent on groundwater can support a broad range of land uses, while protecting the groundwater supply. By mapping your community's groundwater recharge area, you can then appropriately plan for residential, commercial, and industrial land uses in the community. If possible, place parks and open space in the recharge areas, along with residential that is clustered to reduce impervious surfaces and allow water to infiltrate into the ground. Avoid certain commercial or industrial land uses in the recharge area, if possible. If these land uses do occur, require additional measures to ensure protection of the area groundwater supply.

Planning and Regulatory Considerations

The U.S. Environmental Protection Agency (EPA) is responsible for federal activities relating to the quality of groundwater. EPA's groundwater protection activities are authorized by a number of laws, including:

- The Safe Drinking Water Act, which authorizes EPA to set standards for maximum levels of contaminants in drinking water, regulate the underground disposal of wastes in deep wells, designate areas that rely on a single aquifer for their water supply, and establish a nationwide program to encourage the states to develop programs to protect public water supply wells (i.e., wellhead protection programs). In October 2001, EPA began the process of implementing a new standard for arsenic in drinking water. The standard has dropped from 50 parts per billion to 10 parts per billion, with implementation of the new standard by 2006.
- The Resource Conservation and Recovery Act, which regulates the storage, transportation, treatment, and disposal of solid and hazardous wastes to prevent contaminants from leaching into groundwater from municipal landfills, underground storage tanks, surface impoundments, and hazardous waste disposal facilities.
- The Comprehensive Environmental Response, Compensation, and Liability Act (Superfund), which authorizes the government to clean up contamination caused by chemical spills or hazardous waste sites that could (or already do) pose threats to the environment, and whose 1986 amendments include provisions authorizing citizens to sue violators of the law and establishing community "right-to-know" programs (Title III).
- The Federal Insecticide, Fungicide, and Rodenticide Act, which authorizes EPA to control the availability of pesticides that leach into groundwater.
- The Toxic Substances Control Act, which authorizes EPA to control the manufacture, use, storage, distribution, or disposal of toxic chemicals that leach into groundwater.
- The Clean Water Act, which authorizes EPA to make grants to states for developing groundwater protection strategies and authorizes a number of programs to prevent water pollution from a variety of potential sources.

- Parts 31 and 22 of Michigan's Natural Resources and Environmental Protection Act govern groundwater protection. Part 31 is Michigan's primary water pollution control statute and applies to both groundwater and surface water quality. Part 22 sets forth the groundwater quality rules, designed to protect groundwater for all uses while allowing groundwater discharges.
- Where federal and state laws have provided for general groundwater protection activities (such as wellhead protection programs or development of state groundwater protection strategies), the actual implementation of these programs is by the states in cooperation with local governments. A major reason for this emphasis on local action is based on the premise that protection of groundwater generally involves making very specific decisions about how land is used.

Tools for Groundwater Management

There are several tools communities can draw from to protect their groundwater:

- Start a groundwater/wellhead protection program.
- Incorporate groundwater management into planning and zoning regulations.
- Utilize overlay zoning.

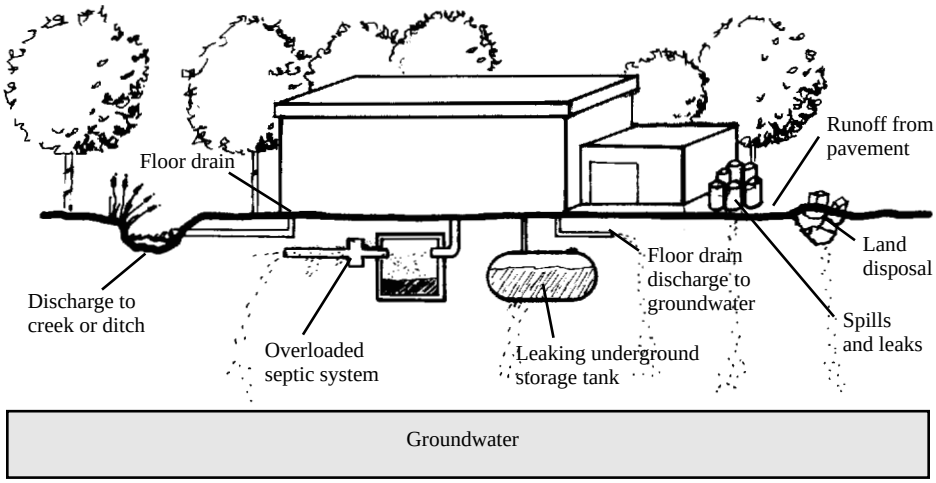
Starting a groundwater/wellhead protection program

One mechanism to effectively manage groundwater is to develop a groundwater or wellhead protection program. Such a program protects groundwater by:

- **Delineating the protection area**. A wellhead protection area is defined by the Michigan Department of Environmental Quality (MDEQ) as, "the area which contributes groundwater to a public water supply system well." Delineating this area often requires a hydrogeologic study to identify the contributing area. While the area contributing groundwater to a well may extend for miles, MDEQ suggests basing the delineation on a groundwater time-of-travel of 10 years. The 10-year, time-of-travel provides a reasonable length of time for responding to environmental problems within the protection area, while concurrently providing an area which can be reasonably managed.
- **Identifying potential sources of contamination**. The next step in a strong wellhead protection program is identifying existing and potential sources of contamination. At a minimum, known sites of environmental contamination may include leaking underground storage tanks, sites of environmental contamination (201 sites of Act 451), and oil and gas contamination sites. Known sites which represent a potential for contamination include registered underground storage tanks, hazardous waste generators, and groundwater discharges. Many of these databases are available online through Michigan's Center for Geographic Information, www.michigan.gov/cgi
- **Management and minimizing the threat**. The final step in a wellhead protection program is providing mechanisms which will prevent existing and potential sources of contamination from reaching the public water supply or wellhead area. This strategy should incorporate both public education and land use activities. A critical step is educating residents, busi-

Figure 19
Groundwater Protection: Contributors to Contamination

Pathways by which contaminants from business facilities can reach groundwater



Source: Adapted from Waste Systems Institute of Michigan, Inc.

nesses, and industries located within the wellhead protection area to emphasize their role in making wellhead protection work.

Incorporate groundwater management into planning and zoning regulations

Planning and zoning are critical components of any effort to protect a community's groundwater resources. Planning documents, such as the community master plan, provide an opportunity for the community to communicate their groundwater protection goals. This signals the value the community places on groundwater protection and provides a foundation for including groundwater protection measures in zoning ordinances.

Site plan review recommendations

Zoning regulations, such as site plan review standards, can be used to protect groundwater resources. Changes to the site plan review process occur in two major places, in the submission requirements and in the review standards. Following are recommendations for inclusion in the site plan submittal requirements:

- Existing topographic elevations at two-foot contour intervals. Indicate direction of drainage flow. (Including 100-foot off-site of subject property).
- Location and elevations of existing water courses and waterbodies, including county drains and surface drainage ways, floodplains, and wetlands.
- A storm water management plan that contains design of sewers, outlets, and retention or detention ponds. Sufficient data regarding site runoff estimates and off-site drainage patterns should be provided to understand the feasibility of storm water detention or retention as well as the impact on local surface and groundwater. Include soils information/classification that is verified with soil borings.
- Location and status of any floor drains in structures. The point of discharge for all drains and pipes should be specified on the site plan.
- Description and location of any existing or proposed outdoor storage facility.
- Description and location of on-site wastewater treatment and disposal systems.
- Location of existing and proposed private drinking wells, monitoring wells, test wells, irrigation wells, or wells used for industrial processes.
- Location, size, and description of any proposed interior or exterior areas of structures for storing, using, loading, or unloading of hazardous substances, hazardous wastes, and/or polluting materials.
- Delineation of areas on the site which are known or suspected to be contaminated, together with a report of the status of the cleanup or closure.
- Inventory of hazardous substances to be stored, used or generated on-site, presented in a format acceptable to the local fire marshal.

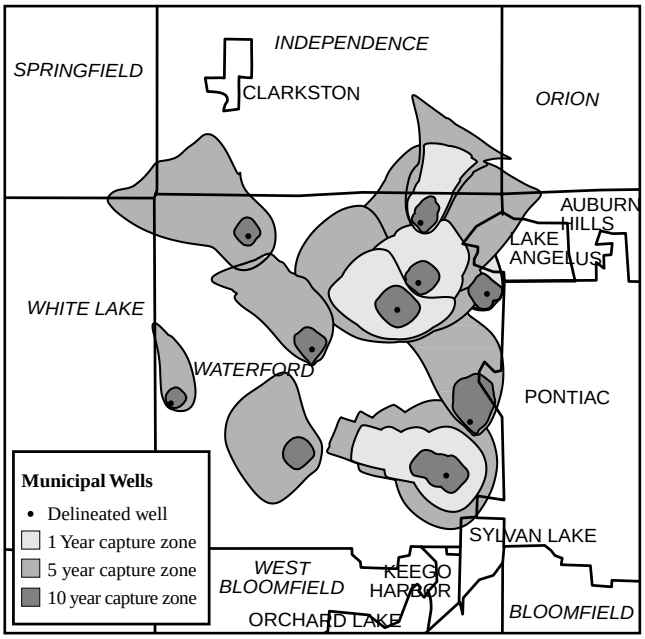
Groundwater discharge area.

Recommended practices for review standards

In addition to application information, following are recommended review standards:

- The project and related improvements shall be designed to protect land and water resources from pollution, including pollution of soils, groundwater, rivers, streams, lakes, ponds, and wetlands.
- Storm water detention, retention, transport, and drainage facilities should be designed to use or enhance the natural storm water system on-site. Storm water facilities should not cause flooding or the potential for pollution of surface or groundwater, on-site or off-site.
- General purpose floor drains should be connected to a public sewer system or an on-site holding tank (not septic system) in accordance with state, county, and municipal requirements, unless a groundwater discharge permit has been obtained from the Michigan Department of Environmental Quality. General purpose floor drains discharging to the groundwater are prohibited.
- Sites at which hazardous substances, hazardous wastes, or potentially pollution materials are stored, used, or generated must be designed to prevent spills and discharges of such materials to the air, surface of the ground, groundwater, lakes, streams, rivers or wetlands.
- Secondary containment facilities should be provided for above ground storage of hazardous substances, hazardous wastes, or potentially polluting materials in accordance with state and federal requirements. Above ground secondary containment facilities should be designed and constructed so that potentially polluting material cannot escape from the unit by gravity through sewers, drains, or other means, directly or indirectly, into a sewer system or into the waters of the state (including groundwater).

Figure 20
Wellhead Capture Zone
Waterford Township



Source: Waterford Township.

Utilize overlay zoning

Beyond the site plan review standards, communities can utilize an overlay zone to protect a community's groundwater supply. An overly zone is a geographical area that is subject to special regulations. For groundwater protection, the geographic area of the zone is typically based on the wellhead zone of contribution 10-year time of travel. This allows for zoning regulations to be placed directly on the wellhead protection area at risk.

Source: Michigan Society of Planning. Zoning and Management Tools for Groundwater and Wellhead Protection.

Case Example

Groundwater Protection Program

Community: Waterford Township

Contact: Robert Vallina, (248) 674-6245

In April 1991, staff from the Planning, Engineering, and Public Works Departments developed a working outline of a groundwater protection program for Waterford Township. The multi-faceted approach is designed to link the recently adopted master plan with the day-to-day activities of these departments in the area of groundwater protection. The intent of Waterford Township is to reach across departmental jurisdictions to ensure a comprehensive and coordinated approach to groundwater protection. The program received statewide recognition in 1992 when the Michigan Society of Planning (MSP) designated Waterford Township as one of only eight "Groundwater Protection Community" award recipients in the state. The award is intended to highlight communities which have taken the lead in groundwater protection planning as well as to publicize the importance of the groundwater resource.

Waterford Township continues to implement of their groundwater program, including:

- adopting ordinance requirements that mandate all site plan applicants review and complete an environmental permits checklist,
- delineating most of their 15 community wells, five and 10-year capture zones (see Figure 20),
- utilizing geographic information systems to map existing and potential sources of contamination, and
- writing a wellhead protection plan.

Additional Resources

Center for Applied Environmental Research at the University of Michigan, Flint. www.flint.umich.edu/Departments/RegionalGroundwater/rgchome.html

Charter Township of Oxford. "Groundwater Protection Standards." Oxford Township Zoning Ordinance, Section 2226. Hazardous Materials. July 1990.

Dean, Lillian F. and Wyckoff, Mark A. *Community Planning and Zoning for Groundwater Protection in Michigan: A Guidebook for Local Officials*. May 1991.

Jaffe, Martin and Frank Dinovo. *Local Groundwater Protection*. Chicago, IL. American Planning Association, 1987.

Michigan Department of Environmental Quality. *Zoning for Wellhead Protection: Program Options and Site Plan Review Standards*. August 2001.

Michigan Department of Environmental Quality's Wellhead Protection Program. www.michigan.gov/deq/0,1607,7-135-3313_3675_3695-50583--00.html

Michigan Society of Planning. *Zoning and Management Tools for Groundwater and Wellhead Protection.*

Michigan Society of Planning. *Using Groundwater Protection Data to Improve Planning and Zoning Decisions.* 1995.

Michigan State University Cooperative Extension. www.msue.msu.edu/waterqual/wq-mats.html.

Planning and Zoning Center, Inc. "Groundwater Protection." *Community Planning Handbook: Tools and Techniques for Guiding Community Change*. Michigan Society of Planning Officials. 1991.

Planning and Zoning Center, Inc. "Groundwater Regulation." *Grand Traverse Bay Region Development Guidebook*. September 1992.

U.S. Environmental Protection Agency. www.epa.gov/seahome/groundwater/src/ground.htm and www.epa.gov/r5water/grnwater/index.htm