From the Director

Many of our readers have learned that funding for some decentralized wastewater-related projects was not included in the U.S. Environmental Protection Agency appropriations bill for FY 2006 recently passed by Congress. Research projects, demonstration projects, and our own National Small Flows Clearinghouse (NSFC) and National Environmental Training Center for Small Communities (NETCSC) are affected by this turn of events. Small and rural communities that can’t afford central treatment systems, as well as regulatory officials, the onsite industry, environmental professionals, public health officials, local elected officials, and the many others who assist these communities with water, wastewater, and training solutions, will be impacted by the loss of services afforded by programs such as the NSFC and NETCSC.

I want to assure you that we are committed to securing other resources to continue our work to serve America’s small communities and those who assist them. Our management team at the National Environmental Services Center is developing strategies to address the funding situation. One of those strategies involves you.

Some of you have called me personally, as well as contacted our staff, to offer expressions of support for the services we provide through NSFC and NETCSC. Your stories help us tell others about the value of decentralized and onsite systems. Testimonials from you in the form of letters are especially useful. Testimonials offer us a way to share with potential funding agencies/organizations the value of decentralized and onsite approaches and the information, assistance, training, and facilitation provided by our programs.

As we do in every issue of the Quarterly, we ask that you let us know how successful we are in addressing your needs. What assistance do you find valuable? How do our services help you and your comm-unities? What else might we do to help? Your stories and input are important to us to enhance our services and to inform others so they may learn—as you have—what a difference information, assistance, training, and facilitation can make when it comes to meeting the environmental infrastructure needs of small town and rural America. Please take a few moments and let us know how we can serve you better.

Thank you for your continued interest and support for NSFC and NETCSC. We look forward to hearing from you. Please contact us by phone at (800) 624-8301 or by e-mail at tsuhrer@mail.wvu.edu.

Rick Phalunas, Ed.D., NESC Interim Executive Director

On the Cover

Design by Julie Black
Recommending Policy on Ownership and Operation of Wastewater Systems

Todd A. Danielson, P.E., B.C.E.E.

Loudoun County, Virginia, promotes the use of cluster systems in its rural areas. County regulations state that the Loudoun County Sanitation Authority (LCSA) must own or operate these systems. However, the LCSA has indicated it will only own and operate systems serving 15 or more connections, leaving some smaller systems without centralized management. This article presents and analyzes several options for managing cluster systems in Loudon County, including management by the county government, the LCSA, and private entities, as well as approaches used in other states. The benefits and drawbacks of several management options are outlined, and the author presents his recommendations to allow the county to manage all cluster systems in its jurisdiction.
EPA Provides Guidelines on Awarding State and Tribal Assistance Grants

The U.S. Environmental Protection Agency has announced the availability of a memorandum titled Award of Grants and Cooperative Agreements for the Special Projects and Programs Authorized by the Agency’s Fiscal Year 2005 Appropriations Act.

This memorandum provides information and guidelines on how EPA will award and administer grants for the special projects and programs identified in the State and Tribal Assistance Grants (STAG) account of the agency’s FY 2005 Appropriations Act.

The STAG account provides budget authority for funding identified water, wastewater, and groundwater infrastructure projects, as well as budget authority for funding the United States-Mexico Border Program, the Alaska Rural and Native Villages Program, and the Long Island Sound Restoration Program. Each grant recipient will receive a copy of this document from EPA.

The memorandum may be viewed and downloaded at www.epa.gov/owm/mab/owm0329.pdf.

Blending of Effluent at Publicly Owned Sewage Treatment Facilities

On May 19, 2005, Assistant Administrator Benjamin H. Grumbles announced that, based on the U.S. Environmental Protection Agency’s (EPA) review of all the information received, the agency has no intention of finalizing the policy on managing peak wet weather flows at municipal wastewater treatment facilities as proposed in November 2003. EPA will continue to review policy and regulatory alternatives to develop the most feasible approaches to treat wastewater and protect communities, upstream and downstream. The agency’s goal is to reduce overflows and improve treatment of wastewater to protect human health and the environment. EPA will work with Congress, communities, and citizens on effective and efficient approaches that protect communities and ensure compliance with the Clean Water Act.

For information about the proposed policy, go to: www.epa.gov/npdes/blending or contact Eryn Witcher at (202) 564-4355.

Federal Advisory Committee on Detection and Quantitation of Wastewater Contaminants

The U.S. Environmental Protection Agency is establishing a Clean Water Act (CWA) Federal Advisory Committee to engage stakeholders in a consultative process to help improve procedures that calculate and use detection and quantitation limits in the Clean Water programs such as the National Pollutant Discharge Elimination System (NPDES) Stormwater Permitting Program. Committee members will be appointed for a two-year term and consist of about twenty stakeholders representing the following five groups: laboratories, industry, publicly owned treatment works, states and tribes, and environmental organizations.

This committee will have technical experts available to analyze, evaluate, and develop scientific and statistical approaches to improve the detection and measurement of pollutants in water samples. Formal meetings of this committee will be open to the public and will be announced in the Federal Register.

Information and documents are available at www.epa.gov/water science/methods/det/.


The 2004 Annual Report on the Clean Water State Revolving Fund (CWSRF) is now available on the Office of Wastewater Management Web site at www.epa.gov/owm/net/cwfinance/cwsrf/. The report highlights program activities and successes throughout the past 15 years of the largest federal funding program for water infrastructure projects. Since it was created in 1988, the CWSRF has provided low-interest loans targeting a wide range of projects in areas like wastewater treatment, nonpoint source pollution control, estuary management, and a host of projects focusing on water quality.

The report provides an overview of the CWSRF, describes its financial status, economic and environmental performance, and discusses new directions for the future. You can view or download the report from EPA’s Web site. You can also obtain copies from the EPA Water Resource Center by calling (202) 566-1729 or by sending an email to center.water-resource@epa.gov. Refer to document number EPA-832-R-05-001.
Calendar of Events

SEPTEMBER

Water Reuse and Desalination: Mile-High Opportunities
20th Annual WateReuse Symposium
WateReuse Association, Water Environment Federation, American Water Works Association
September 18–21
Denver, Colorado
(703) 684-2409
Fax: (703) 548-3075
www.waterreuse.org/2005Symposium/index.html

Colorado Environmental Health Association
Educational Conference
Larimer County Department of Health and Environment
September 22
Estes Park, Colorado
(970) 577-2051
tgonzales@larimer.org

13th Onsite Wastewater Treatment Short Course and Equipment Exhibition
University of Washington, Seattle; Washington State Department of Health
September 19–20
Seattle, Washington
(866) 791-1275
Fax: (206)543-2352
uw-ep@engr.washington.edu
www.engr.washington.edu/ep/wvwt/

TOWA Conference
Texas Onsite Wastewater Association
September 30–October 1
Houston, Texas
(512) 494-1125
confinfo@wef.org
www.txowawa.org

OCTOBER

Mississippi River Basin Nutrients Science Workshop
EPA Office of Water
October 4–6
St. Louis, Missouri
Dana Thomas (202) 566-1046
Fax (202) 566-0409
Thomas.Dana@epa.gov
www.epa.gov/msbasin/new.htm

NRWA Annual Leadership Forum and Technology Exhibit
National Rural Water Association
October 9–12
Sacramento, California
(580) 252-0629
info@nrwa.org
www.nrwa.org/evFLForum.htm

NOWRA Annual Conference: Onsite is Here to Stay
National Onsite Wastewater Recycling Association
October 10–13
Cleveland, Ohio
(800) 966-2942
www.nowra.org

GSA Annual Meeting
Geological Society of America
October 16–19
Salt Lake City, Utah
(888) 443-4472
Fax (303) 357-1071
www.geosociety.org/meetings/2005/

IWEX 2005
Turret Group
October 18–20
Birmingham, England
44 (0) 1895 456 545
www.iwex.co.uk

ON SITE WASTEWATER TREATMENT CONFERENCE
University of Washington, Seattle; Washington State Department of Health
November 2–4
Seattle, Washington
(306) 694-4479
Fax: (206)543-2352
uw-ep@engr.washington.edu
www.engr.washington.edu/ep/wvwt/

TOWA Conference
Texas Onsite Wastewater Association
September 30–October 1
Houston, Texas
(512) 494-1125
confinfo@wef.org
www.txowawa.org

NOVEMBER

On-Site Wastewater Treatment Conference
North Carolina State University
October 25–27
Raleigh, North Carolina
Joni Tanner (919) 513-1678
joni_tanner@ncsu.edu

Community Planning Collaborative Summit
Community Planning Collaborative
October 27–30
Orlando, Florida
(407) 836-5600
www.placematters.com/CPCLI/registration/register.php

WEFTEC 2005
Water Environment Federation
October 29–November 2
Washington, D.C.
(800) 666-0206
www.weftec.org

2005 Annual SWWA Conference and Trade Show
Saskatchewan Water and Wastewater Association
November 2–4
Saskatoon, Saskatchewan
(306) 694-4479
Fax: (206)543-2352
uw-epp@engr.washington.edu
www.engr.washington.edu/epp/wwt/

2005 ASA CSSA SSSA Annual Meetings
American Society of Agronomy, Crop Science Society of America, and Soil Science Society of America
November 6–10
Salt Lake City, Utah
(608) 273-8080
www.asa-cssa-sssa.org/meetings/acs/

Activated Sludge Process Evaluation and Control
Missouri Water and Wastewater Conference
November 29–30
Springfield, Missouri
(573) 761-0376
Fax (573) 761-5544

ACWA 2005 Fall Conference and Exhibition
Association of California Water Agencies
November 29–December 2
San Diego, California
(888) 666-2292
www.acwa.com/events/FC05/FC05_Reg-Info.asp

If your organization is sponsoring an event that you would like us to promote in this calendar, please send information to the Small Flows Quarterly, Attn. Cathleen Falvey, National Environmental Services Center, West Virginia University, P.O. Box 6064, Morgantown, WV 26506-6064. Or you may contact Cathleen at (800) 624-8301 or (304) 293-4191, ext. 5526, or via e-mail to cfalvey@wvu.edu.
Free Environmental Management System CD-ROM Available from LGEAN

The International City/County Management Association (ICMA), in partnership with the American Public Works Association (APWA), hosted a webcast in April 2005 called “Environmental Management Systems: A Powerful Tool to Help Local Government Managers and Public Works Directors Minimize Environmental Liability, Increase Efficiency, and Improve Financial Health.” The webcast demonstrated how local governments have successfully implemented environmental management systems (EMS), highlighted the benefits that were achieved, and identified the support that the U.S. Environmental Protection Agency (EPA) and others are providing to help local governments adopt EMSs.

EMSs are a powerful tool and are helping a growing number of local governments around the country improve their environmental performance and compliance, reduce costs, improve community relations, and build greater confidence as managers on environmental issues. EMSs provide local governments with a flexible and proven framework for setting environmental goals and reducing environmental impacts through the use of best practices, operational controls, and measurable plans for achieving goals. In certain cases, an EMS may also help reduce insurance premiums and improve bond ratings. For example, the City of San Diego was able to save approximately $800,000 and significantly reduce air emissions from heavy equipment at its municipal landfill in the first year of implementing an EMS.

A multimedia CD-ROM recording of that webcast is now available for free from LGEAN. It includes a Windows Media audio/video recording of the original webcast, as well as the individual PowerPoint presentations. It also contains a number of EMS publications and Internet links providing additional EMS information. To order a copy of the CD-ROM, contact LGEAN at (877) TO-LGEAN or lgean@icma.org.

Office of Water Launches New Web Page for Kids

The U.S. Environmental Protection Agency’s (EPA) Office of Water has launched a new Kids’ Page featuring a new character called “Thirstin.” This site contains games, activities, and narrated/animated classroom experiments. Some of the new activities include an animated water cycle, word scramble, word search, water trivia, and “Thirstin’s Wacky Water Adventure.” Teachers and students can work on-line or download some of the information for classroom use. The new pages are located at www.epa.gov/safe-water/kids/index.html. For more information, please contact Charlene Shaw at (202) 564-4635.

All States to Share in Water Quality Monitoring Funds

Every state will get additional water quality monitoring funds as a result of a U.S Environmental Protection Agency (EPA) decision to target a $9.92 million increase in fiscal year 2005 water pollution control grants for these activities. Each year, EPA awards funds under Section 106 of the Clean Water Act to assist states (including territories and the District of Columbia), Indian Tribes, and interstate agencies in establishing and implementing water pollution control programs. EPA will award each state an additional $172,000 in funding, while each territory and the District of Columbia will receive $86,000. The Federal Register notice and other information about the alternative allotment formula are available at www.epa.gov/owm/cwfinance/altformula.htm.
Society of Wetland Scientists (SWS)
www.sws.org/
SWS is a nonprofit organization devoted to fostering innovative and high-quality wetland research and to bringing sound science to wetland management, policy, and conservation. The society publishes a peer-reviewed journal, *Wetlands*, and an official newsletter, *The SWS Bulletin*, and has more than 4,000 members from the U.S. and other countries. You can subscribe to SWS on this site.

Gulf of Mexico Alliance
www.gulfofmexicoalliance.org
The Florida Department of Environmental Protection has launched a Web site that lists the priorities the Gulf of Mexico Alliance has developed as part of its action plan for restoring, protecting and improving the waters of the Gulf of Mexico. The Web-based forum is available for review and for exchanging information on recent ocean research, education, and management recommendations developed by the state-federal Gulf Alliance. There are news updates, features and articles, job listings, an online copy of the Alliance’s online publication, the *Florida Specifier*, and a calendar of events.

WateReuse
www.WateReuse.org
WateReuse is a national organization dedicated to increasing the beneficial use of recycled water. WateReuse has a diverse membership consisting of public agencies; water suppliers; local, state, and federal governmental agencies; consultants; industries and individuals who, either work in the field of water recycling or support its use. The Web site offers news, events, and links to resources.

Water and Wastewater
www.waterandwastewater.com/
This industry-sponsored Web site offers a help forum, an industry directory, news center, case histories, a free newsletter, advertising space, upcoming industry shows and events, a classified section, and other water treatment industry links.

Wastewater Operator Training Grant Program
www.educationmoney.com/prgm_66_467_envrn.html
This Web site provides information about applying for EPA funds that are designated for onsite technical assistance to improve the skills of wastewater treatment plant operators. It describes the uses and restrictions of project grants, eligibility requirements, application process, and the criteria for selecting proposals. It also gives examples of funded programs, provides information contacts, and includes a section on grant writing.

National Center for Environmental Health (NCEH)
www.cdc.gov/nceh
NCEH works to prevent illness, disability, and death from interactions between people and the environment. NCEH tracks and evaluates environment-related health problems through surveillance systems and performs both laboratory and field research. The organization works with domestic and international agencies and organizations to prepare for and respond to natural, technologic, humanitarian, and terrorism-related environmental emergencies. This site includes a wide array of fact sheets and brochures, scientific publications, employment opportunities, training, and a children’s section.

Center for Watershed Protection
www.cwp.org
Founded in 1992, the Center for Watershed Protection is a nonprofit 501(c)3 corporation that provides local governments, activists, and watershed organizations around the country with the technical tools for protecting our streams, lakes and rivers. The Center has developed and disseminated a multidisciplinary strategy to watershed protection that encompasses planning, restoration, stormwater management, research, site design, education and outreach, and training. There is a calendar of events, publications, listing of watershed projects, a description of a watershed, technical tools for assessing and protecting watersheds, and a watershed quiz. There is also a technical assistance section.
New Guidebook Helps Communities Shape their Growth and Development

Smart Growth America has released *Choosing Our Community’s Future*, a guidebook developed to assist communities in shaping the growth and development of their neighborhoods, towns, and regions. The guidebook will help readers understand the elements of community design, the planning and site approval process for development projects, and what can make a plan or project deliver on community and environmental benefits such as walkability, durable design, and a range of community features like parks, libraries, schools, and convenient shopping.

*Choosing Our Community’s Future* focuses on the visioning and planning efforts that set the stage for smarter growth, and how citizens can engage and make suggestions for better growth and development through collaborative stakeholder meetings and workshops. Contents include:

- A Citizen’s Introduction to Planning, Zoning, and Development
- Key Principles for Managing Change
- Evaluating Potential Impacts of Development

To order a copy of the guidebook, click on [http://sgusa.convio.net/site/PageServer?pagename=guidebook](http://sgusa.convio.net/site/PageServer?pagename=guidebook).

National Water Program Guidance Now Available on the Web

The National Water Program Guidance for FY 2006 is now available on the U.S. Environmental Protection Agency’s (EPA) Office of Water Web site at [www.epa.gov/water/waterplan](http://www.epa.gov/water/waterplan). The Guidance describes strategies for accomplishing the key environmental and public health goals in the EPA Strategic Plan. The executive summary of the Guidance describes top priorities for FY 2006. Included in the Guidance are measures of program activities that support each of ten key environmental goals (i.e., subobjectives that support the overall goals of clean and safe water). EPA regional offices will be working with states and tribes to develop “commitments” under these measures over the next several months using general “targets” in the Guidance.

These final commitments are to be included in state/EPA grant agreements, performance partnership agreements, and other documents. The Guidance also includes information about the management system for assessing progress toward the environmental goals and the new agency initiative to link program grants to support of these environmental goals.

Printed copies of the Guidance are available from EPA Regional Offices and from Elana Goldstein in the Office of Water (202) 564-1800.

EPA Seeks Nominations for 2005 Clean Water Act Recognition Awards

The U.S. Environmental Agency’s (EPA) Office of Water is now accepting nominations for the 2005 Clean Water Act Recognition Awards. The awards recognize municipalities and industries for outstanding and innovative technological achievements in wastewater treatment and pollution abatement programs. Awards are presented for outstanding and noteworthy projects or programs in the following categories: operations and maintenance (O&M) at publicly owned wastewater treatment facilities, biosolids management, pretreatment programs, stormwater management, and combined sewer overflow (CSO) controls.

The awards will be presented during the Water Environment Federation’s Technical Exposition and Conference (WEFTEC) scheduled for Monday, October 31, 2005 at the Washington Convention Center, in Washington, DC. Organizations that wish to be nominated should contact their state water pollution control agency or EPA regional office to get copies of the guidance, forms, and submission deadline dates. You can find more information about the awards and a list of contacts at [www.epa.gov/owm/mtb/intnet.htm](http://www.epa.gov/owm/mtb/intnet.htm).

Illicit Discharge Manual Released

Stormwater managers, take note. The Center for Watershed Protection and the University of Alabama has released the *Illicit Discharge Detection and Elimination Manual*. This manual should be of great benefit to communities that want to improve their control of illicit discharges. You can download the manual and technical appendices from [www.cwp.org/IDDE/IDDE.htm](http://www.cwp.org/IDDE/IDDE.htm).
**Water Efficiency**

Did you know that toilets are the greatest water user in a house? Or that a leaky toilet can waste as much as 200 gallons per day? Inefficient and leaky toilets not only waste water but can effect your bottom-line, that is, your household budget. Fixing any leaky toilet is a must, but homeowners and businesses should consider replacing older toilets with newer, more efficient models. An EPA study finds that new residential 1.6 gpf toilets reduce water use by 23 to 46 percent—a savings of about 21,130 gallons of water per year per household. Generally, this equates to about $130 in annual savings.

With increasing pressures on our water resources, EPA is increasing its attention on water efficiency. Efficient water use helps to reduce the need for costly water supply and wastewater treatment facilities, helps maintain stream flows and healthy aquatic habitats, and reduces the energy used to pump, heat, and treat water. More information about water efficiency and water efficient products can be found on EPA's Water Efficiency Web site, [www.epa.gov/owm/water-efficiency](http://www.epa.gov/owm/water-efficiency).

**Water Monitoring Data Delivered to EPA Using Central Data Exchange**

The U.S. Environmental Protection Agency (EPA) and the Wind River reservation are part of a joint effort to pilot the Environmental Sampling, Analysis, and Results (ESAR) project. The ESAR pilot project will be delivering water quality monitoring data directly over the Internet using secure protocols and standards developed by the EPA Office of Environmental Information. “Water monitoring data are important, and sharing it with EPA can only help tribes,” said Don Aragon, director of the Wind River Environmental Quality Commission. The water monitoring data provided by Wind River were collected by the Tribal Wind River Environmental Quality Commission, using funds supplied by EPA through a Clean Water Act Section 106 Water Quality Management Grant. The other participants in the ESAR pilot are the states of Michigan, Texas, and Oregon.

This data exchange activity is part of the EPA American Indian Environmental Office (AIEO) Tribal Program Enterprise Architecture (TPEA). Data flows are planned for December 2005.

For more information contact Ed Liu at (202) 564-0287 or liu.edu@epa.gov.

**Water Utility Security Guide Promotes the Benefits of Information Collaboratives**

The U.S. Environmental Protection Agency’s (EPA) National Homeland Security Research Center (NHSRC) has published *Security Information Collaboratives: A Guide for Water Utilities*. The purpose of the guide is to inform drinking water and wastewater utilities and others about the benefits of establishing collaborative arrangements with other organizations to share information on water security. The guide provides step-by-step suggestions for establishing a collaborative and includes three case studies to show how utilities can successfully coordinate with various key water security partners to enhance security and public health protection.

This guide offers suggestions on how to establish a successful security-information collaborative. A security-information collaborative is a group of organizations and agencies formed to share information and address common issues regarding security—in the case of this guide, water security. This guide describes three types of security-information collaboratives: utility to utility, utility to public health, and utility to law enforcement. Its step-by-step approach will help individual utilities identify and create security-information collaboratives that best meet the needs of their particular situations. Its case studies will show how utilities can enhance their security by working more closely with other entities.

There’s a lot to be said about renewable operating permits (ROP). ROPs made an appearance as Model 3 in the U.S. Environmental Protection Agency’s (EPA) guidance for management of onsite systems. But the reality of imposing operating permits, and the serious consequences that flow from forcing them on homeowners, have not been examined. Upon analysis, ROPs turn out to be bad for consumers, bad for the environment, and even bad for the agencies that are supposed to enforce them.

**What next—ROPs for swimming pools?**

Nobody denies that a functioning wastewater disposal system is essential for proper sanitation and for protection of the environment. Absent such a system, a home is uninhabitable. The current tests for a failing onsite system rely on common-sense measures—whether sewage is backing up into the home, or surfacing on the property, or running off into a nearby body of water. In cases where harm can be demonstrated, public health authorities have always had the ability to require property owners to correct problems. Extreme situations may even result in condemnation of a property for violations of the health code.

ROPs introduce an entirely new dimension. For the first time, people will be faced with the loss of their homes for violation of permit conditions. The key here is the word renewable. These permits are only renewable at the behest of the issuing authorities. Onsite systems need not cause health or safety problems to have permits revoked. They need not cause a nuisance. Now, permits can be withdrawn, and homes deemed uninhabitable, should systems fail to meet pre-set discharge limits.

A mass political revolt would ensue if ROPs were forced on all the nation’s onsite systems. So the folks pushing the idea have limited it to new systems, or in some cases, advanced systems (or supplemental, or whatever the term used for systems other than traditional septic systems) with the intention to force all systems to comply as they are upgraded. In California, this took the extreme form of attempting to require monitoring of every one of the state’s 1.4 million drainfields for excessive levels of pollutants and then forcing operating permits for repairs. That proposal was quickly withdrawn as technically impractical.

EPA’s onsite management document seemed to suggest that fees associated with ROPs would be minimal. Come to California for a dose of reality! Mandatory permits in the San Francisco Bay Area are projected to cost around $400/year, and testing and certification associated with the permits could bring the total to over $1,000/year. All for the dubious purpose of bringing the few properties with advanced systems under the control of the local authorities. Costs, at least
in the California model, are open ended. There is virtually no competition in the private sector in many local areas, leading to the potential for monopoly practices. Health departments, which enforce ROP regulations, are under strict orders from local politicians to recover the entire cost of services that the agencies themselves determine to be necessary.

**Assumptions**

Behind the mania for ROPs is an extreme distrust of homeowners. As a California official once said to this author, “without permits, how are we to control you?” Perhaps officials are looking at the sterling record of big pipe, wastewater treatment systems as a model. These, of course, operate under strict discharge permits, with professionally trained operators. Nonetheless, they manage to spill billions of gallons of untreated sewage into the nation’s waters every year.

Most local officials are unfamiliar with, and many distrust, newer types of onsite systems. They assume that those systems are likely to cause trouble and need to be strictly controlled. But nontraditional onsite systems are always thoroughly inspected prior to service. Advanced systems depend on pumps, which have visual and sound alarms to alert owners to problems and are sometimes even tied via remote control monitoring to local dealers (unlike traditional septic systems). Since these installations are usually quite expensive, owners have every incentive to operate and maintain them properly to protect their investment. If that isn’t enough, lenders require inspections upon transfer of property, which happens on average, in California, every 4.5 years. In short, a good case can be made that alternative systems are actually the least likely to cause health or safety problems for the community.

**Fiddling While Rome Burns**

When officials grit their teeth and approve advanced systems, then demand ROPs as a payback, they ignore the real problem posed by onsite systems. Older systems, often constructed before any type of permits were required, are likely to be in the process of failing and potentially harming the environment. By focusing attention on the newest systems, resources are diverted from offering timely assistance to correct real threats.

ROPs depend on testing to assess nutrient and bacterial levels of the effluent passing through the system. Tests are taken at specified intervals (every year or perhaps every two years) lulling homeowners into a state of mind that considers the operation of onsite systems only at permit renewal time.

A system does not have to exhibit such obvious signs as ponding for its renewable operating permit to be revoked; it could fail to meet pre-set discharge limits.

Responsibility is transferred to government bureaucrats for assurance that systems are working correctly to protect the environment, an assurance that they are ill prepared to give.

**Enforcement?**

ROPs create two classes of property. For those subject to permits, the definition of a failing system changes, from obvious physical manifestations to violation of permit conditions. That poses challenges for enforcing officials. How much latitude should they give to systems before declaring them non-compliant and withdrawing permits? If specific numerical limits are set as permit conditions, should tests be taken until those limits are met? How many tests should homeowners be required to pay for? Apparently none of these issues has been thought out, but they will certainly confound officials in the field.

ROPs will require more staffing at local regulatory agencies and more expertise, higher salaries, higher budgets for agencies, more authority over local property, higher fees from unwilling property owners subject to bureaucratic edicts, more resentment from owners not used to central control over their lives, and perhaps the key point: less cooperation with officials seen as regulators rather than as problem solvers.

Of course, health departments aren’t out to remove people from their homes. But the ROP logic leads in that direction. For the most part, homeowners, however reluctantly, will comply with even the most unreasonable requirements if their homes are at stake. But some will not be able to meet the regulators’ demands. The elderly, the poor, especially those on the exurban fringe, where land values have risen rapidly, will be forced from their homes. The drive for ROPs takes on a neo-Darwinian cast, as an instrument for removing poor, long-term residents from valuable land to be replaced by more financially solvent inhabitants.

**Toward Better Management of Onsite Systems**

ROPs arose from a typology drawn up by a coterie of bureaucrats and academics working with the EPA. Apparently, nobody considered the consequences. Our analysis suggests unnecessary costs for consumers, diversion of scarce resources, and ineffective management of a community’s onsite systems. ROPs discriminate against classes of property owners, fail to protect the environment, and are difficult at best to enforce.

Surely there must be a better way to accomplish the laudable objectives embodied in EPA’s call for management of onsite systems. A better approach is one that depends on education and cooperation rather than old-fashioned command and control bureaucratic regulation. In the meantime, rest in peace, renewable operating permits.

**Bob Feinbaum** is Director of Hydro Nova, a California based nonprofit organization dedicated to consumer education, improved technology for small-scale wastewater treatment and sensible regulation of onsite systems.
Letter to the Editor
development served by decentralized sewage systems. Based on our history, these values result in dealing with the "environmental issue" surrounding land development by way of tech-no-fixes (aerobic treatment, etc.) that never address the complex heart of the matter. Communities rarely come close to applying the concepts presented in Ian McHarg's classic book, *Design with Nature*, or via the enabling of McHarg's ideas by the latest GIS. Land development, again, is highly charged with politics and America's unquestionable and vacuous economic imperative—grow or die, by septic or not.

Yes, planners, realtors, and local zoning officials need an education in decentralized waste-water management, but the decentralized sewage industry needs to quit pretending in retrospect that they're innocent of the local political and economic realities that continue to modify the American landscape, for the worse based on most expert accounts. Clearly, the wastewater industry is a willing participant in slicing up what's left.

Sincerely,

Jim Star, REHS
Santa Cruz County Environmental Health Service
What You Never Learned about Hiring an Engineer and Negotiating an Engineering Contract

One of the big differences between large cities and smaller communities and rural water/wastewater systems is the frequency and scope of construction projects. A larger city will usually have a steady stream of construction projects and regularly hire engineers to design them. Small rural utilities may go years between projects, and at any given time, may have board members and staff who have never had to hire an engineer for new construction. These same folks have to figure out how to hire the right engineer and how to negotiate an engineering contract. In addition, they may not have an attorney who understands the process any better than they do.

Frankly, until I started doing work in this field, I had never really studied an engineering contract. Once I started looking at them, I realized how different they are from normal business contracts. In fact, the whole process of hiring an engineer is different from any other type of service for which most rural utilities will contract. So assuming a rural utility or small town doesn’t know how to start the process of hiring an engineer, here are some guidelines.

First of all, engineers are not supposed to bid for engineering services. (Actually, attorneys and other professionals are not supposed to either.) That sounds odd, but it is true. There is even a U.S. Supreme Court case that states this. Engineers do not bid on price, but they are supposed to compete based on their qualifications. Check out the National Society of Professional Engineers Web site (www.nspe.org) for a good explanation of the process as well as the engineering code of ethics. Ideally, selecting an engineer should go something along these lines. The client (small town, rural water district, etc.) prepares a Request for Qualifications and Experience statement, usually called the RFQ. The RFQ should give information to the engineers—it should describe the project as thoroughly as possible. That is, it should detail the work to be done and the result to be achieved, so that the engineers can decide if they have the expertise to do the project. It should also ask for information from the engineers, such as a company profile, experience on similar projects, and references, but not ask for a price quote.

The RFQ is then published in a newspaper, mailed out to firms within a certain radius, posted, etc. The Internet makes it very easy to get an RFQ widely distributed. In fact, more and more towns and districts are asking for replies to the RFQ via e-mail. The RFQ should contain a deadline, which should be strictly followed, much like a bid opening. Once the responses are received, the board/council should meet and create a short-list of engineering firms. Most boards are comfortable with a short-list of between three and five but let’s face it, in rural areas you may be lucky to get that many firms to respond at all. So you may end up interviewing all the firms that respond anyway!

The next step for the board is to request a proposal from the short-listed firms. That is, ask them to outline how they would do the actual work on the project—that personnel they would commit, how they would approach it, what sequence of events they see happening, etc. I have seen smaller towns/districts decide to combine the RFQ and the RFP, especially for less complex projects. As long as all the sections are broken out and the responses clearly address both components, this can be a good idea.

The next step is to interview the firms selected. This should be done one at a time without the competing firms in the room. The board should ask lots of questions, although they can allow the engineer to make a presentation. Presentations are nice, but the board should not let the engineer take control of the interview. This is a common problem with both engineers and lawyers. Other people do not always understand what we do, and we are often treated with too much deference because of that. We are so used to standing up in front of people and lecturing them about things they do not understand that we sometimes forget that the client is the boss. The board should not be afraid to ask the engineer to explain things in simple terms. I know that I do not know as much as an engineer, so I always ask them to dumb it down for me!

Once the board/council chooses an engineer based on the interview, the hard part starts. The board finally gets to talk money and negotiate a contract. The prob-
The problem is that even boards that have worked their way through the RFQ/RFP process do not always succeed in negotiating a good contract. Part of the problem is that they don’t negotiate. Once they reach this stage, they simply have the engineer prepare a contract that contains price provisions and they often accept whatever the engineer hands them. Somehow they have the idea that once they have selected an engineer, they have to abide by his/her pricing structure. This is not the case. If the board cannot negotiate a price they like, they are free to decline to enter into a contract and go back to one of the other finalists and negotiate with them. I have even seen boards negotiate with and ultimately reject all the candidates, then go back to square one with a rewritten RFQ/RFP and start the process over.

This is a good place to add that the type of funding will also impact this entire process. If the town/district is using its own money for a project, then it may only have to follow state law requirements (if any) on RFQ/RFPs and engineering contracts. If the town/district is using U.S. Department of Agriculture/Rural Development (USDA/RD), community development block grant, or state revolving fund money, then each agency will have very detailed procedures that must be followed for RFQ/RFPs and engineering contracts. This can be good because the agencies assume that smaller entities do not have expertise in this area, so their procedures outline all the necessary steps and don’t leave much to the imagination. The downside is that often times many of the forms that are provided are out of date, and the sample engineering contracts themselves often contain antiquated language that even the engineers don’t understand. These form contracts also lack items that should be included, and the board/council can choose to add things to these contracts as well. For this reason, even if project funding is coming from a state or federal agency, the board/council still needs to understand the elements of the contract and propose changes to these agency forms if they don’t fit the project.

Every engineering contract will have basic elements that must be addressed. The contract should basically answer the following questions:

- Who is the client?
- What is the scope of the project—what is all the work that needs to be done?
- When will the work be done and in what order—is the project schedule?
- How much will the engineer be paid?
- When will the engineer be paid?
- What is the actual work product—maps, plans, specifications, and permit applications?
- Who owns the work product—the engineer or the client or both?
- What additional services will be provided and how/when will the engineer be paid for them?
- How can the contract be terminated and who gets to terminate it?

There are other items that all contracts include, such as choice of venue for lawsuits, damages, etc., but I am going to focus on the issues unique to engineering contracts and save the rest for a legal seminar on Contracts 101. I’ll use the terms client (i.e. town/district) and engineer for simplicity.

**Identifying the Client**

This seems simple, but of course if an attorney is explaining it, it won’t be, will it? The key here is to make sure that the entity identified in the contract had the authority to sign the contract. Who has the authority to request the engineer’s services, and who will be legally responsible for paying the engineer? For example, a utility subcommittee of a city council may be allowed to negotiate the contract, but the actual city council has to be the one to sign it. Another problem involves new rural water/wastewater districts or unincorporated villages. Usually a group of concerned citizens will gather together to form a district or village, and they may start the process of hiring an engineer before they are even legally formed. The legal formation may take place long after the contract is signed with an engineer. (Although I usually shudder when this happens because this means they have had little if any guidance in selecting an engineer.) This is incredibly common. In fact, the USDA/RD engineering services contract even has a special attachment that says the contract will still be binding even after the volunteer citizens group is replaced by the official governing body.

**Project Scope**

The contract needs to spell out exactly what work is going to be performed by the engineer and it should be in simple, clear language so that the client can understand. It is the engineer’s job to clarify all parts of the contract, especially if the client is not experienced enough to toss around terms like *deliverables* and *work product*. Is the engineer just preparing drawings? Is he/she drafting plans and specifications? Is the engineer responsible for filling out loan/grant applications or drafting a feasibility study, preliminary engineering report, or final engineering report? Preparing and submitting regulatory permit applications? Surveying and obtaining easements? How many changes to the project by the client will be allowed before the cost increases? Will the engineer perform construction inspection? Is the project contingent upon obtaining state/federal funding? If the engineer does the preliminary work but the project doesn’t get funded, will he/she get paid for that work or is that just the engineer’s risk? Ideally, the RFQ/RFP will cover some of these issues, but the client and the engineer should sit down and discuss these matters before the engineer just hands the client a contract. Is the board going to request written monthly project reports in simple language? A smart engineer will educate the client about the construction process and want to provide progress reports. If the client knows what is supposed to and does happen, the client will be much happier with the engineer’s work and will understand why the engineer charges the rates he/she does.

**Project Schedule**

The contract should have an outline of the actual work to be performed and clearly define the order in which the items need to be performed, as well as some estimated dates if possible. These tasks to be performed are commonly referred to by engineers as “deliverables.”

**CONTINUED ON NEXT PAGE**
The whole project is really one huge deliverable, but it is made up of lots of individual steps that are deliverables as well. Generally, on a state/federal-funded project, a very rough outline of some of the tasks the engineer may do might be as follows:

- feasibility study (an initial assessment of the economic alternatives—helps client choose best solution and apply for funding);
- funding applications (may include feasibility study and other forms);
- preliminary design;
- final design and specifications;
- easement preparation and acquisition;
- permit applications to regulatory agency;
- response to funding and regulatory agency comments;
- bid preparation, opening, and tallying;
- preconstruction conference;
- construction staking;
- construction inspection, system testing, and authorization of payments to contractors;
- final cleanup; and
- final approval by regulatory agency and final payments to contractors.

Again, a good engineer should be ready, willing, and able to explain how he/she will handle all these steps and what they mean. A project schedule should also include a timeline or what is sometimes called a Gant chart. Another option is a critical path chart that spells out the sequence of events that need to occur in order for the project to be finished as quickly as possible. State and federal funding agencies are sometimes helpful in listing the critical path, but often they focus on the critical path for funding, and there should also be a critical path for the actual construction. These timelines or critical paths are also helpful because they can and should spell out what the client is responsible for and when that item must be completed. For example, if the engineer is responsible for preparing easements, but he/she has to wait for the client to provide a list of the names and addresses of all the landowners who need to sign easements, the schedule should spell that out.

Cost

The client needs to understand what the engineer is going to charge for and how he/she is going to charge for it. Engineers have a number of ways in which they charge for the work they do, and this is one of the concepts that may be new to many clients. Engineers can charge based on cost plus, time and materials, lump sum, a “not to exceed” a set price, or a percentage of the construction cost. Cost plus is basically time and materials with an additional percentage added to it. Time and materials is the cost of any materials and the hourly rates of the engineers and his/her employees. Lump sum is just a fixed price. A “not to exceed” is like a top-end estimate the engineer sets. He/she may charge less but can’t charge more than the upper limit. The percentage of construction cost is the method commonly used by state/federal funding agencies, so this is set out in advance and determined on charts.

Not only are these different formulations a bit confusing, but also normally a contract will have a combination of payment options. The main body of the construction may be based on a percentage of construction costs, but a special attachment may state that any additional work requested by the client, construction inspections, or easement work may be charged on a time and materials basis. You must know what these terms mean and be able to understand how the engineer proposes to charge you.

Back during the RFP interview phase, the client should ask for specific numbers on similar projects. Many engineers may not want to provide this, but if they worked for a public entity, this is public record. The entity itself might help out with information. It is always interesting to see how much a project actually did cost compared to what the engineer said he would charge to do it. Did the engineer exceed a “not to exceed” because of problems with the construction? Did he/she charge a percentage of construction cost but add on a large sum for work outside the scope of the contract at the request of the client?

The next question is when will the engineer be paid? The standard USDA/RD project specifies that the engineer is paid 70 percent when the project goes out to bid, another 10 percent upon completion of construction, and the final 10 percent about 11 months after construction is completed. Maybe the client wants the engineer to do some work for free, in the hope that the project gets state/federal funding and moves ahead. Engineers are not supposed to work on contingencies like this, but many do, and frankly, that can benefit the
client. If the project doesn’t get funded, the client doesn’t owe the engineer any money. It is always a good idea to keep some funds on reserve until the engineer has completed certain phases of the project, no matter which payment formula will be used.

**Work Product and Who Owns It**

Depending on the type of project, engineers do work that is both tangible and intangible. Intangible work product consists of things like advising the client, researching products and talking to manufacturers, negotiating with regulatory agencies, responding to regulatory comments, attending public meetings, setting construction stakes, and interfacing with the contractors. Tangible work product consists of things like preparation of plans and specifications, easements, reports, and permit applications.

It used to be that one way to tell the two apart was to think of tangible items as anything on paper. But what about e-mail? Electronic files? Is that tangible or intangible? Who cares? Well, the reason the client cares is because the contract should specify who owns the work product. Do not assume that the client owns the tangible work product just because the client paid for it. It is now accepted practice for an engineer to use software to design and draw up the plans and specifications or system maps. The client may receive a copy of those plans and maps but not receive the electronic file unless that is negotiated in advance.

This is a hotly contested area between engineers and clients. Engineers like to keep the usable electronic copies of plans, specifications, and maps because they don’t want other engineers piggy-backing off of their work, and they probably hope to get the client to come back to them in the future. Engineers will tell clients that they cannot give them the electronic files because their engineering seal is on them and to give the original plans out would expose the engineer to liability. They will say that they can only submit the plans to the regulatory agency but no one else can have an electronic copy.

Well, that is nonsense. All the engineer has to do is to remove his seal and the plans can’t be submitted. If another engineer is hired to extend a water/sewer system and pick up where the first engineer left off, he is supposed to identify any parts of any plans he didn’t design, anyway. This becomes a problem in system mapping, where small systems hire an engineer to map their system, but they never think to ask for the electronic files so that they can update the map in the future. The client and the engineer need to agree in the contract that both sides will own the work product and that the engineer will provide transportable, translatable, useable electronic versions of the work products in a format agreed upon by the parties.

**Additional Services and Change Orders**

During the course of the project, the client may decide to request additional services, such as additional sewer connections or an extension of a water main two streets further. The contract needs to spell out how the engineer will be paid for those additional services and whether or not they can be treated as change orders. Extensive changes can enlarge the scope of the project. In addition, significant changes to the scope may require the engineer to redraw plans or resubmit plans to a regulatory agency. The client needs to understand that these add-on requests will cost more money. The contract also needs to spell out when the engineer will be paid for this work. At the same time as the other payments? At the time the work is performed? Some change orders are inevitable and are necessary in order to make the project successful. The client needs to understand the difference between necessary and unnecessary change to the scope of the project.

**Terminating the Contract**

Typically, a contract for engineering services can be terminated in writing within a certain number of days by either party with payment for services due up to the date of termination. The client should definitely make sure that the contract spells out what payment is due and for what. If the contract is terminated and the plans and specs are not finished, the engineer should receive considerably less money than if the project has been let out for bid.

The key for a termination is to agree that the client receives the same types of electronic files and all work products as discussed above in whatever state of completion they exist. Many engineers have gotten fired and then refused to give the client the electronic files even after they were paid or have given the client files that could not be used. If the relationship has soured, do not assume that the engineer will give you the files even if you do pay. Make payment contingent upon receipt and examination of the files by another engineer.

Hiring an engineer and negotiating a favorable and clear contract may be the most important thing a town/district does on a project—besides hiring a good attorney of course! The world of engineers and engineering contracts is not a simple one, and looking to state/federal funding agencies for their checklists and guidelines can be helpful. Mostly, towns/districts need to be informed consumers and take nothing for granted. Do not assume that you can turn your project over to the engineer and let him handle it. You need to become knowledgeable about the project. Ask lots of questions! If an engineer will not take the time to answer your questions before you have hired him/her, then it is doubtful that you will get any answers once the project has started.

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Drinking water contaminated by sewage has been cited as the principal cause for most outbreaks of waterborne illnesses in the U.S. Many of these outbreaks can be traced to individual wells or small community drinking water systems. Local health departments have been seeking ways to prevent these outbreaks, and the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia, has offered its help.
CDC Creates New Branch

In 1999, the National Center for Environmental Health (NCEH), a division of the CDC, formed the Environmental Health Services Branch (EHSB) and charged it with improving the practice of environmental health at state, local, and tribal health departments throughout the U.S. “EHSB is involved in many projects that promote advances in the environmental health sciences and the system by which environmental health services are delivered,” said Richard Gelting, Ph.D., environmental engineer, EHSB. “These projects the EHSB is involved in include, but are not limited to, work in food safety, onsite wastewater systems, drinking water safety, recreational water safety, vector control, and environmental health workforce development.”

The EHSB comprises three teams: technical assistance, research and evaluation, and education and training. Many of the activities of the EHSB are based upon a document that was developed by the NCEH and numerous partners titled A National Strategy to Revitalize Environmental Public Health Services. The strategy, which can be found at www.cdc.gov/nceh/ehs/default.htm, has six major goals:

- build capacity,
- support research,
- foster leadership,
- communicate and market,
- develop the workforce, and
- create strategic partnerships.

EHSB Studies Onsite Systems

“Local-level environmental health officials were asking us about the public health issues involved in onsite wastewater,” Gelting said. “We didn’t have much information on the subject, so we began to investigate to see what the issues were.”

In October 2003, the EHSB began a three-year project titled Public Health Impact of Onsite Wastewater Disposal Systems to determine if there is a definitive link between outbreaks of waterborne diseases and onsite systems. The project is administered as a cooperative agreement with the University of New Mexico.

“There really isn’t a lot of evidence showing that this is a problem or showing that this is not a problem,” Gelting said. “The University of New Mexico is doing a case-control study in which it is looking at areas with onsite disposal and private wells versus areas with public water supplies to see if there are apparent differences in water quality and health.”

Gelting and Michael Herring, senior environmental health scientist, EHSB, have teamed together to work with local health departments on onsite systems. “Several years ago, we hired a contractor to search for case studies that showed a connection between human illness and onsite wastewater practices,” Herring said. “The contractor confirmed what we had found—there just isn’t much documented information about this subject.

“We know that untreated sewage is a factor in illnesses, but trying to make a strong link with onsite wastewater is difficult. We are trying to better define the problem.”

Herring’s search for documented cases led him to several Canadian studies indicating that illness had not resulted from a possible widespread exposure to wastewater pathogens from onsite systems. “This raises the question: are we protecting public health if people are exposed to these pathogens?” Gelting said. “One of the theories the authors posed in these studies was that the residents who were exposed to wastewater pathogens might have developed immunity to them. However, visitors to the locale would not have that immunity.”

Harmful Wastewater Pathogens

Some of the types of pathogens found in wastewater that are hazardous to humans include bacteria, viruses, and parasites (including protozoa, worms, and rotifers). Scientists believe that there may be hun-
dreds more disease-causing organisms in wastewater that have not yet been identified.

"Whether or not someone will get sick after being exposed to untreated wastewater is hard to predict," according to "Onsite Wastewater Disposal and Public Health," an article published in the 1996 Summer issue of Pipeline, (Volume 7, Number 3). The article continues: "There are enough disease causing organisms in wastewater, however, to make contact with it always very risky."

Many people who are infected with pathogens or pollutants in water never even develop symptoms. How healthy you are to begin with, whether or not you have built up a resistance to a specific disease, how the organism or substance enters your body, how potent or toxic it is, and the size of the dose all contribute to how severely you will be affected.

People who have suppressed immune systems because of HIV/AIDS, chronic disease, chemotherapy, or other conditions are especially at risk from wastewater-related diseases. Children, the elderly, and the urban and rural poor are also significantly more at risk than the general population.

**Water from Private Wells in Ohio Found Tainted**

Although there are few documented case studies in the U.S., a recent outbreak in Ohio may provide the EHSB with data. In September 2004, the Ottawa County Health Department in Ohio documented 1,455 cases of gastrointestinal illness in South Bass Island residents and visitors. Symptoms included diarrhea, abdominal cramps, chills, and vomiting. Officials believed groundwater contamination to be the likely cause for this outbreak and took steps to test and shut down wells that might have bacterial contamination.

"Three wells at the Island Club tested positive for *E.coli*, an indicator of the possible presence of feces, and for total coliform, which can point to contamination by more serious bacteria or pathogens," according to a September 4, 2004, news report written by Toledo Blade staff writer Steve Murphy. "An auxiliary well at a local inn also tested positive for total coliform, bringing the number of public wells under no-use orders to 15. Last month, the Ottawa County Health Department found total coliform in 32 of 42 residential wells tested, including 11 wells that also tested positive for *E.coli.*"

The CDC has begun a detailed study that will compare 100 island visitors who became ill to 100 companions who weren’t affected, according to Jay Carey, spokesman for the Ohio Department of Health.

**Case Studies**

Other incidents have indicated the link between sewage and waterborne disease. In September 1999, more than 600 people at the county fair in Albany, New York, were stricken with an infectious strain of *E.coli* bacteria that washed into the groundwater from a local barn and contaminated the wells the fair used for its drinking water. Fifty-eight people were hospitalized with bloody diarrhea, abdominal cramping, and fevers, and a 79-year-old man and a 3-year-old girl died from kidney failure caused by the bacteria.

In May 2000, in Walkerton, Ontario, more than 1,000 people became ill from *E.coli*, and seven died from this deadly strain of intestinal bacterium. The cause for this outbreak is believed to be the town’s well water. Manure had washed into the wells during a time when the disinfection system was broken.

In February 2001, the Wyoming Department of Health reported cases of acute gastroenteritis from vacationers at a snowmobile lodge. A study showed that there was a significant association between water consumption and illness. "Norwalk-like virus (NLV) was found in eight of 13 stool samples and one well," according to "A Waterborne Outbreak of Norwalk-Like Virus among Snowmobilers," published in the Journal of Infectious Diseases, volume 187, 2003. The three wells that served the lodge were located within 92 to 115 feet of a septic tank or outhouse.

"Contamination of the water supply is attributed to the geological conditions of the area and to an overloaded sewage disposal system. The sandy, porous soil present at the lodge has poor adsorption qualities and permitted rapid water percolation, decreasing the soil’s ability to filter and remove viruses. Any viruses reaching the fractured granite bedrock below could then be easily pulled into the groundwater well source by the well’s pumping action. The lodge owner remodeled the facilities in November 2000, and the increased sewage load was not matched with a larger septic system, which caused more effluent to pass through the leach fields at a faster rate. The site of this outbreak is illustrative of the need to carefully consider local geology and not simply distance siting requirements for septic systems and wells to ensure safe drinking water."

**Process of Investigation**

For outbreaks of waterborne illnesses, the EHSB conducts investigations to determine the infectious agent, examine exposures, and identify the mode of transmission. This process can be illustrated by reviewing...
the investigation into the outbreak at the snowmobile lodge in Wyoming.

CDC investigators performed a retrospective cohort study that compared symptoms, dates of illness, water and ice consumption, and a complete list of menu items served at the lodge where guests were affected to guests who were unaffected at a nearby lodge. Investigators analyzed the collected data using CDC software.

CDC investigators also collected bulk stool samples from 13 guests who had become ill and tested the samples for NLV, *Salmonella*, *Shigella*, *Campylobacter*, and *Escherichia coli*. Samples of well water from one of the three onsite wells at the lodge were tested for NLVs and fecal coliform. Well water from two nearby lodges was also tested for fecal coliform.

The investigators questioned food handlers about recent illnesses and procedures they used in preparing food. They then conducted an assessment of the lodge’s water supply system and sewage disposal system.

**Outbreaks from Waterborne Illnesses in 2002–2003**

It is impossible to determine how many cases of waterborne illnesses occur in people each year because illnesses can be misdiagnosed or easily go unreported.

But according to the latest statistics from the CDC, an estimated 1,020 Americans became ill and seven died from 31 outbreaks associated with drinking water during 2001 and 2002. “It should be kept in mind that these publications summarize reported outbreaks,” Gelting said. “There is currently no national estimate of the total number of illnesses from waterborne agents in drinking water.”

When the Public Health Impact of Onsite Wastewater Disposal Systems project is completed, Gelting and Herring will provide state and local health departments with public health guidance. “The type of guidance we will provide will depend upon the findings from the study,” Gelting said.

Until then, there are some steps communities and individuals can take to protect public health. Some communities have developed onsite wastewater treatment management programs. These programs help homeowners by centrally monitoring and managing onsite systems to ensure that they are functioning correctly. Another safety measure is to educate homeowners about testing their well water for harmful microorganisms and contaminants and steps to take to prevent contamination.

For more information, contact Gelting at rgelting@cdc.gov and Herring at mherring@cdc.gov.

Infants, young children, the elderly, and the urban and rural poor are significantly more at risk for contracting waterborne illnesses than the general population. These illnesses are the leading cause of infant mortality worldwide.

Photo by Julie Black
At the beginning of the 20th century, finding raw sewage on the ground and in streams around most U.S. rural communities was commonplace. Unfortunately, at the beginning of the 21st century, it still is in many parts of the country.

In 1995, more than 80 percent of the 242 households in southeastern Kentucky’s Wagersville/Barnes Mountain community, located in Estill County, had failing septic systems or straight pipes that emptied raw sewage directly into fields, woods, and streams. Water samples taken from watershed streams showed dangerously high levels of fecal coliform.
“More than 70 percent of surface and groundwater had fecal coliform levels too numerous to count, while others had fecal coliform levels between 1,250 to 1,300 colonies per 100 millimeters,” said Kenny Cole, environmentalist, Estill County Health Department.

These polluted watershed streams flowed directly into the Kentucky River, located upstream from the public water intake for Estill County. Medical professionals believed the increased health problems in the area were a result of contaminated drinking water.

Extending Water Lines Highlights Wastewater Problem

“For years, the people in this community relied upon springs, wells, and cisterns for their drinking water,” Cole said. “When Estill County was awarded a 2.1 million dollar federal Rural Development grant in October 1994 to extend water lines into the Wagersville/Barnes Mountain area, the county health department pointed out that it would be inappropriate for residents to hook onto the new water lines unless they had adequate sewage disposal. We had to find a way to help the people in this low-income area find a low-cost or no-cost solution to their wastewater problem.”

Funding Homeowner Septic Systems

Using information derived from water studies, Cole; Chuck White, Estill County conservationist; and Rodney Hendrickson, Cumberland Valley Resource Conservation and Development Council coordinator, co-authored a proposal for a 319(h) grant from the U.S. Environmental Protection Agency (EPA) and the Kentucky Division of Water to eradicate straight pipes and failed septic systems in two of its watersheds.

In March 1997, two years after the grant was written, EPA approved a 319(h) grant for $219,030. Total funding for the project was $418,750:

- $219,030—EPA 319(h) grant.
- $55,000—Eastern Kentucky PRIDE grant (Personal Responsibility in a Desirable Environment).
- $27,000—Estill Fiscal Court, spread over three years.
- $109,000—in-kind contributions from community organizations and from homeowners who received new systems. This included community education sponsored by area organizations, and homeowners raking, seeding, fertilizing, and mulching. “I am certain we exceeded the $109,000 we were required to meet,” Hendrickson said.
- $8,700—Homeowner Contributions. Each homeowner paid $100 for septic system maintenance education. “We felt pretty strongly that recipients of new systems should come up with some investment of their own so that they would have ownership in their systems,” Hendrickson said.

Partnering

“One of the things I am most proud of with this project is that so many people and organizations took ownership. I was concerned that Chuck [White] and I were going to have to do most of the work ourselves,” Hendrickson said. Project partners included:

- Estill County Conservation District;
- Estill County Health Department;
- Cumberland Valley RC&D Council;
- Estill County Fiscal Court, spread over three years.
- Eastern Kentucky PRIDE grant (Personal Responsibility in a Desirable Environment).
In Estill County, priorities for funding included the illumination of straight pipes, (below) and failing septic systems (right).

- Estill County Fiscal Court;
- Estill County Cooperative Extension;
- Estill County Schools;
- University of Kentucky;
- Kentucky Division of Water;
- PRIDE;
- Rural Community Assistance Program;
- U.S. Department of Agriculture, Natural Resources Conservation Service;
- U.S. EPA; and
- Wagersville/Barnes Mountain Citizens Group.

The project was coordinated through an advisory committee composed of representatives from each of the project partners. Funding issues, however, were deferred to the Natural Resources Conservation Service, since they had initiated the grant and were familiar with its requirements.

**Setting Priorities for Installing Systems**

During the two-year lapse between writing the grant and receiving the 319(h) funds, costs for installing the systems had increased. “We could find only two or three contractors to bid on the project because small operators were unable to post the required bond,” White said. “When you are doing 25 or 30 systems in a compressed time period, even those contractors who have plenty of manpower can be strained.”

Higher costs meant installing fewer systems, reducing the number from 242 systems to 98. PRIDE money could be used to install an additional 12 to 14 systems. With limited funds, it was important to begin with homeowners who were making the greatest impact on water quality. The Advisory Committee defined priorities based on the following descriptions.

- **Priority 1:** straight pipes that emptied directly into a water source.
- **Priority 2:** straight pipes that emptied into wooded areas.
- **Priority 3:** failing septic systems coming to the top of the ground.
- **Priority 4:** working septic systems over 10 years old.

**Homeowner Involvement**

Homeowner participation in the septic system demonstration project was voluntary. With the exception of the $100 education cost, the septic system was given to the homeowner free of charge. “Those who didn’t take advantage of the project will fall under the enforcement policies of the local health department and the Division of Water,” Hendrickson said.

“When we had our first public meetings, I told residents that if they were honest with us about having straight pipes or a failing system, the health department would not cite them,” Cole said. “We were able to build a level of trust.”

Some members of the advisory committee were community residents who were chosen by their peers to represent them. “In a rural community like this, sometimes people trust their neighbor more than they do government,” Hendrickson said. “When their neighbor tells them the project is on the up-and-up, that they need to take advantage of it, and that there is no catch to it, it really helps gain support.

“One of the ladies on the advisory committee was 100 percent blind, and she was very active in the project. She had her sister take her door to door to promote it.”

Throughout the project, members of the Advisory Committee, Estill County Conservation, and the Estill County Health Department visited with residents in their homes to keep them informed.

**Best Management Practice (BMP) Implementation**

Cole, the Project Advisory Committee, and the homeowner worked together to find the best system for a particular site. Criteria for selecting BMPs included soil characteristics, cost, frequency of required maintenance, land availability, educational value, and BMP demonstration value. Cole used this information to design a system that best met the homeowner’s needs.
Site Obstacles

Limiting site conditions, such as shallow soils, steep slopes, high water tables, and small lot sizes made many locations unsuitable for a conventional septic system. “We had to balance our need to be innovative with some of the installations with our need to ensure the safety of the installer,” Cole said. Some of the alternative systems installed include overflow wetland cells, lagoons, leaching chambers, and low-pressure systems.

“Some areas had homes so close together that there wasn’t enough land to physically hold an onsite system; for instance, the back walls of some homes were almost vertical with the creek bank,” White said. “On the other side of the homes were wells. Based on any rule or regulation, there was nothing we could do. If we had more time and money, maybe we could have installed a package system on a downstream property.”

A few of the newly installed systems did not operate as expected. “One system was surfacing because of underground wet weather springs on the hillside that caused the system to be overloaded to overflow into the yard,” White said. “The installers placed some upstream curtain drains to intercept the water before it reached the system, and that solved the problem.

“But we have been very successful in getting these systems installed, and we always kept the homeowner informed about any problems we encountered. There were certain sites where we unable to put in a system because the health department was unable to design a system that would work.”

Monitoring Water Quality

“We monitored the streams before we installed the systems, during installation, and after installation, so that we could document improvement in water quality,” Hendrickson said.

The bottles used to collect samples were sterile, plastic bottles, each containing a sodium thiosulfate tablet. Stream bacteria samples were collected using the surface-grab technique. One hand grasped the bottle and plunged it mouth down 6 to 12 inches below the surface of the water, with the mouth positioned upstream into the current. Each bottle was filled to approximately 75 percent capacity and was free of debris, surface scum, and bottom sediment.

After the sample was collected, the bottle was tagged with information about the sample. This information was then entered onto the chain-of-custody form and was initialed by the sampler. Samples were placed immediately into small, ice-filled containers and were sent to the lab for analysis within one hour of the time they were collected.

Water Quality Test Results

The results of the water quality monitoring tests are given in Tables 1 and 2 (on page 26.)

“There are so many variable factors in the water testing that some of the results look as though we might not have accomplished our goal,” said Sonja Estes, administrative secretary, Estill County Conservation District.

“Testing is done to show the presence of fecal coliform in test sites, and we cannot explain why some tests showed unusual amounts of bacteria after systems were installed,” Estes said. “We have talked with our health environmentalist about this, and he can’t explain it. Our conclusion is that water becomes contaminated from warm-blooded animals other than humans, like deer, bear, and raccoons, and that runoff after heavy rains causes a rise in the presence of bacteria in the streams.

“With the exception of October 2002, when samples were taken after a period of heavy rain, test results in 2002 and 2003 were better than earlier results.”

Initially, water quality monitoring sites were chosen in areas where it was believed systems would be installed so that any subsequent water quality improvements might be documented. “As it turned out, one of the monitoring sites (Jones Branch) did not have any upstream system replacements, and thus can be used as a comparison to the other sites,” said Julie Smoak, technical advisor, Kentucky Division of Water. “The limited data did not allow for statistical analysis or definitive conclusion about water quality; however, we believe that a positive direction was evident in the limited sampling. A comparison of the ratio of exceedances (400 or more colony-forming units) was made prior to and after installation of systems. For all sites except Jones Branch, a trend toward lower incidence of exceedance was revealed.”

Operations and Management (O&M)

Ongoing operations and management (O&M) of BMPs was not required with 319(h) grants before 1998. Since then, BMPs require O&M.

Estill County Board of Health has not passed, nor is it considering, a mandatory operations and management component to onsite systems, according to Cole. Although septic tank systems are not periodically inspected after installation, alternative systems are checked. “This is one of the reasons we educated homeowners, so they would know the kind of system they were getting and how to take care of it,” Cole said. However, homeowner education was not a requirement for PRIDE systems.

“Even though we don’t have an O&M component, if a homeowner has a problem with a system after it has been installed, Kenny Cole, the environmentalist, will be happy to work with them one on one,” Hendrickson said.

Estill County Becomes a Model for Future Projects

“Subsequent 319(h) onsite projects in Kentucky have benefited greatly from Estill County’s trail-blazing...
project to be successful, and I think that is why everyone pulled together,” Cole said.

The Septic System Demonstration Project has proven so successful in Estill County that three other eastern Kentucky counties have applied for and received their own EPA 319(h) grants for septic system installation projects. In addition, PRIDE has awarded eastern Kentucky $9 million to repeat the Estill County project over an 18-county area.

For more information, contact Cole at (606) 723-5181, Hendrickson at (606) 864-2172, White at (606) 723-5104, Smoak at (502) 564-3410, and Estes at (606) 723-5104.

Small Flows Quarterly, Summer 2005, Volume 6, Number 3

**Table 1** - Wagersville-Barnes Mountain EPA # 139 Nonpoint Source Water Test Results

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Doe Creek (Upper Reach)</td>
<td>TNTC*</td>
<td>TNTC</td>
<td>60**</td>
<td>TNTC</td>
<td>216</td>
<td>TNTC</td>
<td>TNTC</td>
<td>1,000</td>
</tr>
<tr>
<td>2. Doe Creek (Upper Reach)</td>
<td>TNTC</td>
<td>150</td>
<td>3</td>
<td>40</td>
<td>36</td>
<td>TNTC</td>
<td>TNTC</td>
<td>123</td>
</tr>
<tr>
<td>3. Buck Creek</td>
<td>TNTC</td>
<td>2,620</td>
<td>693</td>
<td>560</td>
<td>36</td>
<td>TNTC</td>
<td>TNTC</td>
<td>150</td>
</tr>
<tr>
<td>4. Little Doe Creek</td>
<td>TNTC</td>
<td>800</td>
<td>640</td>
<td>780</td>
<td>2,320</td>
<td>TNTC</td>
<td>TNTC</td>
<td>TNTC</td>
</tr>
<tr>
<td>5. Jones Branch</td>
<td>200</td>
<td>2,400</td>
<td>107</td>
<td>400</td>
<td>600</td>
<td>TNTC</td>
<td>1740</td>
<td>72</td>
</tr>
<tr>
<td>6. Jakes Heavenly Highway</td>
<td>TNTC</td>
<td>TNTC</td>
<td>TNTC</td>
<td>400</td>
<td>310</td>
<td>TNTC</td>
<td>TNTC</td>
<td>TNTC</td>
</tr>
</tbody>
</table>

Water Flow Rates

| 750 CFS*** | 12,000 CFS | 5,800 CFS | 4,100 CFS | 390 CFS | 85 CFS | 750 CFS | 4,100 CFS |

Notes:

1. samples taken after a period of heavy rain--water was extremely murky,
2. less than four colonies in 100mL (<4),
3. too numerous to count (TNTC),
4. flow rates were unavailable after August, 2002,
5. cubic feet per second (CFS)

Seventy systems had been installed in spring 2002, but rains and flooding delayed the water tests until June. An early fall with unusually heavy rains moved Estill County Health Environmentalist Kenny Cole to ask that installations and water tests cease until drier weather in the spring of 2003. Heavy rains and floods in spring 2003 further delayed installations and water tests. At an advisory meeting at the Estill County Conservation District office on June 8, 2003, Cole advised that testing should resume. Present at the meeting were Ms. Julie Smoak and Joel Murphy, NPS Grant Administrator. The Division of Water gave the district permission to complete the required water testing with four additional tests, which were performed in August, September, October, and November 2003.

**Table 2** - Wagersville-Barnes Mountain EPA # 139 Nonpoint Source Water Test Results (continued)

<table>
<thead>
<tr>
<th>SITES</th>
<th>6/02</th>
<th>8/02</th>
<th>10/02</th>
<th>11/02</th>
<th>7/03</th>
<th>9/03</th>
<th>10/03</th>
<th>11/03</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Doe Creek (Upper Reach)</td>
<td>&lt;4**</td>
<td>&lt;4</td>
<td>TNTC***</td>
<td>TNTC</td>
<td>27</td>
<td>253</td>
<td>500</td>
<td>257</td>
</tr>
<tr>
<td>2. Doe Creek (Upper Reach)</td>
<td>&lt;4</td>
<td>&lt;4</td>
<td>TNTC</td>
<td>130</td>
<td>67</td>
<td>TNTC</td>
<td>30</td>
<td>130</td>
</tr>
<tr>
<td>3. Buck Creek</td>
<td>&lt;4</td>
<td>60</td>
<td>TNTC</td>
<td>27</td>
<td>143</td>
<td>437</td>
<td>27</td>
<td>27</td>
</tr>
<tr>
<td>4. Little Doe Creek</td>
<td>&lt;4</td>
<td>63</td>
<td>TNTC</td>
<td>&lt;4</td>
<td>257</td>
<td>157</td>
<td>224</td>
<td>&lt;4</td>
</tr>
<tr>
<td>5. Jones Branch</td>
<td>16</td>
<td>27</td>
<td>TNTC</td>
<td>77</td>
<td>TNTC</td>
<td>900</td>
<td>17</td>
<td>77</td>
</tr>
</tbody>
</table>

Water Flow Rates****

| 3,200 CFS**** | 320 CFS |

* too numerous to count (TNTC), ** less than four colonies in 100 mL (<4), ***too numerous to count (TNTC), ****flow rates were unavailable after August, 2002, *****cubic feet per second (CFS)
Many Indiana communities think they have only two options for solving their wastewater problems: building sewers or doing nothing. The first option could mean soaring capital costs and user rates, while the second option could mean polluting the environment and risking public health.

“We knew we had to help communities find another option,” said Richard Wise, president, Indiana Capacity Center for Management of Onsite/Decentralized Systems, Inc. (ICCMODS).

In some rural communities a user’s share of capital costs for a centralized sewer system can exceed a homeowner’s property value, causing financial collapse.
Demographics Support Need for Innovative/Alternative Systems

An ongoing survey of more than 500 unsewered communities in Indiana, (updated in year 2000) found that:

- 78 percent of rural communities have fewer than 100 homes to support a sewer project,
- 62 percent are predominately low to moderate income, with a number of fixed-income retirees,
- 74 percent are unincorporated, and
- 56 percent directly discharge untreated wastewater to the environment via community tile systems or individual tile surface discharges.

“The thought of adults, children, and pets coming into daily contact with raw, smelly, sewage in this day and age makes one wonder, ‘Where have we not gone with our advances in this 21st century?’” said Todd Trinkle, secretary/treasurer, ICCMODS.

Affordability

Since the passage of the Clean Water Act, Indiana has received millions in federal dollars to construct and upgrade its wastewater infrastructure in communities statewide. For large, densely populated areas, centralized sewer systems were traditionally selected, but for rural and sparsely populated areas, these systems were unaffordable. The user base could not support high per capita construction costs or pay for the competent wastewater professionals needed to operate, manage, and update such complex facilities.

“For many of these smaller communities, capital costs would be $15,000 to $25,000 per connection, and user rates would be $60 to $120 per month,” Wise said. “It is just impractical to think there is enough funding and resources to sewer the entire state of Indiana. We should be focusing on improving the viability of onsite systems through technology and management models, which have greatly improved in recent years.”

“People live in these communities because of affordability,” Trinkle, said. “In some communities, a user’s share of capital costs can equal, or even exceed, a homeowner’s property value. A bottom line like that paralyzes a community. Officials throw up their hands and say they can’t afford it.”
particularly in rural areas, if properly designed, installed, and managed. This support of innovative/alternative (I/A) systems is a significant departure from previous national policies.”

Concerned that communities were not being given all the information that they needed to make an informed decision, Wise and Trinkle began to intercede in communities that they targeted as good candidates for the onsite option.

“In a couple of cases, we were able to assist communities in soil evaluations on land that they could potentially acquire,” Wise said. “The consultant’s charge for this would have been hefty, but we were able to get the soil evaluation accomplished at a fraction of their cost because of our relationship with a number of soil scientists across the state, county health departments, and Purdue University.”

**Educating Regulatory Agencies**

Wise and Trinkle were heartened by their accomplishments in assisting communities in pursuing the onsite option, but their successes were not always easy to achieve. They found resistance to the onsite option from the Indiana Department of Environmental Management (IDEM). IDEM is the regulatory agency that consultants would cite when disregarding onsite system options. “We knew we had to help educate the folks at IDEM to get their support,” Trinkle said.

Through their efforts and the efforts of a number of onsite wastewater stakeholder groups in Indiana, IDEM is drafting operational guidelines for certain onsite cluster systems that operate under their jurisdiction. Traditionally, operational guidelines are left up to the Indiana State Department of Health (ISDH) because of their experience with onsite systems across the state. Drafting operational guidelines, however, does not mean IDEM has given their support.

**Concerns about Groundwater Contamination**

The groundwater and other permitting sections of IDEM still have reservations about the viability of onsite systems and their long-term impacts to groundwaters of the state. According to Wise and Trinkle, IDEM’s major concern is nitrates. Groundwater rules in Indiana set nitrates limits at 10 milligrams per liter, and IDEM is not convinced that onsite systems can meet this limit.

The ISDH supports approval and use of onsite systems and has been discussing the issue with IDEM over the past four years, working to reach an agreement that will be acceptable to both state agencies. The issue of groundwater contamination by onsite systems is such a volatile environmental and public health issue that recent Indiana legislation, (HEA 1017)IC 13-18-17-5, effective March 16, 2004, exempted certain onsite systems from nitrate groundwater standards, prohibited ISDH from adopting nitrate numerical criteria from Indiana’s groundwater standards, voided any ISDH rules in affect that may apply such standards, and required ISDH and IDEM to study the environmental and health effects, fiscal impacts, and mitigation barriers of nitrate in groundwater.

**Onsite Systems Legislation**

“In 2000, we worked with other stakeholder organizations to help educate legislators and communities about the viability of onsite systems and the need for management,” Wise said. “A hot topic of debate in the Indiana General Assembly is that sewage openly runs in community storm drains, ditches, creeks, and ponds in neighboring yards, polluting our lakes, rivers, and streams.

“Newspapers across Indiana have published numerous articles about this subject. Because of these debates and newspaper articles, the state appointed a legislative arm, the Environmental Quality Service Council Septic System Subcommittee, to review onsite issues.”
A number of stakeholder organizations spoke before this new legislative committee about onsite system problems in late summer and fall of 2000, including:

- the U.S. EPA's Office of Water Management;
- Purdue University;
- ISDH;
- Indiana Utility Regulatory Commission;
- Indiana State Budget Agency;
- Indiana Environmental Health Association;
- Indiana Onsite Wastewater Professionals Association;
- Indiana Regional Sewer District Association;
- Indiana Department of Environmental Management;
- LaGrange, Marion, Wells, and Allen County Health Departments;
- the Nature Conservancy;
- Acorn Technical Group; and,
- the Indiana Rural Community Assistance Program.

"RCAP's presentation focused on methods for solving sewage disposal problems for a number of unsewered rural communities in Indiana. We stressed looking at onsite cluster systems for communities that had fewer than 150 connections for a sewer system. We also stressed the importance of developing state support for management of these systems and incentives for self-help initiatives for communities. Cluster systems would keep costs down," Wise said.

"Based on the information that the EQSC Septic System Subcommittee gathered, nine pieces of legislation regarding onsite systems were introduced in following legislative sessions," Trinkle said. "That's unheard of in this state."

Based on this legislation push, Indiana passed a law, IC-36-11, that allows the formation of county onsite waste (septic system) management districts at the local level. So far, only Allen County has formed one. "We think it's because management districts haven't been adequately promoted," Wise said.

**Allen County Implements Individual Surface Discharging Systems**

Allen County petitioned the state legislature to pass a law that approved individual surface discharging systems. New onsite systems were failing in less than one year in this county. Based on fieldwork through Purdue University, the state health department, and soil scientists, Allen County was identified as one of several recessional glacial moraine counties. Soil characteristics were very tight, not allowing water to flow through the soil. A law, unique for this county, allowed them to permit surface discharging systems as long as the county implemented a management program for surface discharging and soil-based onsite systems.

The ISDH, IDEM, and EPA Region 5 were involved in formulating operating guidelines that Allen County had to meet under the new law.

**From RCAP to ICCMODS**

Because of their strong support of onsite systems, particularly onsite cluster systems, Wise and Trinkle wanted to devote more time toward helping communities with these systems than their schedules at RCAP would allow. So, Wise and Trinkle established ICCMODS as a nonprofit 501(c)(3) education and survey center and departed RCAP in 2003. The center's primary goal is to promote best management practices of onsite/decentralized wastewater systems that would solve small, rural community wastewater problems. Systems the center promotes are low-cost alternative collection and treatment technologies that disperse treated effluent onsite into the soil.

"Operation and management of onsite systems is not mandatory, but it is critical to keeping onsite systems functioning properly," Wise said.

"Everyone in the wastewater field recognizes it. Indiana continues to try to recover from problems with onsite systems that were caused by a lack of operations and management. Management is just now starting to have its heyday."

According to a recent and ongoing RCAP survey, a 1997 Purdue University study, and information from the ISDH, approximately 25 percent of the more than 800,000 homes in unsewered areas of Indi-
ana have inadequate, outdated, failing, private sewage disposal systems that pollute waterways and surface and groundwater supplies.

“A large number of this 25 percent predates any state regulation, Wise said. “Many of these homes were converted to indoor plumbing when it became available but still currently don’t have a septic system. Direct discharges to ditches, storm drains, or field tiles are very common in small towns.”

**ICCMODS’ Objective**

“We want to serve as a best management and education clearinghouse for small communities in Indiana,” Trinkle said. Some of the ways in which the center achieves this objective is through data collection and dissemination; showcasing successful communities and promoting site visits; providing technical assistance; helping communities secure funding; and educating communities, consultants, and other stakeholders.

ICCMODS began to survey the state’s existing onsite cluster systems in 2003. Their goal is to survey 25 of the existing 50 cluster systems and 25 I/A wastewater projects funded by EPA under the old construction grants program. A number of the I/A projects use the same wastewater components that are used in cluster systems, for example, septic tank effluent pumps, grinders, and vacuum. ICCMODS has completed 60 percent of its survey.

**Avoiding Unwarranted Connection to Municipal Treatment Plant**

The Spencer county health department contacted ICCMODS about five small, rural communities that were targeted to be connected to a newly established municipal treatment plant in the City of Rockport. These communities (Richland, Hatfield, Eureka, French Island Boat Club, and areas along SR 66 and 161) were identified by an engineering firm as communities with failing onsite systems.

Rockport had established the treatment facility to support anticipated urban growth, and the promoters of the facility began to look for surrounding communities that could contribute flows to the fledgling new plant, according to Wise and Trinkle.

“Some people were concerned about the prospect of paying $80.00/month sewer bills and the way things were going and asked us to provide educational data about onsite cluster systems,” Wise said. “The regional sewer district that had been formed to encompass the boundaries of these five communities held a public hearing, which we attended. In a follow-up meeting put together by the public, we presented information about cluster systems and management of these systems. Other onsite wastewater professionals attended the meeting and provided information as well. The public used this information to help determine which method of wastewater treatment would be best for them.

“To date, the majority of residents in the communities have refused to sign over property easements. The project has not gone forward, partly, we think, because of our efforts in educating the communities about onsite being a viable option.”

“Unfortunately, all these communities have the onsite option readily available to them, but it is not being promoted to them by enough well-meaning consultants,” Trinkle said. “The problem, we think, is that consultants are doing the studies and, therefore, have control of the outcome of the studies. They can include or exclude onsite as an option. They can make the outcome support their recommendation by pricing onsite options up there with traditional sewer systems.”

**ICCMODS Helps Waste Haulers**

Usually ICCMODS becomes involved in a community because the state asks for their assistance. Recently, the state rule for land application changed, and a number of septic waste haulers were unable to meet the new stringent requirements. After talks with regulators and haulers, ICCMODS developed and distributed a survey to haulers to collect additional data. ICCMODS also visited a pretreatment facility in northern Indiana where haulers were having a similar scenario. A private company resolved the problem by establishing a pretreatment facility. ICCMODS met with the owner/operator of this facility to see if a similar facility could be used in other areas.

“A septage hauler in a neighboring county is planning to also establish a pretreatment facility,” Trinkle said. “He plans to dewater and make the filtrate acceptable to the town’s wastewater treatment plant and then sell the byproduct. We helped him with zoning the facility through the county.” The waste hauler survey is still ongoing. Results should be available in late 2005.

**Future Case Studies**

Results of the survey that ICCMODS received U.S. EPA funding for are being posted to its Web site (www.iccmods.org). In the near future, the site will identify selected case studies of onsite cluster systems in operation in Indiana. Most of the communities that ICCMODS has worked with are still in the preliminary stages of implementing onsite cluster systems.

**IOWPA/ Purdue University Demonstration Site**

ICCMODS is assisting the Indiana Onsite Wastewater Professionals Association (IOWPA), Purdue University, and ISDH to set up an onsite wastewater training center. Purdue University has already selected a facility; IOWPA will donate the equipment and supplies. ICCMODS is hoping to also find funding that will support this effort.

“We would like to take a community full circle,” Wise said. “We want to get them organized by having them establish an ad hoc committee that we could educate about the problems they are experiencing and how to solve them. Next, we want to help them identify the management entity they need and assist them in developing it. We would identify potential funding for the project and participate in public meetings to educate the residents. Finally, we would like to help them operate the system and use it as a model for other communities. As a 501(c)(3), we’re constantly looking for funding and donations to support the efforts of the Center to help Indiana improve the management of decentralized onsite sewage disposal systems.”

For more information, contact ICCMODS, Inc. at (317) 328-1917 or e-mail Wise at iccmods@iccmods.org. You can also access the Indiana Capacity Center for Management of Onsite/Decentralized Systems, Inc. Web site at www.iccmods.org.

**Editor’s Note:** At print time, it was learned that Trinkle has left ICCMODS to work for IDEM.
Indian Point: A Grassroots Model for Onsite Management

Keeping the lake pristine is critical to the tourism economy in Indian Point in southwest Missouri. Many tourists come to the area to fish, boat, and participate in other water sport activities. This popular vacation site, located in the Ozark Mountains along a three-mile peninsula on Table Rock Lake, is home to Silver Dollar City, a major theme park, and close to Branson, the tourist town known for its wide variety of live entertainment. On a busy summer day, more than 10,000 guests populate the village’s 29 lakefront resorts.

Recent studies at Indian Point have shown that the septic tanks and lateral lines most residents use to treat and dispose of wastewater are ineffective. These systems barely filtered effluent through the thin soil before it hit ledge rock and entered the lake. In addition, phosphorus in the effluent from lakeshore development and city wastewater plants feed algae and can cloud the water. “Eliminating traditional septic systems is vital to maintaining our tourism economy, our quality of life, and our drinking water,” resident, resort owner, and Board of Public Works Chair Greg Maycock said.

### Looking for Answers

Since the early 1990s, a concerned group of village residents had been investigating wastewater systems. Nearly 12 years later, the Village Board of Trustees considered installing a central wastewater treatment plant based on a recommendation from the engineering firm that the village had previously contracted. For $10 million, Indian Point could have a central treatment plant to handle wastewater from the village’s 588 permanent residents and businesses with large-diameter sewer pipes laid through the area’s steep hills, shallow soil, and karst geology. This advice came with a $250,000 price tag and raised serious concerns about fiscal responsibility and user costs with some of the villagers.

“All years, Missouri, like many other states, thought that centralized sewage disposal was the way to go,” resident, resort owner, and Board of Public Works member Arno Wehr said. “It’s logical in large, flat areas without mountains and rock to dig into, but our geography is very different from that.”

“Another problem with these macro plants is that they require operating specialists and a laboratory. You need a large tax base to support one, and Indian Point’s tax base isn’t large enough.”

### Citizen Volunteer Group Investigates Alternative Treatment Systems

Since a central sewer system was no longer an option because of its prohibitive cost, a citizen volunteer group, which included Maycock and Wehr, investigated alternative treatment systems. “We put considerable effort into coming up with a manageable, cost-effective approach,” Maycock said. “A lot of our time was spent disproving systems for our area.

“We decided to look at some new advanced onsite treatment systems that could be scaled for use in both small and large cluster systems. Because our village has such diversity in its topography, geography, and density uses, the ‘one size fits all’ solution does not work here. We decided to adopt a consolidated approach to decentralized wastewater systems, both private and public.”

### Developing Rules and Regulations

Citizen volunteers, guided by Leland Neher, Missouri DNR, found that the U.S. Environmental Protection Agency (EPA) had recently developed model guidelines for managing decentralized wastewater systems.

In the fall of 2003, the village hired Elizabeth M. Dietzmann of Rolla, Missouri, an attorney who specializes in rural water and wastewater issues.

All photos except page 32 courtesy of Gregg Maycock.
to work with the volunteers and with Stone Environmental, a consulting firm in Montpelier, Vermont, to develop a set of rules and regulations based on EPA’s model guidelines for Indian Point.

“The problem with the EPA model guidelines is that rarely do you have just one management level,” Dietzmann said. “More often, it’s a mixed bag, and Indian Point is combining several levels of management to address its diverse needs.

“There are resorts that own their wastewater systems and fall under DNR’s regulation. Then there are village-owned systems that will need to meet DNR’s standards but which the village will manage. Some homeowners will own their own systems but will need to follow the village’s rules and regulations for technology selection, installation, and maintenance.

“We made sure that there was a balance between individual rights and village rights—the good of the whole versus the needs of a few. By being really flexible and creative, they are going to do a fantastic job managing these systems because it is going to address the needs of every component of their community.” The rules and regulations were adopted March 10, 2004 and can be found at [http://indianpoint.us/bpw.htm](http://indianpoint.us/bpw.htm).

Dietzmann recommended that Indian Point set up a board of public works (BPW). “Under Missouri law, this executive department of the village has authority to set rates, handle operations, and regulate all aspects of wastewater operations,” Dietzmann said. “Normally a board of public works is created to manage traditional big-pipe sewer systems, so it was innovative to create one to manage several types of decentralized systems instead. I actually do not know of any other village or town that has created a board of public works in order to manage decentralized systems. That is one of the very unique features about this project.”

Political Realities and Their Impact on a Decentralized Program

By Elizabeth Dietzmann, J.D.

The scope of the project for the Village of Indian Point, which was to create a “code” for the management of all the wastewater treatment systems in the village, was shaped in large part by political restraints imposed by the board of trustees. Under Missouri law, I could easily form a semi-autonomous board of public works (BPW), which once created, would have the to draft its rules and regulations (the code). However, the trustees were not comfortable creating the BPW until after they had approved the rules and regulations. This was a bit unusual, but unless the trustees approved the code, they wouldn’t agree to form the BPW, so we had to operate under that premise.

Basically, the trustees were concerned that a code that was too hard on individual homeowners would be so politically unpopular that it would cause a backlash. In addition, the resort owners, who owned the large commercial systems, did not want duplicate regulations that would be costly—and their businesses generated the tax revenue upon which the village depended. So these were both legitimate concerns.

Most of the homeowners did little, if any, maintenance and did not pay any maintenance provider on a regular basis. The volunteers (the wastewater advisory board) who had worked for so long on the project were convinced that a permit-based management system was the only realistic way to manage a diversity of wastewater treatment systems. But the jump from no management to a permit-based system was a big one. It didn’t help matters that no other city or town in Missouri had tackled the integrated management of such a diverse number of systems.

By collecting permit fees and utilizing the technical expertise of the members of the wastewater advisory board, most of who agreed to serve as the BPW, the BPW could review technology and afford to inspect systems. The main advantage that I had working with these folks was that they were willing to be creative and flexible. We had to create a code that could be adapted in the future and would manage a number of types of systems as cost-effectively as possible—and still appear reasonable to the trustees. The end result is all of those things—creative, flexible, and practical, and it serves to achieve the underlying goals: to phase out traditional septic systems and manage individual advanced treatment systems. You can read it at [http://indianpoint.us/bpw.htm](http://indianpoint.us/bpw.htm). There is no doubt that this approach can be used in other communities.

Management Program

One of the first steps the BPW took was to ban installation of new septic tanks and lateral systems. In addition, the board required that existing septic tanks and lateral systems be phased out over the next 10 years and replaced...
with approved advanced treatment systems.

"The BPW conducted an inventory and inspection of systems that are not regulated by the Missouri DNR. This helps us determine which systems are going to be grandfathered and phased out in a planned manner and which systems are failing and need to be replaced within a 60-day period," Maycock said.

The BPW plans to work with homeowners to repair, upgrade, or replace failing systems. "Some homeowners may need to replace an existing tank and lateral system with an advanced treatment system before we are able to set up a clustered system in their area. In these cases, we will rebate any monetary value the system still has, as long as the replacement system is an approved system," Wehr said.

Owners of wastewater systems operating under a permit issued by the Missouri DNR must send copies of the DNR’s operating permits, testing and inspection reports, and other relevant correspondence to the BPW.

"Because we are a small village, we have contracted out almost everything that deals with services for inspections, operations, and maintenance of systems," Maycock said. A licensed and certified maintenance provider must perform operations and maintenance. The BPW has the contact information for these providers. "The property owner has to show that they have a current operating and maintenance agreement for their system with an approved provider," Maycock said. Operating permits must be renewed annually.

**Types of Systems**

Indian Point will be divided into proposed project areas. The village will construct decentralized cluster systems in certain areas that serve residential users. In areas where there is a mix of residential and commercial use, business owners will share in the costs of the cluster systems.

For some areas, clustering is not cost-effective, and homeowners who are building new homes or replacing failing septic systems will need to install onsite advanced treatment systems. "We are open to new and emerging technology as long as the user can provide data that shows how the system performs," Maycock said.
In evaluating proposed wastewater treatment systems, the BPW will give preference to systems that can achieve, prior to distribution, effluent quality equivalent to that typically achieved by sand filters; namely, 10 mg/L or less biochemical oxygen demand, 10 mg/L or less total suspended solids, and fecal coliform 1,000 or less most probable number/100 mL.

**Persistence Pays Off**

Indian Point already had data showing that alternative systems were a viable option. In the early 1990s, Wehr had installed a reciprocal stone filter (also known as a reciprocal sand filter) at his Indian Point resort.

“There was a lot of resistance to this system in the beginning because the state had not approved it,” Wehr said. Eventually he found support from various DNR officials and was able to install it on an experimental basis.

“The reciprocal sand filter is easy to install, inexpensive, and the effluent it produces is almost palatable and probably cleaner than most waterways in the state,” Wehr said. The success of the system caught the attention of Senator Doyle Childers, (R) Missouri. Childers was so impressed with the system that he brought the entire Clean Water Commission to Wehr’s plant.

“My reciprocal stone filter was the beginning of the state breakthrough in looking at alternative systems,” Wehr said. The system has worked so well that more than 100 plants just like it have been built across the U.S., in Nova Scotia, Canada, and Mexico. Wehr has even received inquiries from Europe.

Maycock installed a reciprocating wetland system at his resort based on the Tennessee Valley Authority model. Effluent runs through stone and gravel filters topped by nutrient-absorbing plants that both treat the effluent and makes the system look like a natural feature of the landscape.

“Just like the reciprocal stone filter, this system produces effluent that is cleaner than the lake,” Wehr said. “The effluent is below the state limit of 0.5 in phosphorous. It is also low in...
solids, ammonia, and all the other things people are worried about.”

Government officials resisted this system also, according to Wehr. “Once again, it wasn’t an approved system, and the word from the engineering firms was that it wouldn’t work. It took one-and-one-half years to get it approved. Now that we proved that these systems work, we can take the stone filter or the wetland system and incorporate them in different areas so that we don’t have any concentrations of sewage outflow into one particular bay or flowing down one particular stream,” Wehr said. He added that, to date, two multi-home cluster systems and two commercial systems have been installed, and ten individual systems have been upgraded, all through private funding.

**Funding**

Indian Point has not been able to find the same kind of financial assistance that larger municipalities can find through the federal and state governments. “That kind of money is very difficult to get,” Wehr said. “If we had that kind of assistance, we probably would be able to put together some very affordable systems. We have never built a profit motive into our planning or asked for grants.”

“We are in fact getting a low-interest loan from the State Revolving Fund program to construct the first cluster system the village has planned,” Dietzmann said. “It has been a frustrating experience to get our rates approved, etc., but we did get the funding commitment.”

**Indian Point as a Model**

Dietzmann expects other communities to look at Indian Point for guidance. “This is the solution for the majority of rural areas in Missouri,” she said. “We are not going to sewer all of rural Missouri with traditional centralized systems, but we can take these adaptable routes.”

For more information, e-mail Maycock at village@indianpoint-mo.gov, Dietzmann at edietzmann@earthlink.net or fax Wehr at (417) 338-5063.
Abstract

Loudoun County, Virginia, promotes the use of cluster systems in its rural areas. County regulations state that the Loudoun County Sanitation Authority (LCSA) must own or operate these systems. However, the LCSA has indicated it will only own and operate systems serving 15 or more connections, leaving some smaller systems without centralized management. This article presents and analyzes several options for managing cluster systems in Loudoun County, including management by the county government, the LCSA, and private entities, as well as approaches used in other states. The benefits and drawbacks of several management options are outlined, and the author presents his recommendations to allow the county to manage all cluster systems in its jurisdiction.

For approximately the last hundred years, people have tried to reduce the pollutant load on the environment from wastewater through the construction and operation of wastewater treatment facilities. Historically, wastewater treatment facilities have fallen into two broad categories: individual onsite systems (e.g., septic systems) and centralized treatment systems. Generally, the individual systems have been the private solution and the centralized systems have been the public solution.

In the U.S., publicly owned treatment facilities treat the wastewater generated by approximately 75 percent of the population, over 32 billion gallons per day (APWA, 2003). The remaining 25 percent of the population is served predominantly by onsite wastewater treatment systems, but also to a small degree by cesspools, pit privies, and outhouses.

Until recently, these two general types of treatment have been sufficient to address most of the wastewater generated in the U.S.; however, land development patterns have taxed the ability of either of these methods to adequately and economically treat and dispose of the wastewater generated. Relatively isolated development in clusters or environmentally sensitive areas using individual onsite systems can exceed the assimilative capacity of the soil, thereby causing pollution of surface or groundwater. Yet pumping the wastewater to centralized treatment can be cost prohibitive. Therefore, classic forms of wastewater treatment have been combined and modified so that a new category of wastewater system has been created—the cluster system.

Loudoun County, Virginia, a suburb of Washington, D.C., is one of the fastest growing counties in the nation. The county’s zoning ordinance promotes cluster development in the rural parts of the county. The zoning ordinance states that the alternatives for wastewater treatment for development in these rural areas may be either individual onsite systems, if the soils allow, or communal treatment provided by the Loudoun County Sanitation Authority (LCSA). Currently, the LCSA is responsible for owning and operating all community water and wastewater treatment systems. The county defines a community system as any system having more than two connections. However, the LCSA has indicated that it will not own or operate systems serving fewer than 15 connections.

The LCSA has experience managing small community wastewater systems, has standards for such systems, and has operated them somewhat cost-effectively. However, it believes that taking on smaller community systems (i.e., clusters serving 3 to 14 connections) may be ill advised. This is because LCSA policy states each system must be financially self-sustaining. The LCSA is concerned
about the public perception of charging higher rates to some customers and the logistics and time requirements involved with managing a number of small cluster systems dispersed throughout the county.

This paper addresses the following problems the LCSA faces with development currently occurring in Loudoun County:

- Development is occurring in isolated areas where large-scale, central wastewater service is not allowed.
- The cost of providing service in these areas is generally higher than in the central service area.
- Current county and LCSA policies favor individual on-lot systems, even when installing cluster or community systems may better protect the environment.

In addressing these problems, this paper reviews the policies and ordinances in Loudoun County that relate to the management of cluster systems and presents and analyzes relevant information regarding how cluster systems are managed in other jurisdictions in the country. It also makes recommendations for revising the LCSA’s policy on cluster systems, that if adopted, would allow the county to stop discouraging cluster systems and start providing smaller subdivisions with a similar level of service given to other residents at a reasonable cost.

**BACKGROUND**

**The LCSA**

The LCSA, a body politic and corporate, was established by the Loudon County Board of Supervisors May 4, 1959, to provide water and wastewater services to the residents of the unincorporated areas of the county. A nine-member board of directors appointed on staggered four-year terms by the county board of supervisors governs the LCSA. Initially, the LCSA was established to provide central water and wastewater services in the rapidly suburbanizing eastern part of the county and currently serves nearly 50,000 connections. The LCSA’s role expanded during the 1970s through the 1990s when it began to operate several small wastewater treatment facilities. Some of these facilities were constructed to address potential public health issues attributed to failing onsite septic systems, while others were constructed to serve commercial entities.

**Loudoun County Policies and Ordinances**

In 1991, Loudoun County prepared its first general plan. The plan promoted two new types of development called villages and hamlets. These developments were created to encourage a rural development pattern that would enhance and protect the natural landscape and scenic vistas of the rural community while preserving and protecting farmland, open space, natural resources, and environmentally sensitive areas.

Figure 1 presents two models. The model on the top shows how development could occur under a typical rural residential zoning, while the model on the bottom shows how development could occur under a village or hamlet design. As is apparent in the models, the village or hamlet design conserves agricultural land and scenic open spaces.

Aside from conserving land, the village and hamlet concept significantly favored a type of centralized wastewater treatment over individual onsite wastewater treatment for two reasons. First, the relatively small lot sizes made it difficult to find suitable soil on or near each property to place onsite system drainfields. Second, the close proximity of the houses significantly reduced infrastructure (piping) costs to collect the wastewater for centralized treatment.

Several communities were designed as rural villages and hamlets, each with usually 100 or more houses, and most with a small, centralized wastewater treatment system called a community system. In 2002 and 2003, the LCSA began operating two of these community wastewater systems, one designed for 91,000 gallons per day (gpd) and the other for 60,000 gpd. Two more community wastewater systems are currently under construction, and several more are under design. These systems range in size from 3,400 gpd to 120,000 gpd.

Loudoun County relies on the LCSA to serve these communities. In fact the zoning ordinance requires the LCSA involvement as illustrated in the following definitions:

**Public Utilities/Facilities:** Public parks, playgrounds, trails, paths and other recreational areas and other public open spaces; scenic and historic sites; schools and other public buildings and structures. Any water or sewer system serving more than two lots, and any building or structure owned by a public utility as defined in Section 56-232 of the Virginia
State Code, all building and facilities owned by a public service corporation as defined in Section 56-1 of the Virginia State Code (Loudon County, 2003, Article 8, p. 39).

**Sewer, Public:** A central, communal or municipal wastewater treatment system serving more than two lots owned or operated by a municipality, or the LCSA for the collection, treatment and disposal of sewage.

**Sewer System, Central:** The sewage treatment system for Eastern Loudoun County owned and operated by the LCSA that is served by the Blue Plains and/or Broad Run treatment plants, and/or capacity supplied by the Upper Occoquan Sanitary Authority.

**Sewer System, Communal:** A sewage treatment system owned or operated by the LCSA that is designed to serve small-scale development, including clusters, where permitted by this ordinance.

**Sewer System, Municipal:** A sewage treatment system that is owned or operated by one of the incorporated towns within Loudoun County (Loudon County, 2003, Article 8, p. 46).

The Loudoun County Codified Ordinance (Loudon County, 1998) also regulates wastewater treatment. Chapter 1066, “Private Sewage Treatment and Disposal Systems,” is in the process of being updated to reflect new, alternative onsite technologies. The revised chapter will include requirements for responsible management entities (RMEs) operating alternative onsite systems. The county has asked the LCSA to draft a new chapter for the codified ordinance, one that addresses requirements for cluster and community systems. This new chapter will help the LCSA implement policy regarding ownership and operation of cluster systems.

**Policy Outcomes**

As development under the revised 1993 and subsequent zoning ordinances has occurred during the past ten years, it has been noted by the LCSA and confirmed by developers that county and LCSA standards favor individual treatment systems (e.g., septic systems or alternative onsite treatment systems) over cluster systems. Developers...
opt for community systems only when developments become large enough to make it difficult to find a sufficient number of drainfields to serve the proposed subdivision lots. The three major reasons for this are as follows:

- Capital outlays for individual systems are made one unit at a time and are usually made by the builder as opposed to the developer. Cluster or community system capital costs are all made up front by the developer, potentially leading to cash flow issues.
- Current LCSA standards require all community systems whose effluent recharges the groundwater to be designed to achieve an effluent total nitrogen (TN) of 7 mg/L on annual average, requiring much high treatment than individual systems, which either have no nitrogen standards or perhaps a limit as low as 15 mg/L TN if the drainfields are clustered together.
- There are currently three review entities for community systems (the LCSA, the county health department, and the state health department), while individual systems are usually only reviewed by the county health department, thereby positively affecting the total review time.

PROPOSED SOLUTION

The LCSA’s mission is to protect public health and the environment, and it should do so in a manner economical to its customers. To better do this, the author proposes the following changes:

- Step One: The LCSA should reconsider its policy of not owning or operating systems serving 3 to 14 connections. This will help reduce the impediments that steer developers away from cluster systems, which are potentially more cost-effective and protective of human health and the environment, to individual on-site systems, which include many alternative treatment systems not currently required to have RME oversight.
- Step Two: The LCSA should modify its design standards to require increased performance based on increased size. Therefore, a cluster system in the 1,000 gpd to 5,000 gpd range may be required to meet a 15 mg/L TN, a large cluster in the 5,000 gpd to 20,000 gpd range may be required to meet a 10 mg/L or 12 mg/L TN, and a community system of 20,000 gpd or more may be required to meet a TN of 7 mg/L. This would allow developers to consider and propose proven cluster system technologies whose total costs would be significantly less than the aggregate individual system costs.
- Step Three: The LCSA should execute a memorandum of agreement (MOA) with the state health department taking on exclusive design review responsibility for the treatment components of the systems while deferring to the county health department for design review of the soil dispersal components of the systems. This would remove one level of design review, thereby speeding the review process and bringing the overall review time more in line with individual systems.
- Step Four: The LCSA should require developers to pay a “revenue equalization fee” that collects money up front to partially defray the long-term cost of operation and maintenance for the systems they propose, bringing them to a level equal to the average operation and maintenance costs for community systems currently operated by the LCSA.

The proposed solution was developed based on research regarding how other parts of the country approach cluster systems and what could be easily and reasonably implemented in Loudoun County. Further explanation is presented subsequently.

CLUSTER SYSTEM OWNERSHIP AND MANAGEMENT OPTIONS

Authors of almost every article on decentralized treatment or cluster systems state that proper management of these wastewater treatment systems is important for reducing overall system costs, increasing system life, improving system performance, and increasing reliability and overall satisfaction (e.g., Olson, 2002; Hoover et al., 1996; and EPA, 2003b). There are several alternatives for managing cluster systems, which may be divided into three broad categories: management by a public agency, management by a special government unit, and management by a private party. (It should be noted that the term management is more encompassing than the term operation. In addition to operation, management includes various oversight roles and ultimate responsibility for assuring the system performs in a manner to meet regulatory limits.) Each management option will be described in more detail below as it relates to Loudoun County.

Management by County Government

The Loudoun County government could directly manage the operation of cluster systems. The government has very broad powers to levy taxes; impose special assessments; issue general obligation and revenue bonds; set fees, rates, charges, and penalties; condemn land; and establish rules and regulations, and would therefore be able to operate, manage, and finance the operation of cluster systems.

Alternatively, the county could establish sanitary districts for the management of cluster systems. As opposed to the direct management above, which would apply carte blanche to the entire county, a sanitary district would provide the county much of the same power but would apply only to the specific district created. Sanitary districts have the power to construct, maintain, and operate water supply, sewerage, garbage removal and disposal, heat, light, firefighting equipment, power and gas systems, and sidewalks for the use and benefit of the public. Furthermore, they have the ability to acquire equipment by gift, condemnation, purchase, lease, or otherwise, as well as rights, titles, interest, or easements in real estate. In addition, sanitary districts can require connections, charge fees for service, levy taxes, employ people, negotiate with others to provide service, and hire policemen to enforce laws. The Loudon
Management Option
Benefits and Drawbacks

Each of the management options has benefits and drawbacks. These are presented in Tables 1 to 4.

Ciotoli and Wiswall (1982) compare the responsibilities, financing capabilities, advantages, and disadvantages of different potential management entities. Table 5

TABLE 1
Benefits and Drawbacks of Direct Management of Cluster Systems by County Government

<table>
<thead>
<tr>
<th>BENEFIT</th>
<th>DRAWBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• can levy taxes to pay for capital/repairs</td>
<td>• bonds must be approved by voters in entire county</td>
</tr>
<tr>
<td>• can set rates, fees, charges for service</td>
<td>• taxes would be paid by all property owners in county</td>
</tr>
<tr>
<td>• can establish liens on property for non-payment</td>
<td>• the county would need to establish new oversight mechanisms and structures</td>
</tr>
</tbody>
</table>

TABLE 2
Benefits and Drawbacks of Management of Cluster Systems by County Government Through Sanitary Districts

<table>
<thead>
<tr>
<th>BENEFIT</th>
<th>DRAWBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• have ability to levy taxes in district to pay for capital/repairs of facilities in district</td>
<td>• the county would need to establish new oversight mechanisms and structures</td>
</tr>
<tr>
<td>• can set specific rates, fees, charges for service provided to district</td>
<td>• the county would need to establish new operation units and structures</td>
</tr>
<tr>
<td>• can establish liens on property for non-payment</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 3
Benefits and Drawbacks of Management of Cluster Systems by the LCSA

<table>
<thead>
<tr>
<th>BENEFIT</th>
<th>DRAWBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• management and operation units are already established</td>
<td>• the LCSA may need to establish new operation units or train existing operators</td>
</tr>
<tr>
<td>• can set specific rates, fees, charges for service provided to each service area</td>
<td>• the county would not be responsible for providing services promoted by policies they established</td>
</tr>
<tr>
<td>• can establish liens on property for non-payment</td>
<td></td>
</tr>
<tr>
<td>• bonds may be approved by the board or directors</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 4
Benefits and Drawbacks of Management of Cluster Systems by Private Entity

<table>
<thead>
<tr>
<th>BENEFIT</th>
<th>DRAWBACK</th>
</tr>
</thead>
<tbody>
<tr>
<td>• several people are considering forming private entities to operate alternative on-site systems and would have the ability to operate cluster systems</td>
<td>• private management of public systems is currently not allowed in Loudoun County</td>
</tr>
<tr>
<td>• may be more cost-effective than public entities</td>
<td>• private wastewater entities do not typically have the financial resources that public entities have</td>
</tr>
</tbody>
</table>

...
summarizes their analysis for the reader's interest as it relates to the management of systems by the entities presented above and also by entities not considered or applicable to Loudoun County.

Cluster System Ownership

In the management options stated above, ownership was not discussed. Regardless of who operates the public facility, ownership may either be private or public. Parts of a cluster system may be used exclusively by one household, and these parts may be owned by the one household, by the homeowner association, or by the public. Other cluster system parts are used by two or more households. These parts should not be owned by one household but could be owned by the homeowner association or by the public. There are benefits and drawbacks to each type of ownership.

Private ownership by individuals may mean that individuals only pay for operation and maintenance expenses as part of their basic operating fee but not necessarily for repair or replacement of system components. This keeps the homeowners more vested in the system. Homeowners may be more careful of what they flush into the system, because they know that if something breaks, they will be faced with a large repair bill. Operators are less vested in the system. Therefore, they might not care for it as well as if they owned it. Because the operators have no capital stake in the system, homeowners can more easily fire one operating company and hire another if the homeowner alone holds the contract and owns the system.

Private ownership by a homeowner association is much like ownership by homeowners. It helps to keep the community vested in the system (however, maybe not as greatly vested as individual ownership), and a homeowner association can more easily “shop around” for service providers. Through monthly or annual membership dues, homeowner associations may collect the money required to pay for expenses and potentially to establish a repair and replacement fund. However, one cautionary note is that homeowner associations have been historically weak and have typically lacked the ability or the resolve to pay for improvements to facilities.

TABLE 5
Institutional Considerations in Selecting a Management Entity

<table>
<thead>
<tr>
<th>Responsibilities</th>
<th>State Agency</th>
<th>County</th>
<th>Municipality</th>
<th>Special District</th>
<th>Improvement District</th>
<th>Public Authority</th>
<th>Public Nonprofit Corporation</th>
<th>Private Nonprofit Corporation</th>
<th>Private For-profit Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td>enforcement of state laws and regulations</td>
<td>enforcement of state codes and county ordinances</td>
<td>enforcement of municipal ordinances; may enforce state/county codes</td>
<td>powers defined; may include code enforcement (e.g., sanitation district)</td>
<td>state statutes define extent of authority</td>
<td>fulfilling duties specified in enabling instrument</td>
<td>role specified in articles of incorporation (e.g., homeowner association)</td>
<td>role specified in articles of incorporation (e.g., homeowner association)</td>
<td>Roles specified in articles of incorporation</td>
<td></td>
</tr>
<tr>
<td>Financing Capabilities</td>
<td>usually funded through appropriations and grants</td>
<td>able to charge fees, assess property, levy taxes, issue bonds, appropriate general funds</td>
<td>able to charge fees, assess property, levy taxes, issue bonds, appropriate general funds</td>
<td>able to charge fees, assess property, levy taxes, issue bonds, appropriate general funds</td>
<td>can apply special property assessments, user charges, other fees; can sell bonds</td>
<td>can issue revenue bonds, charge user and other fees</td>
<td>can charge fees, sell stock, issue bonds, accept grants/loans</td>
<td>can charge user fees, accept grants/loans</td>
<td>Can charge fees, sell stock, accept grants/loans</td>
</tr>
<tr>
<td>Advantages</td>
<td>authority level and code enforcement are high; programs can be standardized; scale efficiencies</td>
<td>authority level and code enforceability are high; programs can be tailored to local conditions</td>
<td>authority level and code enforceability are high; programs can be tailored to local conditions</td>
<td>flexible, renders equitable service (only those receiving service pay); simple and independent approach</td>
<td>can extend public services without major expenditures; service recipients usually supportive</td>
<td>can provide service when government unable to do so; autonomous, flexible</td>
<td>can provide service when government unable to do so; autonomous, flexible</td>
<td>can provide service when government unable to do so; autonomous, flexible</td>
<td></td>
</tr>
<tr>
<td>Disadvantages</td>
<td>sometimes too remote; not sensitive to local needs and issues, often leaves enforcement up to local entities</td>
<td>sometimes unwilling to provide service, conduct enforcement; debt limits could be restrictive</td>
<td>might lack administrative, financial, other resources; enforcement might be lax</td>
<td>can promote proliferation of local government services; can result in administrative delays</td>
<td>contributes to fragmentation of government services; local government must cover debt</td>
<td>financing ability limited to revenue bonds; local government must cover debt</td>
<td>local governments might be reluctant to apply this concept</td>
<td>services could be of poor quality or could be terminated</td>
<td>No enforcement powers, company might not be fiscally viable; not eligible for major grant/loan programs</td>
</tr>
</tbody>
</table>
Public ownership or ownership by the operating entity means that owners pay for both operation and maintenance as well as system repair and replacement costs as part of a basic operating fee. Recurring fees are more expensive, but the system is more “out of sight, out of mind.” Operating entities or companies can more easily replace equipment that breaks because they do not need to coordinate replacement with individual homeowners or associations. Because the operating company owns the infrastructure, changing operating companies is more difficult. Homeowners or associations would need to get the new operating company to buy the infrastructure from the old company before the new company could take over operation.

The U.S. Environmental Protection Agency (EPA) has recently published voluntary national guidelines for management of cluster systems (EPA, 2003b). The guidelines present five management models with Model 1 being homeowner awareness, Model 2 being maintenance contracts, Model 3 being operating permits, Model 4 being responsible management entity (RME) operation and maintenance, and Model 5 being RME ownership. The main difference between Model 4 and Model 5 is private ownership or RME/public ownership—the discussion presented above. The benefits and limitations are presented in Table 6.

The U.S. Environmental Protection Agency (EPA) has recently published voluntary national guidelines for management of cluster systems (EPA, 2003b). The guidelines present five management models with Model 1 being homeowner awareness, Model 2 being maintenance contracts, Model 3 being operating permits, Model 4 being responsible management entity (RME) operation and maintenance, and Model 5 being RME ownership. The main difference between Model 4 and Model 5 is private ownership or RME/public ownership—the discussion presented above. The benefits and limitations are presented in Table 6.

Management Options in Other States
Several states and counties are now considering management of small community or cluster wastewater treatment systems. Below are summaries of allowable management options in Maine, Massachusetts, Michigan, Minnesota, North Carolina, and Sedgwick County, Kansas.

Maine
Maine state law (10 CMR 241) defines a “multi-user (common) disposal system” as a system “designed to serve three or more parcels with structures under individual and separate ownerships, and when the disposal system is not owned by one party or entity.”

<table>
<thead>
<tr>
<th>Typical Applications</th>
<th>Program Description</th>
<th>Benefits</th>
<th>Limitations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model 4 - RME Operation and Maintenance (O&amp;M)</td>
<td>• areas of moderate to high environmental sensitivity where reliable and sustainable system O&amp;M is required—e.g., sole source aquifers, wellhead or source water protection zones, critical aquatic habitats, or outstanding value resource waters • cluster systems</td>
<td>• establishes system performance and monitoring requirements • professional O&amp;M services through RME (either public or private) • provides regulatory oversight by issuing operating or NPDES permits directly to RME (system ownership remains with property owner) • inventory of all systems • tracking system for operating permit and compliance monitoring</td>
<td>• O&amp;M responsibility transferred from the system owner to a professional RME that is the holder of the operating permit • identifies problems needing attention before failure occurs • allows use of onsite treatment in more environmentally sensitive areas or for treatment of high-strength wastes • can issue one permit to a group of systems • protects homeowner investment</td>
</tr>
<tr>
<td>Model 5 - RME Ownership</td>
<td>• areas of highest environmental sensitivity where reliable management is required, e.g., sole source aquifers, wellhead or source water protection zones, critical aquatic habitats, or outstanding value resource waters • preferred management program for cluster systems serving multiple properties under different ownership (e.g., subdivisions)</td>
<td>• establishes system performance and monitoring requirements • professional management of all aspects of decentralized systems through public/private RMEs that own or manage individual systems • qualified, trained, owners and licensed professional owners/operators • provides regulatory oversight by issuing operating or NPDES permit • inventory of all systems • tracking system for operating permit and compliance monitoring</td>
<td>• high level of oversight if system performance problems occur • simulates model of central sewerage, reducing the risk of noncompliance • allows the use of onsite treatment in more environmentally sensitive areas • allows effective area-wide planning/watershed management • removes potential conflict between user and RME • greatest protection of environmental resources and owner investment</td>
</tr>
</tbody>
</table>
All parts of the system after the building sewer “shall be vested in a single and independent, legally established entity under Maine law.” The entity can be a municipal department, a quasi-municipal agency such as a sanitary district, or a private organization representing the owners of the system such as a condominium association (Stone Environmental, 2003a, p. 6). Maine law treats systems treating more than 2,000 gallons per day (gpd) different than systems treating less than 2,000 gpd. Systems treating less than 2,000 gpd are considered small, multi-user systems and are treated similar to single-family residence systems. Systems treating over 2,000 gpd are approved as an engineered system and are permitted by Maine Department of Environmental Protection (Stone Environmental, 2003b).

Massachusetts
Massachusetts treats cluster systems treating less than 10,000 gpd differently than those treating 10,000 gpd or more. Systems treating below 10,000 gpd are considered private sewage treatment facilities and are regulated under Title 5, which regulates septic systems. Systems treating 10,000 gpd or more also may be private, are regulated under 314 CMR 5.00, and must receive a groundwater discharge permit. Private entities operating sewage treatment facilities must be financially viable, providing financial assurances to ensure long-term operation and maintenance of the facility. Immediate funding must be available for emergency repair and replacement, as well as adequate funding at the end of the system’s useful life for prompt replacement (O’Donnell, 1999; and Corr, 2003).

Michigan
Cluster systems have been operated in Michigan for 30 years or more. Several developments have been sited on lakefronts or other environmentally sensitive areas. In order to protect the environment, septic tank effluent from communities is combined and pumped outside the sensitive area possibly for further pretreatment and then common dispersal in a soil absorption field. These systems are considered public and, until recently, the municipality in which they are located must sign a resolution indicating the municipality will be responsible for the system in the event the operator/owner does not maintain the system as required (Mikulski, 2003). However, in a November 2003 ruling by the State of Michigan Court of Appeals (Lake Isabella Development, Inc. v. Village of Lake Isabella) and the subsequent June 10, 2004 policy by the Michigan Department of Environmental Quality, municipalities no longer had to accept ultimate responsibility. The facility may be owned and operated privately without municipal guarantees so long as it is owned and operated by a legal entity; an escrow initially for two and eventually five years of operation and maintenance is established; and a covenant requiring system users to agree to pay the fees for operations, maintenance, repairs, and upgrades is also established.

Minnesota
Minnesota allows several different ownership and operation options for cluster systems. In unincorporated areas of Minnesota, several organizational structures may own and/or operate cluster systems including special governmental districts, rural utilities, and homeowner and other associations. The owners of the systems may, at their discretion, contract the operation and maintenance to private operators (Olson, 2002).

North Carolina
North Carolina has well-developed regulations regarding treatment and disposal of wastewater followed by subsurface dispersal of effluent (State of North Carolina, 1998, 15A NCAC 18A.1934 et seq.). Table 7 (on the next page) summarizes the relevant requirements.

Sedgwick County, Kansas
Sedgwick County encircles Wichita and is under significant development pressure, similar to Loudoun County. Several small subdivisions are being considered on the county’s rural fringe. The developments are too far away for central service to be extended, and the county does not want to promote the five-acre tract development that would be required to support septic systems and drain-
fields or lagoons, as this would make it cost prohibitive for future extension of public water and sewer service. For this reason, Sedgwick County is considering allowing cluster systems to serve new residential subdivision development.

Kansas law states that wastewater treatment systems with two or more connections are considered public systems and would be permitted by the Kansas Department of Health and Environment. Sedgwick County will require subdivision developers intending to construct cluster systems to establish a county sewer district, where the board of county commissioners serves as the governing body of the district and has latitude in how to provide services. It could provide operation and maintenance services by itself or enter into contracts with other entities to provide service. Regarding ownership, the district owns the “public” parts of the system and has the option to own the parts serving individual properties (Wagner, 2003 and 2005).

THE CASE FOR LCSA OWNERSHIP AND MANAGEMENT OF ALL COUNTY CLUSTER SYSTEMS

As presented above, cluster systems could be owned publicly or privately and managed either by the county government, by the LCSA, or by a private entity. The LCSA’s current policy of only owning and operating systems serving 15 or more connections arose from its desire to operate what the Safe Drinking Water Act defines as a public system—a system serving 15 or more connections. However, the definition also states serving 25 or more people. By the county government’s estimates, an average of 3.2 people live in each single-family home. This would, therefore, define a public system as eight or more connections.

Because it’s only a little farther from eight to the county’s definition of public as “serving more

<table>
<thead>
<tr>
<th>System Classification</th>
<th>System Description</th>
<th>Management Entity</th>
<th>Minimum System Inspection/Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type I</td>
<td>a. privy</td>
<td>owner</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>b. chemical toilet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. incinerating toilet</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. other toilet system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>e. grease trap</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type II</td>
<td>a. conventional septic system (single-family or 480 gpd or less)</td>
<td>owner</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>b. conventional septic system with 750 linear feet of nitrification line or less</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. conventional system with shallow placement</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type III</td>
<td>a. conventional septic system &gt;480 gpd (excluding single family residence)</td>
<td>owner</td>
<td>N/A</td>
</tr>
<tr>
<td></td>
<td>b. septic system with single effluent pump or siphon</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>c. gravity fill system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>d. dual gravity field system</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>e. PPBPS system, gravity dosed</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>f. large diameter pipe system</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>g. other nonconventional trench system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type IV</td>
<td>a. any system with LPP (low pressure pipe) distribution</td>
<td>public management entity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. system with more than 1 pump or siphon</td>
<td>with a certified operator</td>
<td>2/yr</td>
</tr>
<tr>
<td>Type V</td>
<td>a. sand filter pretreatment system</td>
<td>public management entity</td>
<td></td>
</tr>
<tr>
<td></td>
<td>b. any &gt; 3,000 gpd septic tank system with a nitrification field designed for &gt; 1,500 gpd</td>
<td>with a certified operator</td>
<td>2/yr (0-1,500 gpd)</td>
</tr>
<tr>
<td></td>
<td>c. aerobic treatment unit (ATU)</td>
<td></td>
<td>4/yr (1,500 – 3,000 gpd)</td>
</tr>
<tr>
<td></td>
<td>d. other mechanical, biological, or chemical pretreatment plant (&lt;3,000 gpd)</td>
<td></td>
<td>1/yr (&gt;10,000 gpd)</td>
</tr>
<tr>
<td>Type VI</td>
<td>a. any &gt;3,000 gpd system with mechanical, biological, or chemical pretreatment system plant</td>
<td>Public management entity</td>
<td>1/yr (3,000 – 10,000 gpd)</td>
</tr>
<tr>
<td></td>
<td>b. wastewater reuse/recycle</td>
<td></td>
<td>2/yr (10,000 – 25,000 gpd)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>3/yr (25,000 – 50,000 gpd)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>5/yr (&gt;75,000 gpd)</td>
</tr>
</tbody>
</table>

Note: The regulations do not present requirements for system ownership (Rubin, 2003).
than two connections,” it seems reasonable for the LCSA to own and manage all cluster systems. Owning and managing all cluster systems would be supportive of the LCSA’s mission of protecting public health and the environment. This approach would help the LCSA better assure recharge of high quality waters to the groundwater, a resource used by the LCSA in providing public water service.

The LCSA’s policy, specifically, should be to own and manage all cluster systems. Stating that it will manage all systems would give the LCSA the option to contract with private companies with the LCSA’s oversight and management if that proves more economical. Furthermore, because of the resources available to the LCSA, their ownership of these systems would help aid in quick and appropriate repairs to systems in the event of breakdowns or failure. This approach has similarities to the approaches in several of the states presented above.

For example, prior to the November 2003 ruling, municipalities in Michigan served as an ultimate source of funding for repairs if owners or private operating companies were unable to maintain systems. In North Carolina, systems with mechanical equipment require management by a public entity, which either may be a governmental agency or a private company licensed as a public utility. Finally, this approach is probably most similar to that of Sedgwick County, Kansas, where the governmental agency governs the district serving the cluster system and determines how to best serve the customers. Regardless of state, the approach is to assure that an organization will manage these systems in perpetuity. By assuming responsibility for these systems, the LCSA would assure that the systems are managed in perpetuity.

Another important point with respect to the LCSA reconsidering its policy to own and manage cluster systems serving three to 14 connections is that it would remove these facilities from the regulatory “black hole” in which they currently reside. These systems are not currently managed because, although county ordinances require LCSA ownership or operation of systems serving more than two connections, the LCSA will not operate systems serving less than 15 connections.

**LCSA Design Standards**

As owner and operator of both community water and wastewater systems and protector of public health and the environment, the LCSA has a significant stake in the quality of effluents dispersed to the groundwater. Effluent dispersed from a cluster system directly affects the groundwater the LCSA withdraws from community wells used to supply the subdivisions with drinking water. If the groundwater quantity is negatively affected, the LCSA may need to provide additional treatment prior to consumptive use. For this reason, the LCSA adopted an effluent standard of 7 mg/L TN to help assure that nitrates in the groundwater remain within the Virginia Department of Environmental Quality anti-degradation standard of 5 mg/L due to the dispersal of effluent.

This logic is important for facilities dispersing large quantities of effluent during low recharge periods, such as droughts. However, as the effluent quantities decrease, the imperativeness for such high quality effluent also decreases, and the practical importance of the difficulty to meet those standards at small facilities increases. If design standards for cluster systems are too stringent, developers of small subdivisions that have the option to either use individual treatment systems (such as alternative treatment systems) or cluster systems would very likely select individual treatment systems that may have much lower performance, thereby impacting the groundwater to a much greater extent. Therefore, to protect public health and the environment, it would be appropriate to adopt standards that realistically can be achieved with smaller residential cluster systems. The county would benefit from the improved effluent quality over that from individual systems and also from the increased operator attention, which would likely identify and repair problems more quickly, thereby impacting groundwater to a much lesser extent.

Further research is required on final standards, but preliminary discussions with equipment manufacturers indicate that a standard of 15 mg/L TN for facilities with design flows of 1,000 gpd to 5,000 gpd (approximately 3 to 15 homes) is manageable and protective of the groundwater. Reducing the standard to 10 mg/L to 12 mg/L TN for 5,000 gpd to 20,000 gpd systems (approximately 15 to 60 homes) is also manageable and protective of groundwater. Systems larger than 20,000 gpd (more than 60 homes) should be designed to meet the current standard of 7 mg/L TN.

**LCSA Design Review and Regulatory Approval**

Recently, the Virginia Department of Health (VDH) entered into a MOA with Charles City County essentially waiving the requirement for VDH to review the designs of non-discharging systems (i.e., dispersing effluent below the ground). In return for this, Charles City County has agreed to assure that certain performance standards and groundwater standards will be met.

The LCSA has begun initial discussions with VDH regarding execution of a similar agreement. LCSA staff and engineering consultants retained by the LCSA have extensive experience reviewing designs and operating small wastewater treatment facilities. Furthermore, LCSA standards are more stringent than state standards. Therefore, the LCSA feels comfortable that facilities it reviews will achieve standards that would be required in the MOA and will be protective of public health and the environment while saving potentially months of review time by the VDH. It should be noted that the LCSA would only assume responsibility for reviewing the treatment components of the systems and the operability of the entire system. Because the LCSA does not have as much experience with dispersal...
facilities as it does with treatment facilities, it would continue to rely on the county health department to assure that dispersal facilities adhere to state prescriptive standards. By potentially cutting months off of the review time, developers would be less disinclined to pursue cluster systems instead of individual treatment systems.

Revenue Equalization Fee

The previous recommendations to the LCSA discussed in this paper potentially promote the use of cluster systems over the use of individual treatment systems. A revenue equalization fee, on the other hand, would increase the cost to developers for cluster systems but improve the LCSA’s ability to operate the systems at a similar level of service to that of the larger community systems.

Recently, the water authority in James City County, Virginia, instituted a revenue equalization fee charged to developers of small community water systems on a per unit basis to account for the deficit the water authority would incur from the addition costs of operating the small community water systems while charging these customers the same rate as customers in the large central system. The LCSA currently has individual water and wastewater rates for each community system it operates, but is investigating blending these rates into one community system rate structure. The LCSA has been actively considering cluster systems as a result of the third reason.

As one of the fastest growing counties in the nation, Loudoun is experiencing growth in all areas—the suburban east, the transitional central, and the rural west. Current regulations and policies seem to be pushing rural subdivisions toward individual onsite wastewater systems, even when they might not be the most appropriate treatment technology. Onsite wastewater systems allow developers to get their subdivisions to market quicker than they could with cluster or community systems, and their overall cost is either lower or more attractive on a cash flow basis.

The author, therefore, presents the following four recommendations with respect to management of cluster systems to the LCSA as an organization whose mission is to protect public health and the environment and to do so in a manner economical to its customers:

1. The LCSA should reconsider its policy of not owning or operating systems serving 3 to 14 connections. This will help to reduce the impediments that have helped steer developers away from cluster systems—an alternative potentially more cost-effective and protective of human health and the environment—to individual systems—many of which are alternative treatment systems with currently no requirements for operation by a RME.

2. The LCSA should modify its design standards to require increased performance based on increased size. Therefore, a cluster system in the 1,000 gpd to 5,000 gpd range may be required to meet a 15 mg/L TN, a large cluster in the 5,000 gpd to 20,000 gpd range may be required to meet a 10 mg/L or 12 mg/L TN, and a community system of 20,000 gpd or more may be required to meet a TN of 7 mg/L. This would allow developers to consider and propose proven cluster system technologies whose total costs would be significantly less than the aggregate individual system costs.

3. The LCSA should execute an MOA with the state health department taking on exclusive design review responsibility for the treatment components of the systems, while deferring to the county health department for design review of the soil dispersal components of the systems. This would remove one level of design review, thereby speeding the review process and bringing the overall review time more in line with individual onsite systems.

4. The LCSA should require developers to pay a revenue equalization fee that collects money up-front to partially defray the long-term cost of operation and maintenance for the systems they propose to a level equal with the operation and maintenance costs for community systems currently operated by the LCSA.

The LCSA has been actively considering some of these options. By implementing the recommendations, the interests of LCSA customers (environmental and public health protection in an economical manner) would be best achieved. It would allow the LCSA to better assure that its source water for community water supplies is being protected and ease the management requirements that would be placed on homeowner associations and other entities whose expertise is likely not in wastewater management. It would also help spread the cost burden for repairs over a much larger base, making the burden felt by individual homeowners much more bearable. Finally, it would place the burden of any additional costs for running small cluster systems, as opposed to a larger community system, on the developer (in the first cost of the home) instead of the burden being shoul-
dered by the customers in each bill ad infinitum. In conclusion, it could provide better protection of public health and the environment at lesser cost.

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Contributing Writer

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the next phase of treatment. Solids that have settled are returned to the aerobic section of the ATU.

Two basic ATU operating styles currently exist: suspended-growth and fixed-film systems. Before discussing these operating styles, it’s important to note that most, if not all, ATUs will have a pretreatment step prior to the aeration unit to remove larger solids that would interfere with treatment. This pretreatment step could be a settling chamber or a trash trap contained within the unit or a separate septic tank prior to the ATU.

Suspended-growth ATUs usually have one main aeration tank where the air is bubbled through the wastewater and bacteria float freely. The solids settling chamber can be referred to as a second chamber and is usually separated from the main aeration tank by a wall or baffle. Both chambers are connected at the bottom or by a pump so that the solids and bacteria that have settled out can be brought back to the main treatment (aeration) tank. Over time, sludge does build up in ATUs and will need to be pumped out periodically. The treated wastewater (effluent) from the settling chamber is passed on to the next treatment step, which could be a soil dispersal system, disinfection unit, or an additional treatment such as a sand filter. Experience with suspended-growth ATUs shows that they are simple to operate; however, there is concern with waste load fluctuations (i.e., changes in wastewater strength or quantity) that may result in bulking, thus leading to potential clogging of the soil dispersal system if one is part of the overall onsite wastewater system.

Fixed-film systems provide a surface media where the bacteria can attach and grow. Common surfaces include fabric, plastic, and Styrofoam. Fixed-film systems normally have two areas: one area with the media and a settling area. The wastewater is treated by exposing the surface of the media alternately to wastewater and air by either rotating the surface in and out of the wastewater or by dosing the wastewater onto the surface of the media. Experience with fixed-film ATUs shows high-quality effluent with routine maintenance, very little concern with bulking, and no need for a return mechanism since the bacteria stay in place.

Advantages of ATUs
- Small land requirement
- May reduce vertical separation to limiting layer
- May reduce size of soil treatment system
- Soil treatment system may last longer

Disadvantages of ATUs
- Requires regular maintenance due to mechanical parts
- Increased annual operating cost compared to some onsite systems
- Some types subject to upset under heavy loads
- Requires a source of power
the area of the fixed-film media. However, this design is somewhat more expensive than suspended-growth systems.

Regardless of the operating style, a properly operating and maintained ATU should produce a consistently high-quality effluent. The type of ATU will most likely dictate the way and rate in which the wastewater will need to be received. Continuous-flow designs are units that allow the wastewater to flow through at the same rate that it leaves the home. Other designs employ devices such as pretreatment tanks, surge chambers, baffles, pumps, and siphons to control the amount of wastewater allowed to enter the aeration chamber and/or discharge the amount of effluent leaving the ATU.

ATUs need to be large enough to allow the proper amount of time for the wastewater to be treated. Consider the amount of wastewater to treat, the amount of oxygen needed, the strength of the wastewater, and the settling characteristics of solids. The daily wastewater volume is usually determined by the number of bedrooms (not bathrooms) in the house; the same way the size of a septic tank is determined, in most areas. However, check with your local regulatory authority to see how ATUs are sized in your area. Some states or local permitting authorities require ATUs to be sized at least as large as a septic tank in case the unit malfunctions or in the event of a power outage. Other jurisdictions follow the example detailed within the NSF International’s Standard 40 Individual Aerobic Wastewater Treatment Plants, discussing treatment capacity of a unit.

A two-year service contract is normally required with installation of a new ATU. The maintenance contract should be issued to the homeowner and explained to them. All service records and permits should be kept together and left with the house in case of property transfer. The first service visit should be scheduled immediately after installation to make sure everything is working correctly—most malfunctions commonly occur during the first few months after installation. After the initial two-year service contract expires, it is strongly recommended that you renew the contract even if you are not required to do so.

The operating costs for an ATU are based on the electricity to run the air compressor and usually average around $12 to $15 per month for an individual home. Overall, a homeowner can expect to pay an average of $300 to $500 per year for pumping, repairs, maintenance, and electricity.

**New Pipeline About ATUs**

The latest issue of the *Pipeline* newsletter (Summer 2005) describes Aerobic Treatment Units (ATUs) as a wastewater treatment alternative to septic systems. A description of the basic operating principles of ATUs is presented along with informative diagrams. Special design considerations and maintenance issues are discussed. A section on NSF International’s industry standards as they relate to wastewater treatment systems is included. This *Pipeline* is an update to the Winter 1996 issue. Copies of the Summer 2005 issue are available from NESC at (800) 624-8301.
New Products Are Available

Wastewater Technology Fact Sheet: Slow-Rate Land Treatment
Office of Water; U.S. Environmental Protection Agency
Slow-rate land treatment is one of the oldest and most widely used forms of land treatment. Slow-rate systems can produce a very high-quality percolate but also require the largest land area compared to other treatment concepts. This fact sheet offers a description, applicability, advantages and disadvantages, design criteria, performance, operation and maintenance, costs, and references for slow-rate land treatment. The cost of this fact sheet is $1.00. Request item #WWFSGN222.

Wastewater Technology Fact Sheet: Sewers, Pressure
Office of Water; U.S. Environmental Protection Agency
This wastewater technology fact sheet discusses the septic tank effluent pump, (STEP) and grinder pump systems. Both systems use pressure to deliver sewage to a larger treatment system. The fact sheet discusses the applicability, advantages and disadvantages, design criteria, operation and maintenance, cost, and references for each type of system. The cost is $1.80. Ask for item #WWFSGN223.

Wastewater Technology Fact Sheet: The Living Machine
Office of Water; U.S. Environmental Protection Agency
The Living Machine is an emerging wastewater treatment technology that uses a series of tanks that support vegetation and a variety of other organisms. The Living Machine gets its name from the ecologically based components that are incorporated into its treatment processes. The fact sheet describes the treatment process, applicability, advantages and disadvantages, design criteria, performance, operation and maintenance, cost, and references for the Living Machine. The cost is $1.40. Request item #WWFSGN224.

Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters
Office of Water; U.S. Environmental Protection Agency
This book contains guidance specifying management measures for sources of nonpoint pollution in coastal waters. It addresses five source categories of nonpoint pollution as well as a suite of management measures for each source category. In addition to this management measures guidance, EPA and NOAA have jointly published final guidance for the approval of state programs that implement management measures, explaining more fully how the management guidance will be implemented in state programs. This book is free of cost. Ask for item #WWBKMG40.

Onsite Wastewater Treatment Systems Technology Fact Sheet 8: Enhanced Nutrient Removal—Phosphorus
Office of Research and Development; U.S. Environmental Protection Agency
The removal of phosphorus is of concern where effluents may enter surface waters via direct surface discharge or subsurface flow through fractured bedrock and in soils where little phosphorus exchange would take place. Few phosphorus removal processes are well developed for onsite wastewater systems application. This 3-page fact sheet goes into detail about successful applications that have been implemented. Also included are typical applications, design assumptions, performance, management needs, risk management issues, and cost for the systems. The cost of this fact sheet is $0.60. Request item #WWFSGN240.

Onsite Sewage Treatment in California and the Progression Toward Statewide Standards
California Wastewater Training and Research Center; California State University at Chico
The regulation of onsite sewage treatment systems will be undergoing significant changes in California in the coming years. Recent legislation passed in 2000 mandated that the State Water Resources Control Board (SWRCB) develop and adopt statewide regulations. These are to be the first statewide regulations governing the use of onsite wastewater treatment in California. The purpose of this report is to provide some insight into the efforts to develop statewide regulations. A brief history of regulation in California is included. This CD-ROM is free of cost. Request Item #WWCDRG69.
Guidance for Evaluation of Potential Groundwater Mounding Associated with Cluster and High-Density Wastewater Soil Absorption Systems
Eileen Peoter; McCray, John; Thyne, Geoffrey; Siegrist, Robert; International Groundwater Modeling Center of Colorado School of Mines
Hydrologic evaluation of cluster and high-density wastewater soil absorption systems (WSAS) is important because it can help ensure a site has sufficient capacity to assimilate water in excess of natural infiltration. Insufficient capacity may result in significant groundwater mounding on low hydraulic conductivity lenses or elevate the water table. This report presents a methodology for evaluation and selection of investigative techniques of site conditions and other important issues facing WSAS. A flow chart and decision support tool are also provided, as well as characterization activities and modeling approaches for each level of assessment. This CD-ROM is free of cost. Request Item #WWCDRE46.

Integrated Risk Assessment for Individual Onsite Wastewater Systems
Daniel S. Jones; Efroymson, Rebecca A.; Armstrong, Anthony Q.; Muhlheim, Michael D.; Carnes, Sam A; Oak Ridge National Laboratory
The approach to risk-based decision making for individual, onsite wastewater treatment (OWT) systems provided a framework that integrates four different types of risk analysis: engineering, public health, ecological, and socioeconomic. Three stages of risk assessment were used to structure the framework, in addition to three example systems to represent categories of modern OWT systems. This report discusses each type of risk analysis, monetary costs, inequities of the costs/risks among members of the community, and the intrusiveness of regulatory requirements and management. This CD-ROM is free of cost. Ask for item #WWCDMG39.

Quantifying Site-Scale Processes and Watershed-Scale Cumulative Effects of Decentralized Wastewater Systems
Colorado School of Mines, Electric Power Research Institute, Systech Engineering, and Summit County Environmental Health Department; Colorado School of Mines, Electric Power Research Institute, Systech Engineering, and Summit County Environmental Health Department
The research described in this report was undertaken to enhance the quantitative understanding of site-scale processes affecting the performance of onsite wastewater systems (OWS), to develop modeling tools that can describe and predict individual system performance, and the cumulative effects of multiple systems on water quality within a watershed. The project included literature reviews and analysis, laboratory experimentation and field monitoring, development and refinement of mathematical models, and completion of site-scale and watershed-scale model simulations. This CD-ROM is free of cost. Request Item #WWCDRE45.

Wastewater Technology Fact Sheet: Aerated, Partial-Mix Lagoons
Office of Water; US Environmental Protection Agency
Partial-mix lagoons are commonly used to treat municipal and industrial wastewaters. A partial-mix system provides only enough aeration to satisfy the oxygen requirements of the system and does not provide energy to keep all total suspended solids (TSS) in suspension. Some solids in the partial-mix lagoons are kept in suspension to contribute to overall treatment. This allows for anaerobic fermentation of the settled sludges. Included in this fact sheet are applicability, advantages and disadvantages, design criteria, performance, operation and maintenance, costs, and references. The price of this fact sheet is $0.60. Request item #WWFSGN235.

Tribal Management of Onsite Wastewater Treatment Systems
Office of Water; U.S. Environmental Protection Agency
To protect public health and water quality, state and local governments across North America establish regulations for the safe and appropriate use of onsite wastewater treatment systems (OWTS). OWTS can provide effective sewage treatment if sited in suitable soils and constructed and operated properly. This guidance document is intended to help tribal nations determine what level of management or tribal regulation will work best to ensure public health and protection of the environment. OWTS (map, design, maintain, regulate) are outlined and explained in detail. The price of this fact sheet is $0.40. Ask for item #WWFSGN238.

Source Water Protection Practices Bulletin: Managing Septic Systems to Prevent Contamination of Drinking Water
Office of Water; U.S. Environmental Protection Agency
If improperly used or operated, septic systems can be a significant source of groundwater contamination that can lead to waterborne disease outbreaks and other adverse health effects. This fact sheet discusses ways to prevent septic systems from contaminating sources of drinking water. The cost is $1.00. Ask for item #WWFSGN237.
Many products. The guide may be downloaded via nsfc_productscatalog.htm. The NESC’s item number and title of the product you wish to order. To place an order...

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NESC Product Distribution Welcomes its Newest Staff Member

If you have contacted NESC in the last few weeks, you may have noticed a new voice on the line. That new voice is Tara Martin, the newest product distribution staff member. Tara joined our staff on June 8.

A Morgantown West Virginia native, she came to us from WVU’s Extended Learning where Tara assisted the Dean and helped students register for classes online. In May 2004, she graduated with a Journalism degree from WVU.

She loves spending time with family and loved ones. When asked what the best thing about her new position is, she responded, “The customers and my new employers are some of the nicest people I’ve met.”

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The Great Lakes are a unique and extraordinary natural resource—a national treasure for both the United States and Canada. Together, the lakes make up one-fifth of the fresh water on the earth’s surface. They provide drinking water, food, recreation and transportation to more than 35 million Americans.

But the Great Lakes have faced many serious environmental challenges. Since 1970, much has been done in attempts to restore and protect the lakes. EPA and nine other federal agencies administer some 140 programs that fund and implement environmental programs in the Great Lakes basin. Although there has been significant progress, the work of cleaning up the lakes and preventing further problems has not always been coordinated.

That prompted President Bush, in May 2004, to create a cabinet-level interagency task force and to call for a “regional collaboration of national significance.” After extensive discussions, the federal Great Lakes Interagency Task Force, the Council of Great Lakes Governors, the Great Lakes Cities Initiative, Great Lakes tribes and the Great Lakes Congressional Task Force moved to convene a group now known as the Great Lakes Regional Collaboration.

The collaboration includes the EPA-led federal agency task force, the Great Lakes states, local communities, tribes, nongovernmental organizations and other interests in the Great Lakes region. The collaboration has two components: the conveners—mostly elected local and regional officials—and the issue area strategy teams. The ambitious first goal of the Collaboration is to create a workable strategy within one year to restore and protect the Great Lakes.

**Conveners Meet**

The Great Lakes Regional Collaboration was officially launched with the first Conveners Meeting on Dec. 3, 2004, in Chicago. On this day, members of the President’s cabinet, the Great Lakes governors, the Great Lakes congressional delegations, mayors, and tribal leaders met and forged an intergovernmental partnership and officially voiced their support for a coordinated strategy to further protect and restore the Great Lakes.

About 400 regional leaders and stakeholders attended the Conveners Meeting. Commitment to the collaboration is expressed in the Great Lakes Declaration while the Framework for the Great Lakes Regional Collaboration defines the process for developing a Great Lakes restoration and protection strategy.

Collaboration partners have rallied around a shared vision of a restored, sustainable Great Lakes ecosystem. This has generated optimism and a spirit of cooperation. While the collaboration is a U.S. effort, its members will do everything possible to make sure the final plan synchronizes our efforts with those of our Canadian partners.

**Issue Area Strategy Teams**

Following the Conveners Meeting, the issue area strategy teams began their work. These eight teams were organized using priorities identified by the Council of Great Lakes Governors. The priorities are:

- Aquatic invasive species
- Habitat conservation and species management
- Near-shore waters and coastal areas
- Areas of concern
- Nonpoint sources
- Toxic pollutants
- Sound information base and representative indicators
- Sustainability

The teams are made up of subject-matter experts from many diverse backgrounds. There are more than 1,500 people from all levels of government, and nongovernmental organizations, working on the specific issues identified as crucial to the health of the Great Lakes ecosystem.

They are the working bodies responsible for drafting specific action items and recommendations to address the eight issues. As they focus on the respective conditions and tasks of each issue area, the teams have addressed the following overarching considerations and topics:

- Human health impacts and priorities
- Tribal interests and perspectives
- Research and monitoring

**Final Report Due by End of 2005**

In July 2005, the teams filed their first reports, listing key recommendations in all eight issue areas. This is the Collaboration’s first step toward putting a plan into action.

Five public meetings have been scheduled during a 60-day comment period to gain even more input on the July draft report. With this valuable public involvement, the teams will revisit their recommendations to ensure they are workable. By the end of 2005, the Collaboration will publish a final comprehensive action plan that will define specific actions to be taken, as well as the resources that can be brought to bear by all Collaboration members.

The goal is to begin implementation of the action plan promptly after its release.

For details about this regional collaboration, visit the EPA’s Great Lakes Web page at [www.epa.gov/grtlakes/index.html](http://www.epa.gov/grtlakes/index.html).
The National Environmental Services Center (NESC), part of the National Research Center for Coal and Energy located at West Virginia University, is accepting applications for a Program Coordinator–Technical Services. This position leads and manages all technical services required for grant and externally supported programs and projects, including the National Drinking Water Clearinghouse, the National Small Flows Clearinghouse, and National Onsite Demonstration Projects, as well as the West Virginia Technical Advisory Program, and the West Virginia Onsite Training Center. The NESC is federally supported with funds from the USDA, Rural Utilities Service, the U.S. EPA, other public and private organizations. This position oversees the work of engineers, information specialists, and administrative support staff, and interacts with federal, state, and local government officials, engineers, consultants and technical contractors, and others involved with providing technical assistance to small communities having water and wastewater treatment systems needs.

This position is responsible for operations and personnel management, performance monitoring, contractual reporting requirements, budget planning and management, and assisting with NESC’s program development activities.

Applicants should possess a Masters degree in civil/environmental engineering in the area of water systems technology or related fields suitable for small communities, sanitation, public health or related field, along with a minimum of 3 years’ related experience (doctoral degree preferred), demonstrated knowledge of water and wastewater treatment system technologies, their management and utilization, and the corresponding federal, state, and local regulations applicable to communities having populations of 10,000 or less. Extensive experience may be considered in lieu of an advanced degree. Professional license/registration/certification preferred. (Examples include: PE; PG; RS; REHS.) Engineer-in-Training (EIT) certificate or other qualifications making it reasonable to obtain a professional license within 3-5 years of employment will be considered. Equivalent professional certification/registration in related fields is acceptable. Operator licenses for wastewater and drinking water plant operations also preferred. To receive consideration, please submit a cover letter, resume, and names and contact information (including email addresses) of three references by September 30 to ResearchJob@mail.wvu.edu (list “Program Coordinator–Technical Services” in subject line). A detailed job description is available at http://www.wvu.edu/~research. Additional information describing NESC can be found at http://www.nesc.wvu.edu/. This announcement is available in alternative formats. Please contact the listing above for details. West Virginia University is an Equal Opportunity/Affirmative Action Employer.
Looking for information about wastewater collection, treatment, and disposal? The National Environmental Services Center (NESC) can help.

Through funding from the U.S. Environmental Protection Agency, NESC assists small communities (those with populations less than 10,000) with their wastewater-related needs. A nonprofit organization, we offer a wide variety of free and low-cost resources on such topics as:

- septic systems and alternative onsite and community wastewater treatment technologies,
- regulations,
- operation and maintenance,
- design and monitoring,
- strategies for managing small wastewater systems, and
- public education.

NESC helps homeowners, local and state government officials, renters, realtors, citizens’ groups, regulators, research scientists, educators, consultants, manufacturers, operators, contractors, and the general public. We produce two quarterly publications about wastewater treatment in small communities, the Small Flows Quarterly and Pipeline, which are free by request to U.S. residents. Our Web site at www.nesc.wvu.edu/nsfc/nsfc_index.htm hosts discussion groups on wastewater issues and provides information about conferences and events across the country.

In addition, NESC operates a toll-free technical assistance hotline available Monday through Friday, 8 a.m. to 5 p.m. Eastern Time. NESC provides outreach services through workshops, seminars, and conference participation. We have an inventory of more than 430 free and low-cost educational products about wastewater. NESC also offers information and assistance to small communities about drinking water and environmental training. Contact us today at (800) 624-8301/(304) 293-4191 for a free information packet.