Small Community Wastewater Solutions:

A Guide to Making Treatment, Management and Financing Decisions

Kenneth Olson
Bridget I. Chard
Douglas Malchow
Don Hickman

Small Community Wastewater Solutions:

A Guide to Making Treatment, Management and Financing Decisions

Kenneth Olson
On-Site Sewage Treatment Program
University of Minnesota Extension Service
Rochester, MN

Bridget I. Chard
Small Communities Project Coordinator
Pillager, MN

Douglas Malchow
Community Resources
University of Minnesota Extension Service
St. Cloud, MN

Don Hickman
Environmental Specialist
Initiative Foundation
Little Falls, MN

Acknowledgements

Funding

Partial funding for this publication was provided by a grant under the Federal Clean Water Act Section 319 from the Minnesota Pollution Control Agency to further reduce nonpoint source pollution.

Additional Funding from:

Minnesota On-Site Treatment Contractors Association

Univerisity of Minnesota Extension Service On-Site Sewage Treatment Program

Development and Technical Review

Sara Christopherson, David Gustafson, James Anderson, Roger Steinberg, University of Minnesota Extension Service

Jeff Freeman, Assistant Director , Public Facilities Authority, Minnesota Department of Trade and Economic Development

Richard Phalunas, Director , The National Environmental TrainingCenter for Small Communities and Small Flows Clearinghouse, West Virginia University

The McKnight Foundation (Initiative Foundation) and Laura Jane Musser Trust

Special thanks to community participants in pilot workshops, Blue Earth River Basin Initiative

Production Editor: Phyllis Wolk Unger, University of Minnesota
Copy Editor: Nancy Goodman
Graphic Design and Illustration: Jim Kiehne

Preface

In April 1997, the Environmental Protection Agency (EPA), in a report to Congress, acknowledged that decentralized (individual and small multiple household) wastewater treatment systems "can provide the treatment necessary to protect public health and meet water quality standards just as well as centralized (municipal) systems" in a cost-effective manner. Before then, on-site septic systems were generally thought to be inferior—a temporary solution until the large centralized systems reached everyone.

The EPA recognizes that, just like large municipal systems, small on-site treatment systems also need good planning and good management. In September 2000, the EPA released *Guidelines for the Management of On-site/Decentralized Wastewater Systems* [1] as a way to improve the management of all decentralized treatment systems. It has become imperative that all communities make sure that all wastewater is delivered to an effective treatment facility and that all facilities—including home septic systems—are well managed.

Minnesota has many thousands of communities—groups of homes—scattered across rural, forested and lake areas, all of which face the issue of providing good wastewater treatment to protect themselves and to meet current regulations. Many of these communities have small lot sizes, poor soil for treatment or both. Some communities are experiencing rapidly growing population while others are not growing or even declining. Property values range from a few thousand to well over a million dollars.

Seventy-three percent of households in Minnesota deliver their wastewater to a centralized municipal treatment facility. The remaining 27 percent treat their wastewater using an on-site sewage treatment (septic) system to recycle their water back into the natural environment. The percentage of new homes being served by on-site systems is growing. In Minnesota over 30 percent of all new homes built are using on-site systems to recycle their water. These are similar to national figures.

People often do not know what to do when they run into common wastewater treatment issues such as algae in the lake or bacteria in the drinking water. Community members need to be educated and prepared to make thoughtful and appropriate decisions about wastewater treatment. One goal of this publication is to help property owners become critical thinkers with respect to the information, concerns and recommendations that will surface as they begin the process of solving their wastewater problems. Another goal is to provide the tools small communities need to access this data and to make independent, informed judgments and choices.

Property owners need to identify current and incipient wastewater treatment problems, evaluate options, and make appropriate and informed decisions about financing, monitoring, operating and maintaining cost-effective sewage treatment systems in their community. This is not an easy, quick task. Read chapter one for a quick grounding in solving wastewater problems. Then chapter by chapter, here's what the people in your community will need to do.

---

[1] Guidelines for Management of On-site/Decentralized Wastewater Systems. September 2000. Environmental Protection Agency, Washington D.C. This can be downloaded from: www.epa.gov/OW-OWM.html/decent/downloads/guidelines.pdf

- **Work together to solve the community problem.**

  People can work together via a community process to identify wastewater problems. They must recognize that they need to make changes in human behavior to successfully implement their shared goals, such as providing effective and affordable wastewater treatment for the community. (Chapter 1)

- **Collect and interpret data and keep records.**

  The approach your community needs to take to wastewater treatment depends on the density of the population, soil conditions near the homes and the changes in density and population expected in the future. Communities must collect and interpret such information, understand what regulations apply and keep good records. (Chapter 2)

- **Learn about different kinds of treatment systems.**

  There are many types of treatment systems. A good treatment facility could be an individual on-site (septic) system, a multiple-household on-site (cluster) system, or a large collection/treatment (municipal) system. Learn the pros and cons of each so your community can make an informed choice. (Chapter 3)

- **Design a way to manage the treatment system.**

  Proper management is important to insure the long-term performance and cost effectiveness of the treatment system. Management of all wastewater treatment systems involves the monitoring, operation and maintenance of the system to prevent early failure. (Chapter 4)

- **Select an organizational structure.**

  Many landowners just want to get their system fixed and be done with it. However, when there are multiple landowners and properties involved, a responsible legal entity is usually needed to work on behalf of the community. Learn about your options. (Chapter 5)

- **Find a way to fund the project.**

  Appropriate funding of the initial capital investment and facility replacement over time, along with the costs of on-going operation, maintenance and administration, are important to successful wastewater treatment. This chapter covers funding mechanisms of many kinds. (Chapter 6)

- **Hire qualified professional help.**

  A key concern is how to pick a qualified consultant when outside help is needed. Guidelines for working with the many different professionals involved with wastewater treatment are provided. (Chapter 7)

- **Plan for a successful project.**

  Implementing a successful wastewater treatment plan is not easy. It requires commitment and endorsement from the entire community. In this chapter, all this information is brought together to focus on how to assure a successful outcome for a community wastewater project. (Chapter 8)

A Roadmap to Small Community Wastewater Treatment Solutions

Every community would naturally like to skip all of the struggle and go right to the solution, but it doesn't work that way. The process of finding a viable solution to a community wastewater issue can take several years from inception through implementation. Working through the steps stimulates the people in the community to learn, to understand and negotiate their differences, and to come to a conclusion that everyone can live with. Such a decision will ensure that your community's wastewater is adequately treated at a reasonable cost and will accommodate the plans of your community into the future.

Kenneth Olson

Bridget Chard

Douglas Malchow

Don Hickman

Tinytown map

Contents

Contents

Contents

Chapter 1

Wastewater Problems Are Community Problems

JIM KIEHNE

"On the other hand, just the mention of 'change' can bother some people."

"There never will be any more or any less water on Earth than there is right now. When wastewater receives inadequate treatment, the overall quality of the world's water supply suffers."

Pipeline, Fall 1999 (A newsletter of the National Small Flows Clearinghouse.)

Everyone generates wastewater. Typical residential water usage is from 75 to 100 gallons per person per day. Seventy-three percent of the population is connected to a centralized (municipal) wastewater collection and treatment system, while the remaining 27 percent uses on-site septic systems.

Water is not used up. When people are through with water it becomes wastewater—better known as sewage—that must be cleaned up before it is returned to the environment for reuse. In one way or another, all water is recycled. In the past, people had the idea that wastewater was something that could be disposed of—it would just disappear. This idea has caused many people to assume that when they dispose of the wastewater they also dispose of any problems or hazards related to it. Today we recognize that we must recycle water to maintain sustainable supplies of safe drinking water for future generations.

In order to clean up or treat wastewater for recycling, it is important to understand what wastewater contains, what problems it may cause, and what it takes to clean it up. (See Chapter 3 for more on these topics.)

Everyone must make sure that all wastewater is delivered to a good treatment facility and continue to see that the facility is properly managed.

Why We Need to Treat Wastewater

In addition to water that we want to recycle, wastewater contains pathogens (disease organisms), nutrients such as nitrogen and phosphorus, solids, chemicals from cleaners and disinfectants and even hazardous substances.[1] Given all of the components of wastewater, it seems fairly obvious that we need to treat wastewater not only to recycle the water and nutrients but also to protect human and environmental health.

Many people, however, are not very concerned about wastewater treatment until it hits home. They can ignore it until bacteria or nitrates show up in their drinking water, the lake gets green in the summer and the beach is closed, or the area begins to smell like sewage on warm days. Sometimes residents discover they can't get a building permit or sell their home without a septic inspection or upgrade, or they find out there is no room on their property for a new or replacement septic system. Often when one homeowner has a sewage treatment problem, others in the neighborhood have the same problem. People don't always talk to their neighbors about sewage problems for a variety of reasons, including risk of enforcement actions.

What Does It Take to Clean Up Wastewater?

Ultimately, people using water are responsible for treating and recycling their own wastewater. As individuals and members of a larger community, everyone must take responsibility for wastewater generated in their community. To protect the health of all, they must make sure that all wastewater is delivered to a good treatment facility and continue to see that the

facility is properly managed. Following this principle ensures that the wastewater will be recycled safely and at a practical cost.

People who live together in communities have to work together to address what matters to them—whether it is reducing violence, revitalizing a neighborhood or preserving environmental quality on a cherished lake. This process inevitably means building civic engagement among all of the members of the community. Community here is defined as "a group of people who share a common place (such as a rural community or common shoreline), experience or situation." They may live in a large city, small city, unincorporated small town, older development, subdivision or just a cluster of homes.

How Community Change and Responsibility Are Built

Often, to address what matters to them, community members need to make changes in the way they live, changes that will affect people's behavior today and also in the future. For example, a community organization might make it more difficult for teens to buy cigarettes, hoping that change will result in fewer smokers and thus fewer deaths. A lake association might offer a $10 rebate on every septic pumping receipt, hoping to encourage routine system maintenance and inspection.

When a community faces wastewater treatment issues, a successful outcome is often more dependent on the process the community follows to address the issue than it is on the sewage treatment technologies available to them. A key factor that affects community change is whether or not the members share a community vision and have a clear mission. Other factors that can greatly influence how change happens are having and following an action plan, encouraging new leaders and initiatives, locating needed technical and financial resources, and taking time to document successes and reward participants. Because these factors are so important, each is discussed more below.

"We don't manage natural resources, we manage human behavior. The resources will take care of themselves just fine. It's the human influence we interject on the resources that causes the problem."

—John Sumption,
Cass County Water Planner

Key Factors in Community Change [2]

● Shared vision and clear mission

Initiatives with a clear and specific focus, such as increasing the number of compliant septic systems or restoring a certain shoreline to native species, bring about much higher rates of change than broad "healthy communities/healthy lakes" efforts that don't have a targeted mission and objectives. While the mission should be specific, it should not get hung up on the mechanism for implementation. An appropriate mission would be "to provide effective, functioning, and affordable wastewater treatment for the entire community," rather than specifying a certain *type* of treatment facility. People will be willing to act on a vision only to the extent they feel ownership of its content.

● Action planning

Identifying specific community changes (new or modified programs, policies and practices) may be the single most important thing you can do. To be most effective, action steps must identify who will implement and who will track and monitor progress, and specify a reasonable and honest timeline and budget. Turning the plan into reality through action is critical; if the plan sits on a shelf, energy that could be channeled into action will instead become cynicism.

● Leadership

A change in leadership can dramatically affect the rate of change brought about by a community group. Nurturing diverse leadership and encouraging new leaders and initiatives is invaluable for avoiding substantial loss of momentum. Excluding members of any constituency because of their position on an issue, economic status, education, race, age, geography or any other factor will greatly weaken project credibility and its mandate in the entire community. Leaders with skill in effective, two-way communication and conflict management get at the core of community building work.

● Resources

Nothing can be more frustrating than knowing what you want, why it is important and how to get it, but not having the resources to get it done. In addition to financial assistance, technical assistance is invaluable for identifying practical and realistic goals, and may provide the added benefit of someone who knows how to find funding or professional help. Learn from the successes of all community members; local knowledge is often the most practical kind!

● Make the outcomes matter; provide incentives

Recognize people who are helpful, who give of their time and heart to community concerns. Celebrate successes frequently, and take the time to thank everyone who has contributed. Documenting successes helps focus attention on what you are most effective at, and is a form of recognition and reward to the participants. Some actions may not provide the outcome you had hoped for, but recording these efforts helps future leaders learn from your experiences.

Gaining Community Endorsement

How hard can it be to achieve community endorsement? Success depends on the level of connectedness people feel with their neighbors. If people know, respect and trust each other, they can build bridges that transcend economic, educational, ethnic or other differences. Conversely, few people respond well to the best-intended efforts of others when they perceive that the message is, “We’re here to help, this is what we are going to do to you, and the bill will arrive shortly.”

Finding an appropriate technological solution to a community’s wastewater problems is the easy part. Working together as a community to do so is what is challenging. To be sure all community members feel adequately represented and fairly treated regardless of the choices made along the way, the process needs to involve the steps outlined below. (See Chapter 8 for more on bringing about community change.)

● Form a steering committee

While community-wide participation and endorsement is critical, a steering committee will be needed to do much of the work of assessing community needs, talking with resource people, developing consensus and implementing action steps.

● Develop a community vision

Hold a community meeting to help identify the positive values the community wishes to preserve, making a sincere effort to recognize the values and concerns of everyone. You need an unbiased assessment of your community's existing assets before you make decisions.

● Develop a work plan

The work plan identifies goals and specific actions you need to take. It describes steps that are practical and measurable, responsibility for each step, a timeline, criteria for making decisions and measuring success and a budget.

● Keep everyone informed

For people not actively involved in the project, progress often appears slow. It is vital that you take every opportunity to keep the community informed of progress and decision opportunities.

● Implement and evaluate

The steering committee is responsible for ensuring that progress is made, time and money are invested responsibly and action steps are implemented. Integrate evaluation tools into your action steps so you can recognize mistakes early, learn from them and not lose significant momentum.

Solutions to wastewater issues are more dependent on the community's process (people) than on the science and engineering (technology) available.

Why Some Communities Succeed

Many communities have successfully solved wastewater issues while others have been polarized and derailed. Unsuccessful outcomes often result from failure to understand the concerns and priorities of all community members. No one wants to consume drinking water contaminated with fecal material, but a resident already struggling on a fixed income may feel that "the water hasn't killed anyone yet," especially if a new treatment facility is likely to substantially increase utility bills.

Some people may view the community engagement process as pandering to political correctness—an unnecessary step that delays the engineering discussions and technological solutions. But ignoring *citizen involvement* will frequently result in considerably greater delays, more resentment and a much weaker consensus as to the best resolution. It's important to recognize that solutions to wastewater issues are more dependent on the community's process (people) than on the science and engineering (technology) available.

Citizens of communities that succede . . .

- Clearly understand their current situation ***before*** they start looking for solutions.
- Know that only they can make the best decisions for their community.
- Take responsibility for and ownership of the problem.
- Have or develop members with strong leadership abilities.
- Have a clearly defined vision and mission and set appropriate goals.
- Take the time and energy to identify and examine all options before making decisions.
- Gather information from as many sources as possible before taking action.
- Keep all affected parties involved and informed all along the way.
- Identify criteria for making decisions and use all identified criteria.

Characteristics of Successful Communities

Communities that are successful in finding a viable solution to their wastewater issues have several distinguishing characteristics. The list at left details some of these.

Communities are less successful when a small group makes the decisions and expects everyone to agree (and pay the bill), and/or the community lets engineers, consultants or funding sources dictate their choices.

These unsuccessful communities frequently end up in disarray, with people disliking their friends and neighbors because of their position on the issue. Many elected officials end up "un-elected" even when they have tried to do their best—and the original wastewater problem continues.

Making the Process Work for Your Community

To implement a community process that will be able to move the project all the way to completion, the steering committee must work with the entire community, including those who have the legal authority to make official community decisions. The entire process, from start to finish, may take three to seven years. You will go through five distinct phases, which are discussed more fully in Chapter 8.

- Understanding the situation and defining the problem
- Exploring the options for treatment, management, organization and funding
- Sorting through the options and making decisions
- Implementing the decisions—making final plans and constructing the treatment system
- Managing the treatment system—operating and maintaining the treatment system

Making Change Go Smoother

Making decisions about a basic community infrastructure need, such as wastewater treatment, is usually difficult when it represents a significant change from the way things have been done in the past. People will work together when there is an issue that matters to them. If they do not think it concerns them, they will resist any change, especially when there is a

big price tag. This is especially true when the local government unit has never dealt with wastewater issues.

Preparing a citizen-based group to address wastewater issues helps the decision-making process go smoother. The result will be a more viable solution that is a socially, economically and environmentally responsible method to safely recycle the community's wastewater.

The entire process, from start to finish, may take three to seven years.

References

1 "Basic Wastewater Characteristics," *Pipeline,* Fall 1997: 8(4). National Small Flows Clearinghouse, West Virginia University.

2 Adapted from *Five Key Points,* The Initiative Foundation, Little Falls, MN.

Resources

The Initiative Foundation

405 First Street SE
Little Falls, MN 56345
(320) 632-9255

The Initiative Foundation is a private nonprofit philanthropic organization that supports projects that create healthy communities in a fourteen county area (Benton, Cass, Chisago, Crow Wing, Isanti, Kanabec, Mille Lacs, Morrison, Pine, Sherburne, Stearns, Todd, Wadena, and Wright Counties). Through the Healthy Communities, Healthy Lakes & Rivers, and Healthy Organization Partnership programs they have developed many training materials to foster inclusive, intergenerational, asset-based, sustainable development. For additional information on these programs, visit www.ifound.org.

Minnesota Department of Health publications:

- Bacterial Safety of Well Water – IC# 141-0108
- Nitrate in Drinking Water – IC# 141-0107
- Sealing Unused Wells – IC# 141-0434
- Protecting Your Well – IC# 141-0155

Order from Minnesota Department of Health, Division of Environmental Health, Well Management Section, 121 East Seventh Place, Suite 220, PO Box 64975, St. Paul, MN 55164-0975. Call 800-627-3529 or visit www.health.state.mn.us

Minnesota Pollution Control Agency publications:

- Why Treat Sewage

Order from Minnesota Pollution Control Agency, 520 Lafayette Road N, St. Paul, MN 55155-4194. Visit www.pca.state.mn.us or call the ISTS Information Line at 651-282-6246; to speak to a district representative call 800-657-3864.

National Small Flows Clearinghouse publication:

- "Basic Wastewater Characteristics," in Pipeline, Fall 1997: 8(4).

Order from National Small Flows Clearinghouse, West Virginia University, PO Box 6064, Morgantown, WV 26506-6064; phone (800) 624-8301 or visit the web site: www.nsfc.wvu.edu

North Central Regional Center for Rural Development

Iowa State University
107 Curtis Hall
Ames, IA 50011-1050
Phone (515) 294-3180
www.ncrcrd.iastate.edu

The North Central Regional Center for Rural Development workbook, Vision to Action: Take Charge Too, is an outstanding guide to community development practices and can be ordered for $25.

The Sustainable Lakes Planning Workbook: A Lake Management Model,

This book was developed by the Minnesota Lakes Association in cooperation with the University of Minnesota Center for Urban and Regional Affairs. Chapter 1, "Initiating Support for the Planning Process," covers stakeholder identification, choosing a planning method, developing plans and maintaining momentum. The entire document can be downloaded in PDF format from the MLA web site: www.mnlakesassn.org

University of Kansas Website Community Toolbox: Bringing Solutions to Light

http://ctb.lsi.ukans.edu/tools

This is an outstanding website listing detailed tools, strategies, and examples of successful community organization and leadership.

University of Minnesota Extension Service Publications:

- Groundwater Contamination #05866
- Our World of Water #00328

Order from University of Minnesota Extension Service Distribution Center, 405 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108; 800-876-8636; or from your county extension office. For more information visit www.extension.umn.edu

Chapter 2

What You Need to Know Before You Study Options

"Bob, the county's here. Some kind of sewer survey."

If you don't know where you are and what you have to work with, how will you know where you want to be and how to get there?

Before your community can begin to review wastewater treatment options, the steering committee needs to assemble a wide array of information that will help everyone better understand the situation and present this information to the community. Committee members or other volunteers will need to work with local units of government (LUGs) and other organizations to assemble that information. This chapter discusses some of the information you will need and where that information might be found. Just as the sewage treatment situation varies a great deal from community to community, so too does the information communities need to make an informed sewage treatment decision. Therefore, the suggestions in this chapter should be viewed only as a starting point: all the information discussed may not be necessary in every situation and, in some cases, information other than that discussed here may be necessary.

Just as the sewage treatment situation varies a great deal from community to community, so too does the information communities need to make an informed sewage treatment decision.

Once the information is gathered, steering committee members, resource people and other key members of the community will need to take a hard look at the data to determine what it all means. Transformation of the raw data into useful information lets the community gain a clearer understanding of what's happening today and what's likely to happen in the future. This provides a better sense of direction as the project proceeds.

An assessment of existing community assets and trends that will affect the community in the future should be presented at an initial town meeting (see Chapter 8). It is important that the information presented be unbiased and give a complete picture. The critical nature of this step is suggested by this question: If you don't know where you are and what you have to work with, how will you know where you want to be and how to get there?

Gathering the Data: Types and Sources

Each entry below lists the type of information that may be necessary, where that information may be found and the reason the information may be useful in the community's decision-making process.

Local Regulations

● Comprehensive land use plan

County Environmental Services office or County Planning and Zoning office.
A comprehensive land use plan provides the broad framework and vision of how the community and its citizens intend to respond to and manage change. The plan provides the legal basis and initial tools needed to manage land use, environmental quality, resource preservation and utilization and sustainability within the county. This information is critical to water and wastewater issues because it provides the vision for future population density and growth potential. It must be noted that the plan may change, subject to changes in political control and future desires of citizens.

● Sanitary ordinances

County Environmental Services or Planning and Zoning or Public Health offices.
Sanitary ordinances are the rules used by a LUG to regulate the design, and other requirements, for individual or multiple-household wastewater treatment facilities. They may also determine what level of risks associated with wastewater facilities will trigger legal action, for example, enforcement of "imminent threat to public health or safety" laws.

● Shoreland regulations

County Environmental Services or Planning and Zoning or Land Management offices.
These regulations, as established by the state of Minnesota, regulate wastewater and other activities within 1,000 feet of lake shorelines and 300 feet of riverbanks. They become critical in shoreland communities and are enforceable by LUGs or the Department of Natural Resources (DNR).

● Zoning ordinances

County Environmental Services or Planning and Zoning or Land Management offices.
Zoning ordinances establish specific guidelines for the types of land uses allowed and the density at which development can proceed. Both factors may influence the size and type of sewage treatment options the community needs to consider. Although State Code 7080 sets the rules for on-site sewage treatment systems, local ordinances, such as performance code systems, may vary from them to allow for local conditions and make special provisions for less common types of wastewater treatment facilities.

Physical Geography Data

● Temperature and precipitation

County Soil Survey, County Soil and Water Conservation District (SWCD), Natural Resources Conservation Service (NRCS) field offices or the Minnesota Climatology Home Page at http://climate.umn.edu.
Design and management of large surface area systems need to take into account precipitation patterns and totals as well as seasonal management practices related to freeze dates.

● Soil temperatures/depth of frost/snow cover

Minnesota Climatology Home Page at http://climate.umn.edu.
Depth of frost, which is the critical soil temperature value, varies annually and geographically based partly on snow cover. These variables may influence not only the depth of system components but also the type of system installed.

● Wildlife habitat potential

County Soil Survey, SWCD or NRCS field offices.
Soils affect the kind and amount of vegetation that is available to wildlife as food and cover. They also affect the construction of water impoundments. Wildlife potential should be considered in the placement of treatment systems.

● Native plant and animal species

DNR Biological Survey; DNR regional offices or website at http://www.deli.dnr.state.mn.us.
This information may suggest that certain areas are not suitable for some components of systems because of protected plant or animal species or critical habitat.

● Building site suitability

County Soil Survey, SWCD or NRCS field offices.
Soil type influences the kind of buildings that may be put on a parcel. Some sewage treatment facilities may require the construction of buildings.

● Sanitary site suitability

County Soil Survey, SWCD or NRCS field offices.
Soil type and hydrology (water tables) influence the degree of water absorption and soil treatment effectiveness, therefore limiting the placement of absorption fields and sewage lagoons.

● Topography

County Soil Survey, SWCD or NRCS field offices, or DNR Data Deli at http://www.deli.dnr.state.mn.us.
Elevations are critical in determining whether gravity or mechanical movement of wastewater or effluent will be used in treatment systems. Topography is a critical factor in the amount of disturbance required to install collection systems.

● Wellhead Protection Areas

Minnesota Department of Health (DOH) state and regional offices, or the DOH website at http://www.health.state.mn.us
This DOH program, sometimes referred to as a "source water protection program," is designed to preserve and protect public drinking water supplies. All potential groundwater contamination sources, including wastewater treatment facilities within a Wellhead Protection Area, may be subject to special provisions, regulations or management practices.

● On-site suitability characteristics survey

SWCD or NRCS.
County joint powers engineers can, in some cases, visit the site to do an initial engineering study to ascertain the suitability of a site for sewage treatment options (depending on workload).

Community-wide Data

● Parcel ownership

County Recorder's office.
Individual parcel owners should be contacted not only to let the owners know that sewage treatment discussions are taking place, but also so the planners can acquire information needed in the decision-making process.

- **Current sewage treatment method by parcel**

  County Environmental Services or Planning and Zoning. These records can provide valuable information about the age, design (type, size, location, etc.), soil conditions and history of repairs for individual systems within the community. (Availability of this information may vary greatly from county to county.)

- **Sewage treatment Certificates of Compliance**

  County Environmental Services office or Planning and Zoning. Certificates are frequently required when property changes hands or building permits are required. Compliance inspections are usually good for one to three years. Current certificates may provide information on the condition of the system and alleviate the need to do another inspection. (Availability of this information may vary greatly from county to county.)

- **Septic pumpers' records**

  County Environmental Services or Planning and Zoning or local contractors. These records may provide information on the current condition of the system. (Availability of this information may vary greatly from county to county.)

- **Current community demographic information**

  Office of Minnesota Planning. Steering committee members will need to acquire community demographic information (age groups, income levels, housing stock, ethnicity, etc.) for use in the grant writing process and for assessing the community's ability to pay for sewage treatment facilities.

- **Future community demographic projections.**

  Office of Minnesota Planning (possibly from the Comprehensive Plan). Future conditions such as projected population growth or decline, aging trends or changing income levels may influence the size of a sewage treatment project and the community's ability to pay for the project.

- **Sewage treatment plants in neighboring communities.**

  City administrator, mayor or council member. It is important in assessing the options to know the age, treatment method used, current capacity and future plans for all potential neighboring communities. This also lets other communities know that you are working on your wastewater treatment issue.

Collect only information the steering committee deems necessary.

Individual Community Member Data

This information is probably best gathered through a mail, telephone or in-person survey. Several examples of surveys are included in Appendix A. The examples given should be adapted to suit your community's situation. Collect only information the steering committee deems necessary. Collecting more data than you need wastes the time and energy of both the resident and committee member. This information is valuable for determining the potential life of existing systems and the future needs of residents.

Interpreting the Data: What Does It Tell Us?

It is essential that the data collected be turned into information that is useful to the steering committee, to professionals working with the community and to potential outside funding sources. The steering committee and key resource people do this by carefully going over all the data they have collected to determine what it means to each of them. Many LUGs and agencies have Geographic Information System (GIS) capabilities that could be very useful if you see the need to layer sets of information about your community.

Community members will better understand and take future ownership in the project if they are involved in collecting and interpreting the data.

The interpretation step requires a focused, well-facilitated meeting (perhaps more than one meeting) because the results are critical to the rest of the project. Community members will better understand and take future ownership in the project if they are involved in collecting and interpreting the data. The steering committee needs to present the information collected and what that information means to community residents and to listen to concerns and interpretations. Be sure to record all of the interpretations and identify those with total group consensus. This prepares the community to evaluate all of the treatment, organizational and management options available to them (as discussed in Chapters 3, 4 and 5).

It is highly likely that you will find additional information is needed as you go along. This information should be communicated to the residents and other interested parties (for example, township and county officials) on an on-going basis.

Things to Remember

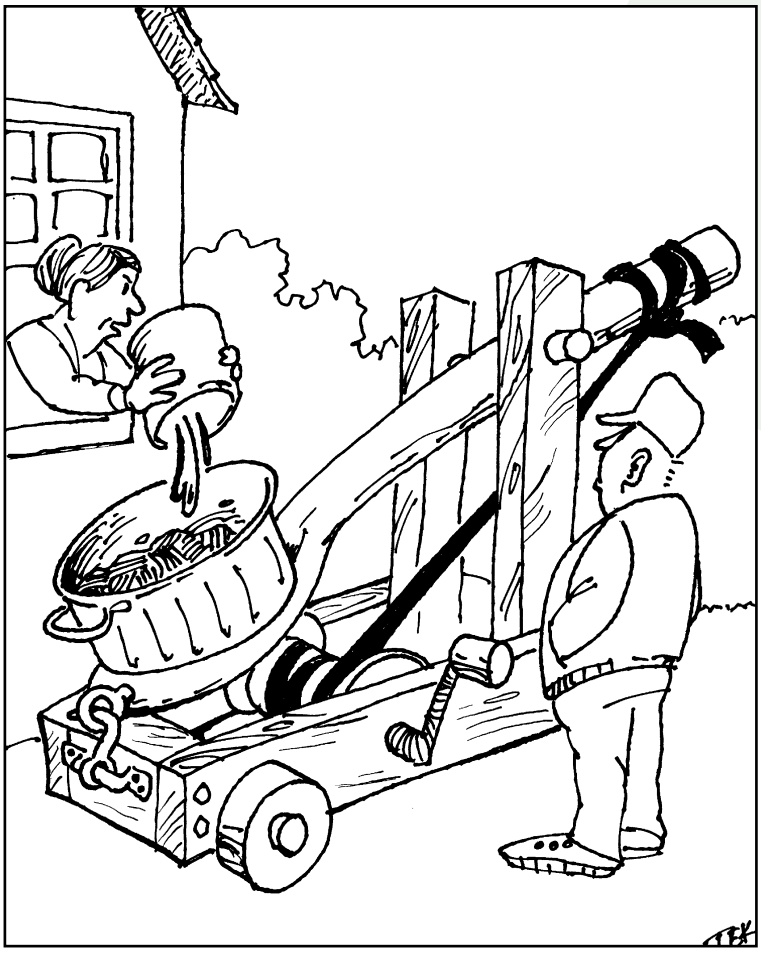
Without a good base of information, it is difficult to make an informed community decision. Resolving wastewater issues in an existing community can be extremely frustrating and time-consuming without complete background and physical properties information.

Every piece of information discussed above may not be necessary in every situation and, in some cases, information other than that listed above may be required. After discussing your community's situation, determine what kind of data you need. Assign specific pieces of this data collection step to several individuals. Resist hiring a consultant or engineer to do this because it can be very expensive and the information you get may be biased.

Many kinds of information are readily available, but the sources and completeness of the data will vary from county to county. It is up to each community to collect and interpret the data. This information and your interpretations are the basis for evaluating options and making decisions throughout the balance of the process.

Chapter 3

Sewage Treatment System Options



JIM KIEHNE

"Fred, I really don't think this is what they meant by a centralized collection system!"

"Both centralized and decentralized system alternatives need to be considered in upgrading failing (wastewater) systems to provide the most appropriate and cost-effective solution to wastewater treatment problems."

EPA Response to Congress on Use of Decentralized Wastewater Treatment Systems April 1997

This chapter reviews why it is important to understand what wastewater contains, what problems it may cause, and what it takes to clean it up for recycling.

A viable system or systems for responsible community wastewater management must provide effective and manageable treatment at a reasonable cost. To accomplish all of these goals, each community needs to evaluate all of the treatment options available. This will require a lot of diligence on the part of community residents and likely they will have to acquire a significant amount of information from outside sources.

What's in Wastewater?

The most critical component of wastewater is pathogens, or disease-causing organisms.

Wastewater contains a lot more than water. Its components fall into five categories:

- Pathogens (disease organisms)
- Nutrients (nitrogen, phosphorus and micronutrients)
- Solids (organic and inorganic)
- Chemicals
- Water

Pathogens

The most critical component of wastewater is pathogens, or disease-causing organisms. These include viruses, protozoans and bacteria shed by the human body and found in wastewater from all sources in the house. Water containing these pathogens becomes a public health issue and presents a risk of spreading disease. Fecal coliform bacteria are pathogenic organisms that are an indicator for the presence of other pathogens in wastewater. They are residents of the human intestinal tract and are also fairly easy to test for. A typical concentration of fecal coliform bacteria in wastewater from a residence is 1-10 million cells/100ml; the concentration leaving a septic tank is typically 1 million cells/ml. [Note: A summary of scientific abbreviations and measuring units is included in Appendix H.]

Nutrients

The second most critical component of wastewater is the many macro- and micronutrients that enter wastewater via food particles, human excretions, cleaners, personal-care products and other materials. The nutrients of primary environmental concern are phosphorus and nitrogen.

● Phosphorus

Phosphorus is a macronutrient essential to all plant and microorganism growth. Phosphorus (P) is the most limiting nutrient to the growth of plants and algae in Minnesota lakes and streams. Any additional source of phosphorus to a lake or stream in Minnesota will foster the growth of additional algae and plants. The typical Minnesota household wastewater contains from 4 to 15 pounds of phosphorus in one year. In a properly functioning septic system, P is tightly held by soil particles.

● Nitrogen

Nitrogen is another macronutrient essential for plant and microorganism growth. Nitrogen (N) is present in wastewater in four forms: organic N, ammonia, nitrite, and nitrate. As the ammonia form of N moves through a treatment system it changes to the nitrate form. It is possible in some treatment systems for nitrogen to change to nitrogen gas and be lost to the air (our air is 82 percent nitrogen), but in most systems the nitrogen ends up as nitrate. Nitrates at high levels (over 10 ppm) in drinking water can be toxic to infants under 6 months, causing methemoglobinemia or "blue baby syndrome." Ammonia in surface waters can be toxic to fish.

● Micronutrients

Micronutrients such as mercury, zinc and many others are present in very small quantities in most residential wastewater. They come from products such as hair dye, makeup, alloys (worn off tools) and cleaning products. Other micronutrients are vitamins and minerals present in the food we eat.

Solids

The majority of the solids entering the residential wastewater stream are organic.

● Organic solids

Organic solids include food particles, fats, oils, greases, human feces, hair, toilet paper and other substances. The concentration of organic matter in wastewater is measured by the biological oxygen demand (BOD) value. BOD measures the amount of dissolved oxygen the microorganisms require to oxidate or decompose the organic matter in the wastewater. The typical concentration of BOD in untreated household wastewater is from 270 to 400 mg/l.

● Inorganic solids

Inorganic solids entering the wastewater include soil from washing hands and clothing and components of cleaners (carriers in detergents). These solids are separated from wastewater in the treatment process by settling or floating. They cannot be oxidated or decomposed by bacteria, so they are stored until the tank is cleaned (pumped).

BOD and TSS are the most widely used indicators of the "strength" of the wastewater.

The solids, organic and inorganic, that remain suspended in the liquid effluent leaving a septic tank or initial treatment process are measured as total suspended solids (TSS). A typical TSS value leaving a septic tank is 65 mg/l. BOD and TSS are the most widely used indicators of the "strength" of the wastewater. A low value is better.

Chemicals

The residential wastewater stream also includes nonhazardous products used in homes to clean fixtures and people, such as soap, detergent, shampoo, toilet bowl cleaners, bleach, drain cleaners and salt from water softeners. Many of these products are disinfectants and can have harmful cumulative affects on people or treatment systems when used in excessive amounts. Medications are another kind of chemical that enter our wastewater stream: unwanted medications should never be disposed of in a septic system. Hazardous chemicals also get into wastewater: paints, paint thinners, antifreeze and large amounts of chlorine-treated water will cause problems in treatment facilities.

A family of four is likely to generate over 300 gallons of wastewater per day.

Water

By far the largest part of the total volume of wastewater generated is water. The typical Minnesota resident (adult or child) uses an average of 75 to 100 gallons of water per day. This quantity amazes most people until they start to think about how much water is used for laundry, dish washing, bathing and toilet flushing. This means that a family of four is likely to generate over 300 gallons of wastewater per day—not including lawn watering and other outdoor water uses!

The water is, of course, the component of the wastewater we want to reuse. However, the nutrients and organic components removed from the water during treatment can also be valuable resources provided they can be delivered to the right place for reuse (for example, N and P are valuable as plant food for crops and lawns).

Evaluating Treatment Facility Options

Many small communities begin the process of addressing their sewage treatment needs by thinking that all they will need to do is find the "recommended" treatment option and install it! However, what they quickly find out is that numerous treatment technologies are available to small communities and that each technology has its advantages and limitations. ***There is no one recommended treatment technology that meets the specific conditions and treatment objectives of every community. To choose the right treatment technology, a community must evaluate many factors.***

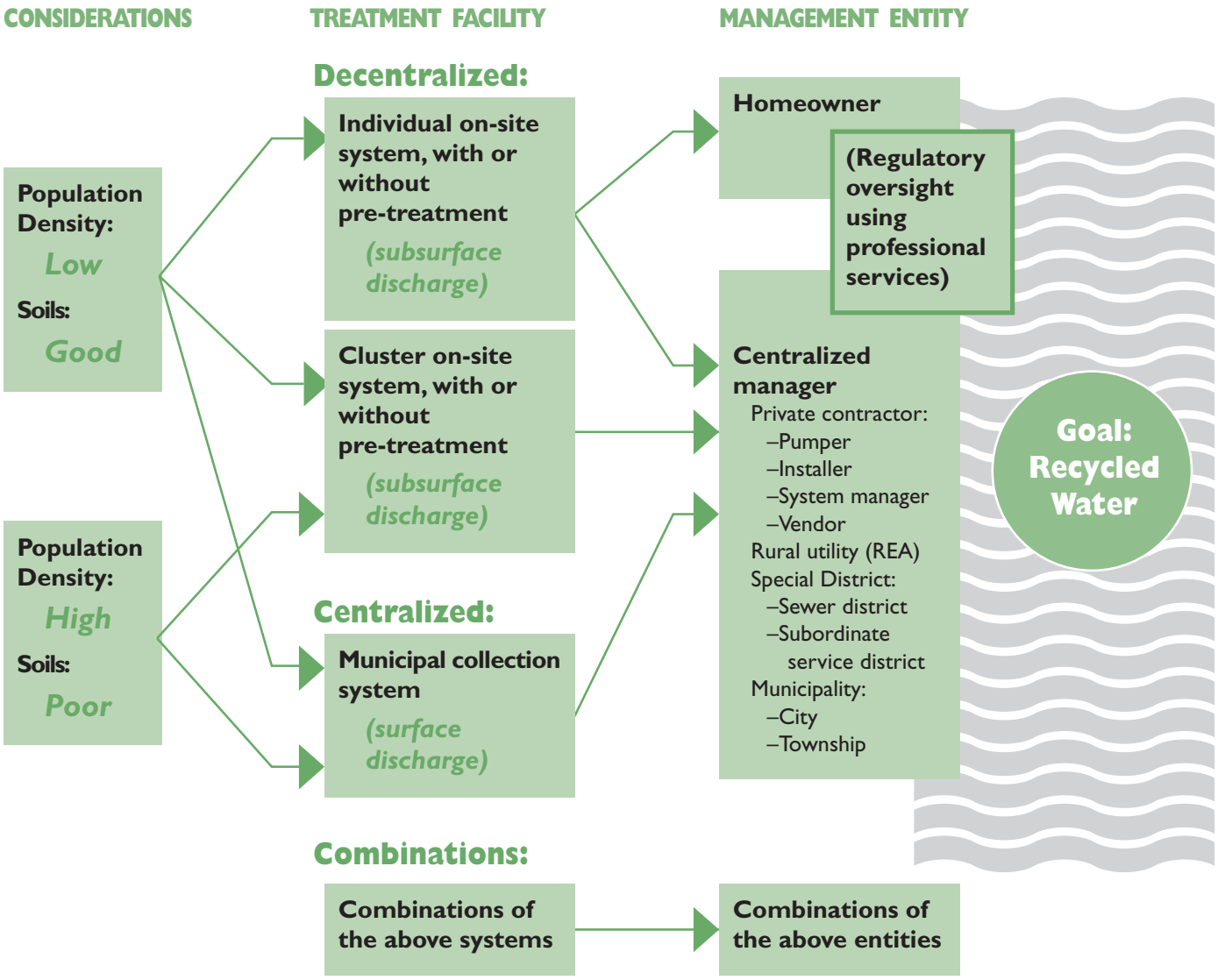
- **Regulatory requirements.** Local, state and national treatment standards; county or local land use plans and ordinances.
- **Community characteristics.** Population trends, location and distribution of customers, desired character of the community (rural, urban, open space, etc.).
- **Physical conditions.** Topography, soil conditions, spaces available, surface and groundwater conditions, quality and quantity of wastewater generated, climate, condition of existing systems, esthetics and appearance.
- **Financial factors.** Capital costs, operation and maintenance costs, community income levels, financial reserves and capacity.

Individuals and communities are responsible for seeing that all wastewater is delivered to an adequate and well-managed treatment facility. In addition to water being discharged, all systems must also properly recycle residuals or solids removed in the treatment process.

General system concepts

Depending on the population density (property sizes) and soil conditions, treatment systems follow one of two general concepts: *decentralized and centralized.*

Responsible Management of Wastewater



● Decentralized concept

—Individual on-site systems
—Multiple-household on-site systems (cluster systems)

Both use standard or alternative technologies with or without pretreatment processes with subsurface discharge and reuse on site.

● Centralized concept

Use municipal style collection and centralized treatment with surface discharge.

● Combination of concepts

A combination of centralized and decentralized approaches is frequently found to be the most viable solution . Such a combination may use two or more of the above options.

Decentralized On-site Treatment Options [1]

Individual and small multiple-household soil-based treatment systems with subsurface discharge are frequently referred to as *decentralized* or *on-site systems*.

Numerous treatment technologies are available to small communities, and each technology has its advantages and limitations.

Individual on-site systems need adequate space (low overall property or population density) and appropriate soil to facilitate treatment. An exception is a totally self-contained water reuse system. There are many treatment options for individual properties.

Multiple-household on-site systems collect wastewater from a small number of homes (two to several dozen) and deliver it to a nearby site with adequate soil conditions to facilitate soil-based treatment and dispersal. They are called on-site systems because they use the same soil-based treatments with subsurface discharge as individual homeowner systems and they treat relatively low volumes of wastewater. A community water supply system is an alternative you should consider if your community is also looking at a multiple-household wastewater system as part of the solution. This option may offer the advantage of lower capital investment costs and reduce the potential for negative impact on a multiple-household on-site treatment system from poor home management practices of the individual homeowners.

On-site treatment options available for individual or multiple-household (cluster) systems fall into two general categories, *standard* and *nonstandard*.

● Standard systems

Standard designs based on vast research and experience are prescribed by code to be used for reliable treatment of residential wastewater. These systems are installed in original soil with a minimum of three feet of vertical separation to a restrictive layer (groundwater, bedrock, hardpan, etc.). They also receive normal household strength wastewater with maximum effluent qualities of 220 mg/l BOD, 65 mg/l TSS and 30 mg/l oil and grease. Standard systems include:

Septic tanks separate the solids from the liquids and decompose organic solids.

Soil treatment (drainfield) systems destroy pathogens and remove nutrients.

—***Trench:*** Series of shallow, narrow trenches using one of three distribution methods:

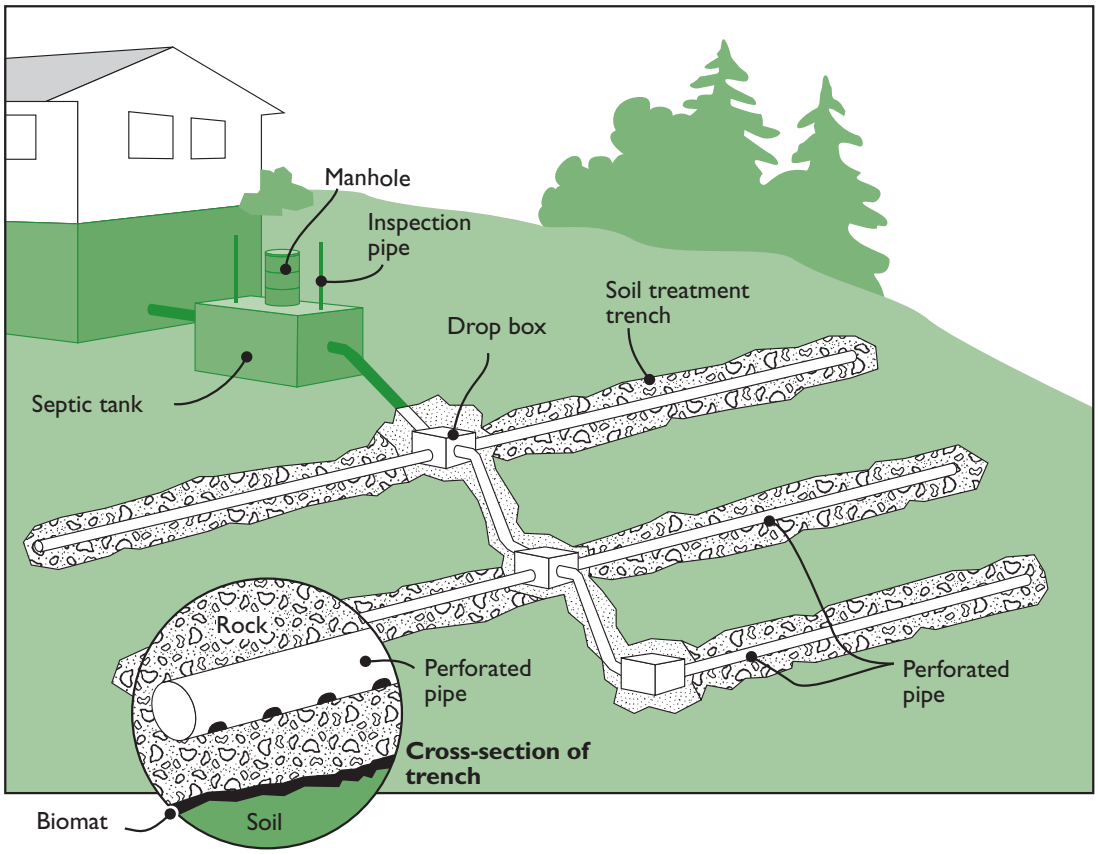
1) perforated pipe;
2) large perforated pipe (gravelless); or
3) half-round chambers.

—***Mound:*** Seepage bed elevated above ground with clean sand to provide three feet of vertical separation to saturated restrictive layer.

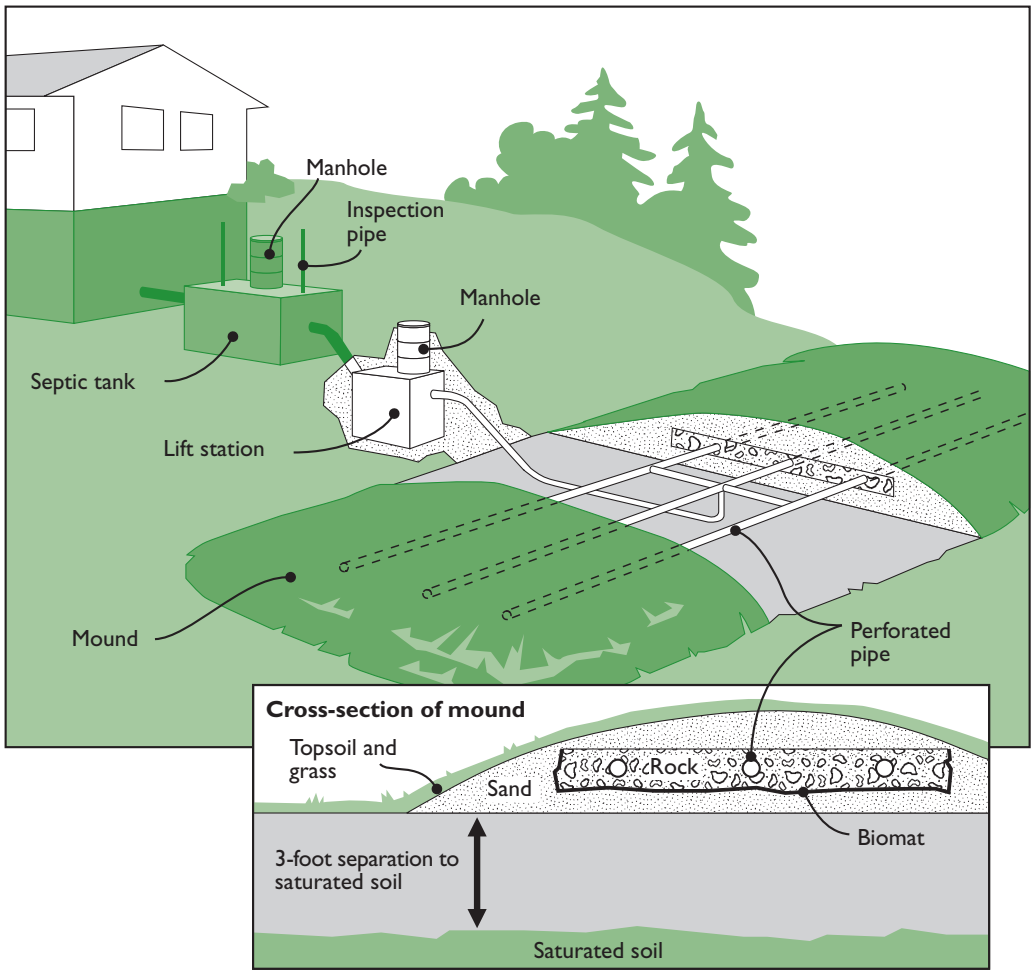
—***Bed:*** Similar to a trench but wider than three feet.

—***At-grade:*** Seepage bed constructed on the surface of original soil covered with sandy fill.

Standard trench system

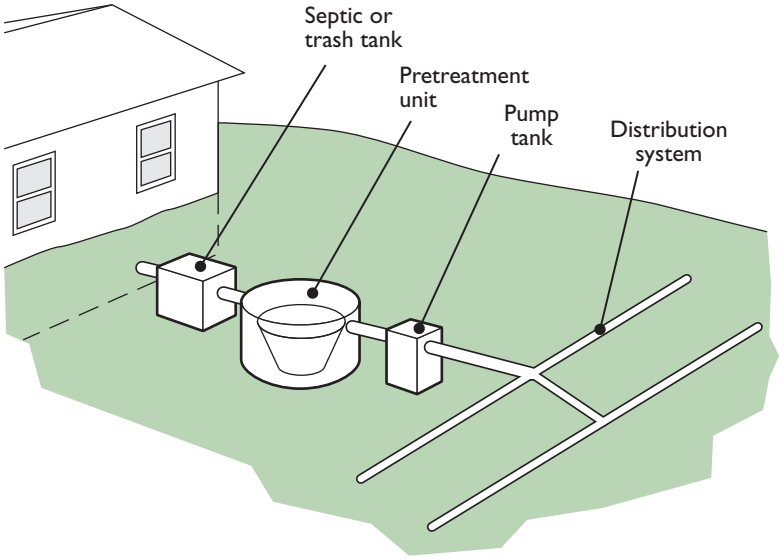


Standard mound system



● Nonstandard, or alternative, systems

Nonstandard designs add to or replace components in a standard system. They are designed to achieve the same basic treatment goals of standard systems, but may be used to meet individual site challenges such as high groundwater, small property size or sensitive conditions. They may be designed to give longer system life or have other treatment objectives such as increased N removal. There are three categories: *pretreatment, final treatment* and *dual systems*.



Pretreatment

Pretreatment adds a step between the septic tank and soil treatment/dispersal system. This additional process is expected to deliver a higher quality effluent (lower BOD, lower pathogen content, etc.), thus requiring less treatment from the final treatment/dispersal component of the system. This may allow the soil unit to be downsized, require less vertical separation or last longer. Several types of pretreatment units are discussed below.

—***Single-Pass Sand Filters:*** Single-pass sand filters handle pathogens well, which is especially important when a system must be placed less than three feet above the water table or bedrock. Because sand filters have been in use for a long time, system design and reliability are well established. The materials needed to make a sand filter are readily available in Minnesota.

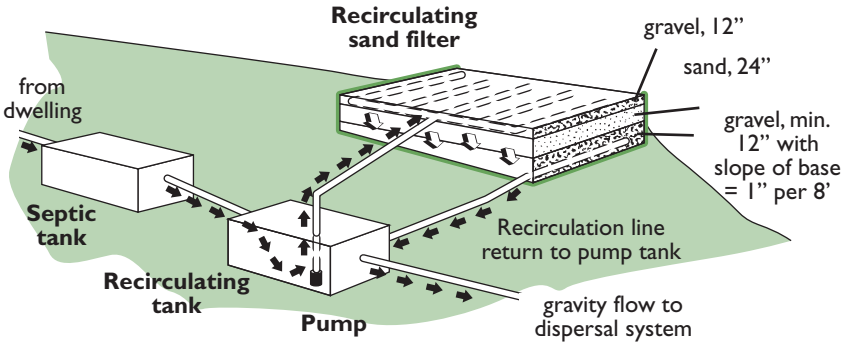
—***Recirculating Sand Filters (RSFs):*** RSFs use similar principles to sand filters—with a few differences. The materials in an RSF are coarse (in comparison to a single-pass sand filter) and do not remove fecal coliform as effectively. Fine gravel is often used. They are loaded at a much higher rate and are therefore smaller. RSFs remove a significant amount of nitrogen.

—***Peat Filters:*** Peat filters remove pathogens effectively and remove some nutrients as well. They are sometimes sold as manufactured containers, allowing for flexibility of design. Because the medium has an organic base, it breaks down over time and will need to be replaced every 10-15 years, which is significantly more often than a sand filter. Another disadvantage of peat filters is that the ready-built containers must be placed above the ground surface to breathe, where landscaping may be required to disguise them.

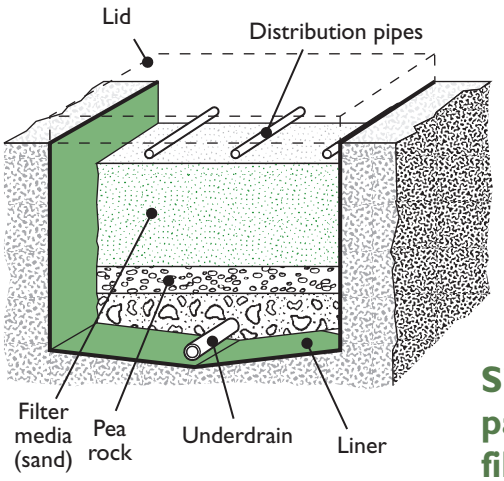
—***Constructed Wetlands:*** Constructed lined wetlands use native plants to aid in treatment of wastewater. A wetland system is not as effective as a sand or peat filter, and requires a significantly larger area. It may not be as effective as some of the aerobic tanks. Performance varies seasonally and, in Minnesota, a wetland system performs much better in the summer than in the winter. Vegetation is a significant part of the treatment process and therefore must be maintained and managed.

—***Aerobic Treatment Units:*** Aerobic treatment units (ATUs) are single tanks that require less space than sand and peat filters or constructed wetlands. They can handle different

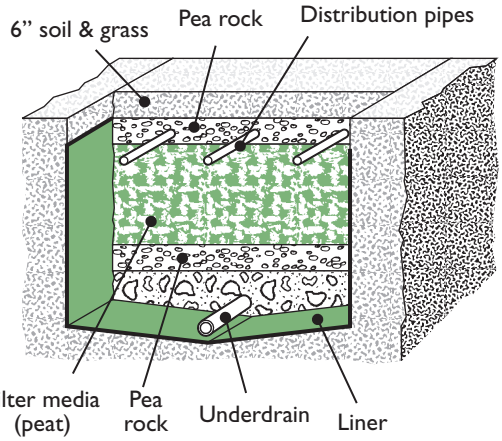
Examples of Pretreatment Options



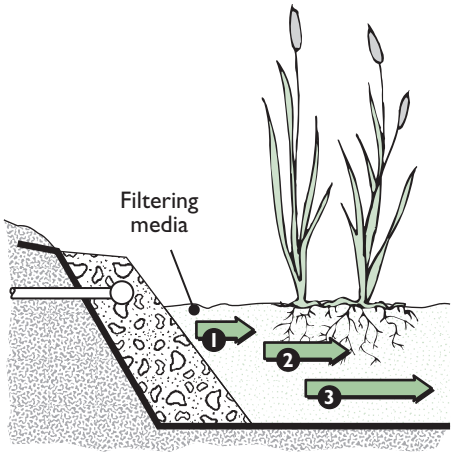
Recirculating sand filter



Single-pass sand filter

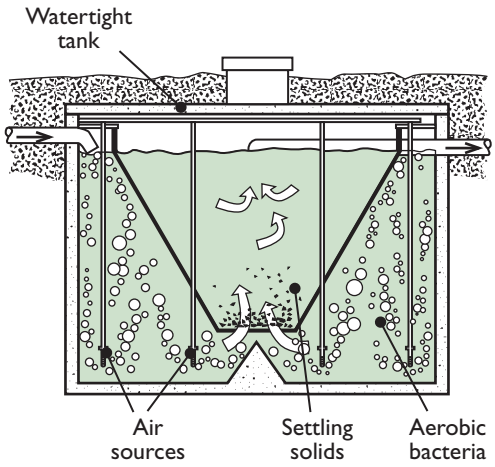


Peat filter

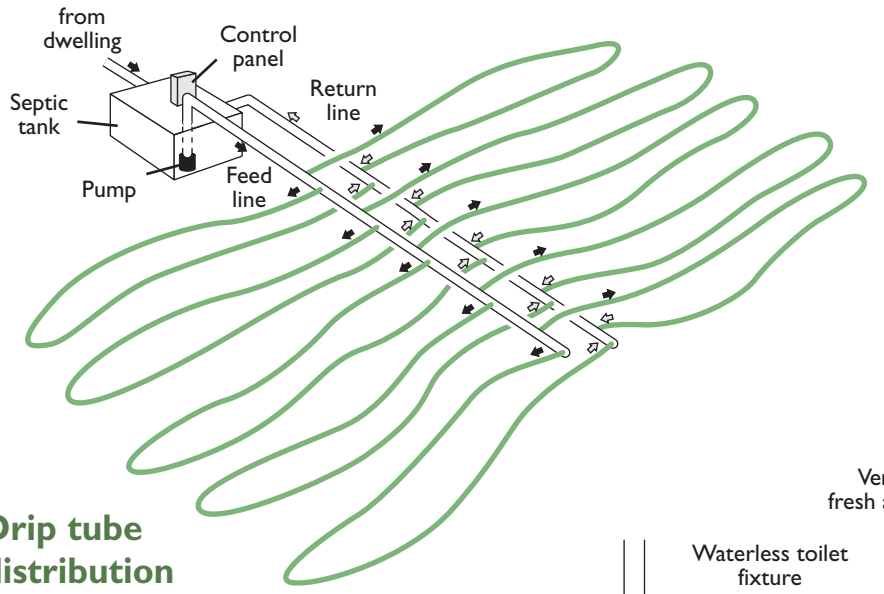


1. Physical filtering
2. Aerobic breakdown at plant roots
3. Anaerobic breakdown in media

Constructed wetland

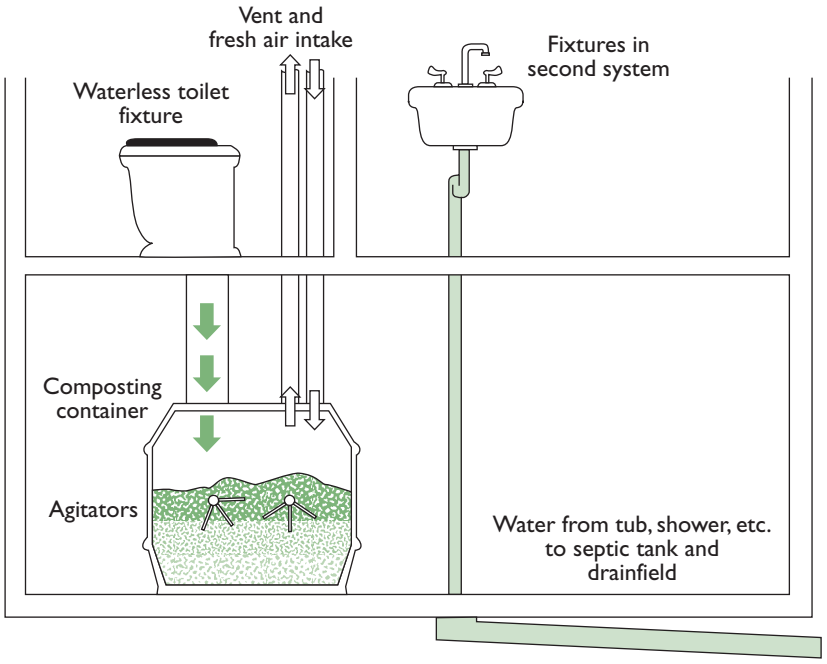


Aerobic treatment unit (suspended growth type)



Drip tube distribution system

strengths of wastewater with adjustments to air flows and configuration. However, all of the mechanical pieces need to be correctly maintained for proper treatment to occur. Studies done in Wisconsin have shown a large degree of variance in terms of ATU operation and maintenance that greatly affected how well they perform. Electrical costs are usually higher than those for the other systems.



Separation system

Final treatment/dispersal may substitute a distribution system such as drip lines or an unlined wetland in place of a trench or mound. The effluent would come directly from a septic tank or from a pretreatment device such as an aerobic tank or sand filter.

—***Drip Distribution:*** A series of small plastic tubes distributing wastewater over a relatively large area for use by plants and groundwater recharge.

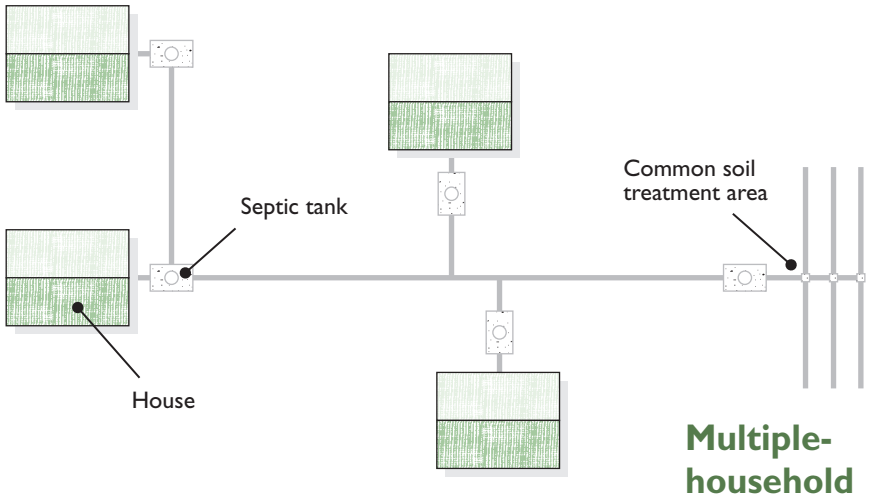
—***Unlined Wetland:*** A constructed wetland similar to the pretreatment constructed wetland, except that it is not lined, which allows the water to infiltrate into the native soil below it.

Dual or separation systems use a combination of two or more technologies. Most frequently this includes a composting or ultra–low-flow toilet as a system independent of a wastewater system that handles all the other wastewater. The second system could be any of those described above. Separation technologies and nonwater toilets allow homeowners to reduce water use and install a smaller system. Reducing water use may provide cost savings in itself. Taking toilet waste out of the system through a composting toilet removes about 70 percent of the N along with other nutrients. The drawbacks might be that these systems may require extensive plumbing changes in an

existing residence. Also, a significant increase in management is needed to operate the unit and handle the solids from the composting tank.

A detailed description of each of the nonstandard on-site treatment systems is available in the *Innovative On-Site Sewage Treatment Systems* publication series listed in the resources at the end of this chapter. A summary of treatment option characteristics is in Appendix B. Performance information is summarized in Appendix C. With the exception of the separation or dual systems, all treatment systems may be used for single- or multiple-household applications.

In multiple-household on-site applications, traditional septic tanks may be located on the individual properties, or a large septic tank or multiple tanks placed at a central location. When tanks are located on individual properties, the effluent is collected and delivered to a common pretreatment or final treatment/dispersal site. When raw sewage is collected it is transferred via a large pipe to a centralized tank or tanks, or via a small diameter pipe with a grinder pump located on each property. Some designers prefer individual tanks for each home as a valuable tool in diagnosing problems caused by individual households.



Multiple-household onsite application

● Solids treatment and handling

All decentralized systems use septic tanks that need to be pumped and cleaned periodically to remove the accumulated solids or *septage.* The septage removed from tanks must be applied to land for recycling or delivered to a municipal treatment facility for further processing in a way that protects human health and the environment. In growing and more densely populated areas, the management of septage generated can become a concern.

Centralized System Options [2]

Municipal-style centralized systems collect wastewater from many homes via a large network of pipes and deliver the wastewater to a central treatment facility. There are several collection and treatment methods available. In many small communities a combination of two or three of these treatment configurations may be a viable choice because of variations in topography, locations, density and costs of design, construction and management.

Centralized collection and treatment systems serve large cities and small communities.

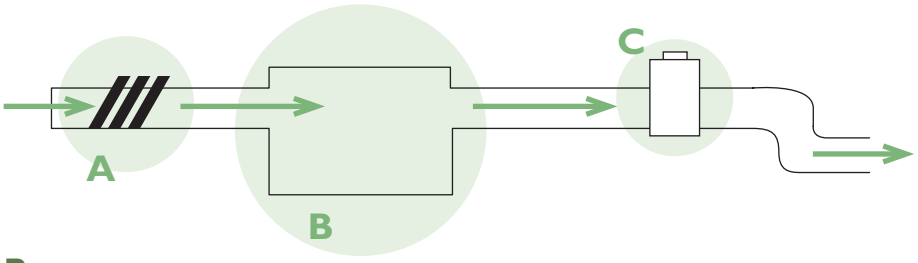
Centralized collection and treatment systems serve large cities and small communities. Collection systems may operate using gravity, pressure, vacuum or a combination of these to move the sewage to the treatment facility. The treatment concepts used in large municipal systems are generally similar to those used in on-site treatment systems: separation of solids and biological decomposition of

organic matter. The methods used to accomplish these tasks are different because of the volumes, contents, operating systems and discharge points.

All municipal style treatment systems typically have five primary components:

1. **Preliminary treatment**—removal of large solids
2. **Primary treatment**—separation of organic and inorganic solids
3. **Secondary treatment**—biological decomposition of organic solids and reduction of pathogens
4. **Disinfection**—chemical or physical treatment of remaining pathogenic organisms
5. **Tertiary/advanced treatment**—removal of additional nutrients or solids
6. **Stream purification**—natural stream process

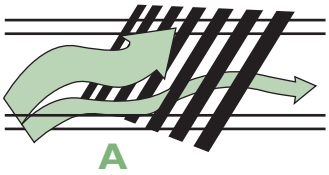
Preliminary treatment units



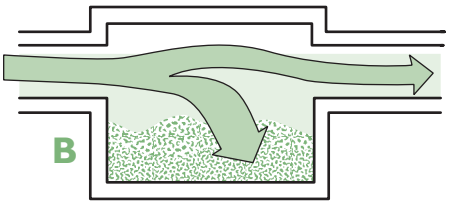
1. Preliminary treatment

Preliminary treatment removes the large solids that can clog or damage pumps and interfere with subsequent treatment processes. Among types of preliminary treatment units are bar screens, comminutors and grit chambers.

Bar screen



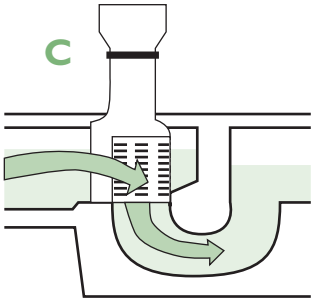
Bar screens placed in the influent channel provide for the removal of large rags, sticks or other debris found in wastewater. They can be cleaned either mechanically or manually. Most bar screens in small plants are manually cleaned. Screenings removed are dried and disposed of in a landfill or incinerated.



Grit chamber

Grit chambers, not normally found in small plants, are used to remove sand, silt and grit. The chamber slows the velocity of the wastewater flow allowing the heavier inorganic particles to settle out. Grit removal units are cleaned on a regular basis.

Comminutors are devices such as grinders, cutters, and shredders that break or cut up solids so they can be returned to the sewage flow without causing damage to the treatment process or unit. They are placed in the influent channel where wastewater flows directly through the screen and cutter. As debris is caught on the screen it is cut or shredded into very small particles.



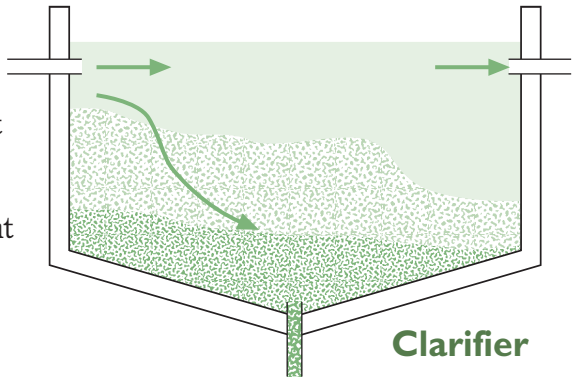
Communitor

Grease removal can also occur during the preliminary treatment process. A pre-aeration process removes grease and oil, supplies dissolved oxygen (DO) and increases the settleability of solids in the wastewater.

2. Primary treatment

Primary treatment removes organic and inorganic solids by the physical process of sedimentation. This is accomplished by reducing the velocity of the wastewater enough to allow the solids to settle out. Units that do this are clarifiers (settling tanks, sedimentation tanks) or Imhoff tanks. Primary treatment units also remove floating solids such as grease or plastics. Typically these units remove 90–95 percent of the settleable solids, 40–60 percent of the suspended solids and 25–30 percent of the organic wastes (BOD).

Primary Treatment Unit



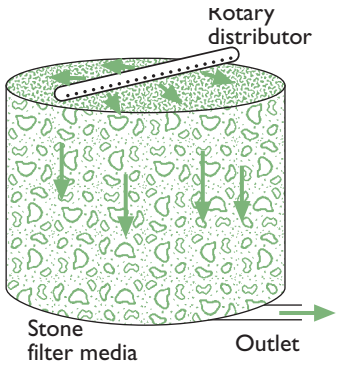
Clarifier

3. Secondary treatment

Secondary treatment is used when wastewater contains more organic solids in suspension or solution than the receiving water could accept if only the preliminary treatment was used. It depends primarily on biological aerobic organisms to break down the organic solids into inorganic and stable organic solids. These solids will then settle out and be removed. This process is comparable to the zone of recovery in a natural body of water (see Stream Purification below). Examples of types of secondary treatment units are trickling filters, rotating biological contactors (RBCs), activated sludge and stabilization ponds.

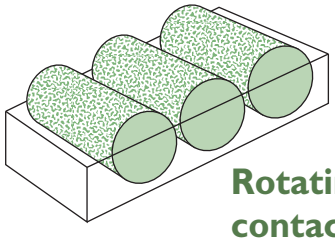
Secondary Treatment Units

Trickling filters (not true filters) break down organic wastes (BOD) by the bacteria that live in the slime layer on the media. Oxygen is supplied to the bacteria from the natural flow of air between the rocks or filter media.



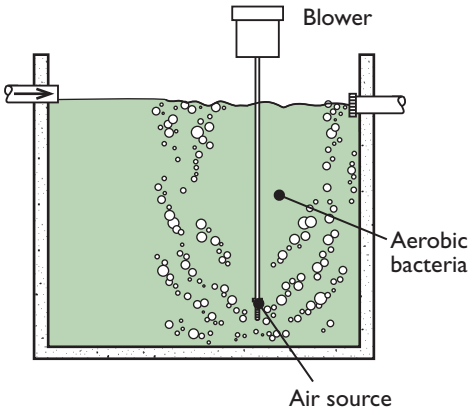
Trickling filter

Rotating biological contactors (RBCs) break down organic wastes by the bacteria that live in the slime on the rotating disks. As the disk rotates, the organisms receive their food from the wastewater and their oxygen as the disk rotates through the air.

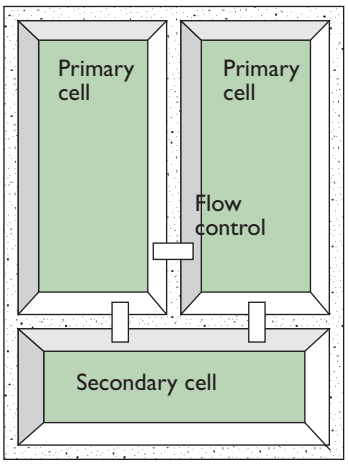


Rotating biological contactor

Activated sludge is a process by which the bacteria suspended in the water break down the organic waste. Oxygen is supplied to the bacteria by aeration equipment within the unit.



Activated sludge



Stabilization ponds

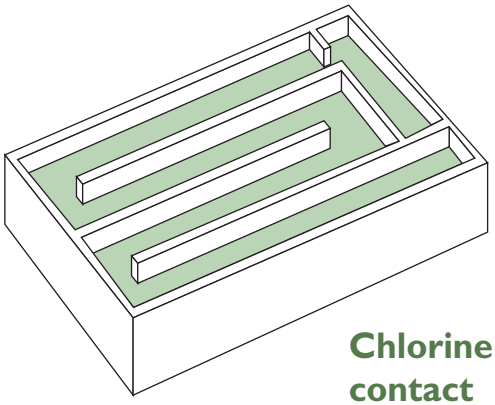
Stabilization ponds and aerated ponds break down the organic wastes by bacteria suspended in the water. Oxygen is supplied by algae living in the pond or by aeration equipment (aeration ponds).

Activated sludge, RBC units and ponds remove 80–95 percent of BOD when operated properly.

4. Disinfection

Disinfection destroys potentially harmful or pathogenic organisms. It is not designed to kill all organisms in a waste stream—that is neither necessary nor cost effective.

Chlorination is one form of disinfection. In a chlorine contact chamber, chlorine is mixed with the water and sufficient detention time (approximately 30 minutes) is provided to kill most of the pathogenic organisms.



Chlorine contact basin

Ozone is a very unstable gas that must be created at the site for immediate use as a disinfectant. Ozone is created by discharging an electrical current through air, then is injected or forced into the water.

Ultraviolet light (UV) is another disinfection method. UV is a form of radiation. It is generated by a series of UV lamps with the light directed into the water.

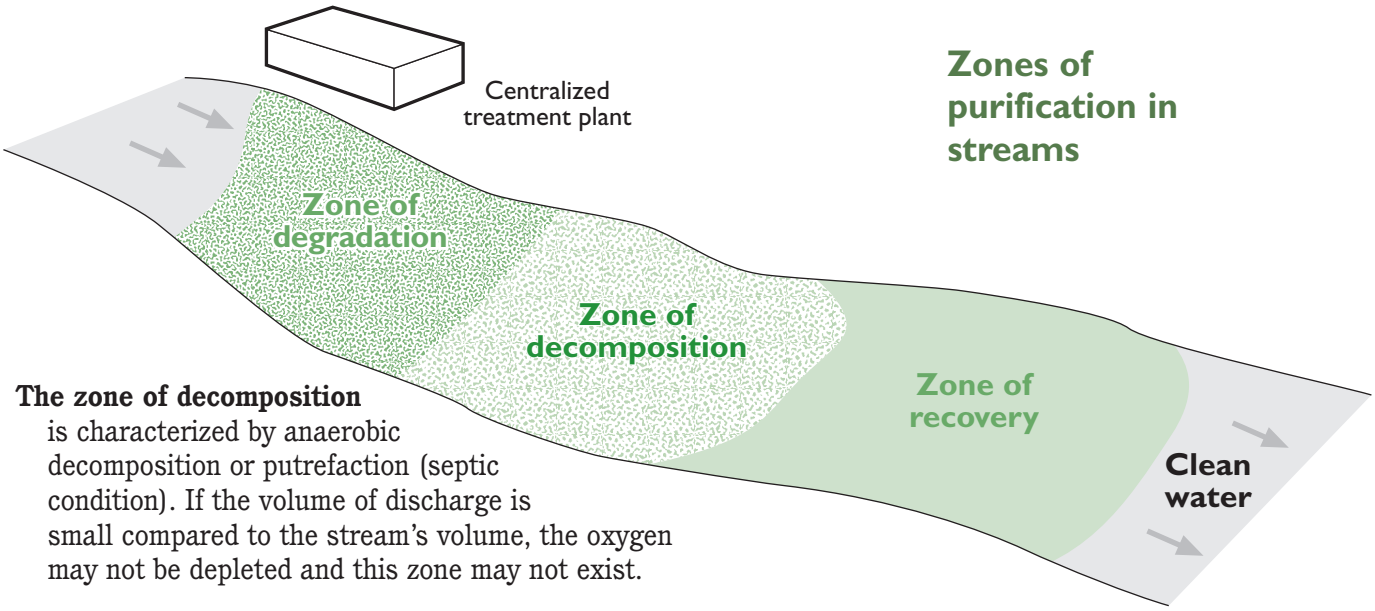
5. Tertiary/advanced treatment

Tertiary or advanced treatment includes any additional treatment following a secondary treatment process for the removal of nutrients or more organic or inorganic solids. Polishing ponds or effluent filtration are forms of tertiary treatment designed for further removal of BOD or TSS. Spray irrigation or the addition of chemicals is used to improve nutrient removal.

6. Stream purification

Treated water from municipal style treatment facilities is discharged to surface water. Most discharge is to flowing streams. Stream purification is the natural ability of water to reduce bacterial content, to largely satisfy the BOD requirements of wastewater, to stabilize organic material and to return dissolved oxygen to normal levels. This process occurs in several overlapping zones within a given body of water.

The zone of degradation is directly below the discharge point. Normally there is visual evidence of pollution around the discharge point. For example, sludge bank formation and a decrease in fish and other life may be observed.



The zone of decomposition is characterized by anaerobic decomposition or putrefaction (septic condition). If the volume of discharge is small compared to the stream's volume, the oxygen may not be depleted and this zone may not exist.

The zone of recovery occurs with the reappearance of aerobic bacteria species, fish and other higher organisms.

The zone of clean water occurs when the quality of the stream is back to its original state or better than it was just above the discharge point.

A centralized wastewater treatment facility allows the self-purifying ability of water to occur under controlled conditions. A detailed description of typical sewage treatment performance of centralized systems is contained in Appendix C.

Solids Treatment and Handling

In all treatment processes, solids are removed from the wastewater. Solids treatment and handling has two functions: 1) it reduces the volume of materials by removing liquids and 2) it decomposes highly organic materials into relatively stable or inert organic and inorganic compounds. A centralized system may use a sludge lagoon and digesters or vacuum filters and drying beds to remove solids. Both centralized and decentralized methods use land application or incineration.

In all treatment processes, solids are removed from the wastewater.

Total Maximum Daily Load

A concept receiving increased attention is that of *total maximum daily load* (TMDL). This concept follows the notion that a receiving environment can only accept a given total amount of a "contaminant" before it has an unacceptable negative impact on the health and safety of that environment. This concept speaks to the fact that not only is the concentration of a contaminate in a source such as wastewater important—that is, the parts/million or colonies/milliliter—but also of importance is the total amount of contaminant that environment can handle.

There are frequently many sources of a pollutant including point and non-point sources. For example, the sources of phosphorous in a stream might include non-point sources such as storm water runoff, lawn fertilizer, agricultural crop fertilizers, livestock manure, on-site wastewater disposal, and soil erosion from fields, construction sites and shore lines. Point sources of phosphorous might include municipal wastewater treatment plants and others.

n the near future all wastewater treatment facilities, centralized and decentralized, will need to meet prescribed treatment standards.

As this concept is applied to surface water bodies, scientists, legislators and regulators are taking into account all sources of contaminants including wastewater. It means that in the near future all wastewater treatment facilities, centralized and decentralized, will need to meet prescribed treatment standards. This is of particular concern as population demographics change and the wastewater from larger areas and growing city populations are funneled through centralized treatment facilities using surface water as their discharge point.

An example will illustrate this concept: The XYZ River is determined to be able to handle 100 units of a contaminate within a 7 mile stretch of the stream. All other sources are calculated to contribute 60 units of the contaminate and so the city's municipal treatment plant is allowed to release up to 40 units. Currently the city wastewater treatment plant is releasing a total of 35 units (at 1ppm concentration). However, the city is growing and also considering the annexation of adjacent land to provide wastewater treatment services. The TMDL concept applied to this scenario suggests that if significant additional volumes of wastewater are going to be treated, the city will likely need to invest in additional treatment and contaminate removal capacities to clean all the wastewater to a concentration of less than 1ppm in order to meet their maximum total discharge limit of 40 units.

Criteria for Choosing a System

With so many options available, it is important your community follow a good decision-making process using all of the information you can get and evaluating it against the criteria identified by the community as important. Many communities that have dealt with sewage treatment issues have found the basic criteria below to be important.

- Treatment effectiveness
- All costs over time
- Appearance
- Reliability
- Longevity
- Ease or difficulty of management
- Space required
- Flexibility—ability to handle changes in flow and wastewater contents
- Impact on community culture and values
- Consistency with long term land use goals

Making an Informed Decision

There are many ways to properly treat (recycle) wastewater while protecting human health and the environment. As you look to make an informed decision for your community, it is prudent to consider ***all*** of the treatment options available. You need to consider both categories of treatment options:

- decentralized individual or multiple-household on-site systems, and
- collection and centralized treatment systems.

The discharge point is a significant difference between systems: decentralized systems disperse back into the ground and centralized systems discharge to a surface water body. The on-going management of the system(s) chosen must play a key role in the decision of how wastewater will be handled in your community. (Management is covered in Chapter 4.)

Each community situation is unique and all treatment options have their advantages and disadvantages. The many new, nonstandard or alternative, on-site style treatment systems make the choice of system more challenging than ever. However, they offer you the opportunity to make a good choice. There are also several styles of municipal systems to choose from. In deciding on the right solution for your community, you need to have a clear definition of the community's goals and identify all the criteria that will bear upon your choice.

References

1 Adapted from "Decentralized Onsite Treatment Options" and "Decentralized Wastewater Treatment Systems," *Pipeline (Newsletter of the National Small Flows Clearinghouse)* Fall 2000.

2 Adapted from "Components of a Centralized Treatment System," *Wastewater Treatment Technology* 1997 Edition, Minnesota Pollution Control Agency. The publication contains a much more detailed description (with illustrations) of each of these processes and treatment systems.

Illustrations in this chapter of preliminary, primary and secondary treatment units were adapted with permission from the Office of Water Programs, California State University, Sacramento.

Resources

Environmental Protection Agency publication:

- Response to Congress on Use of Decentralized Wastewater Treatment Systems, April 1997.
  www.epa.gov/owmitnet/decent/response/index.htm
- Total Maximum Daily Load (TMDL) Program
  www.epa.gov/owow/tmdl

Minnesota Pollution Control Agency publications:

- Wastewater Treatment Technology, 1997 edition.
- ISTS* Chapter 7080 (State of Minnesota Code) – Program History & access to code
- Water-quality Permit Requirements for Wastewater Discharges to Ground Surface and Subsurface.
- NPDES/SDS Permits for Surface-water Dischargers
- Chapter 7080's ISTS* Options
- Surface Discharge of Sewage from Rural Homes and Businesses
- Minnesota's Water-Quality Standards (Legislative Fact Sheet) – January 28, 2000
- Nitrates in Minnesota Ground Water
- Your Private Well
- Baseline Water Quality of Minnesota's Primary Aquifers
- Guideline to Septic Tank System Disclosure at Property Transfer
- Existing ISTS* Vertical Separation Requirement
- Reliability for Mechanical Wastewater Treatment Plants
- Activated Sludge Design Review Considerations
- Riprap Criteria for Stabilization Ponds

* ISTS = Individual Sewage Treatment Systems

- Facts About Sewage Bypasses
- Scheduled Maintenance Bypassing Review Guidelines
- Disposal of Industrial Wastewater and Alternatives
- Guidelines for Wastewater Treatment Facilities during a Flood
- Car Wash and Vehicle Maintenance Facilities
- Overview of Underground Disposal Control Programs (Non-household)
- ISTS* Maintenance
- Sewage Treatment in a Soil System
- Septage and Restaurant Grease Trap Waste Management Guidelines
- Highly Permeable Soils in Minnesota by County
- Other System Classification
- Warrantied Systems
- Chapter 7080's Performance Standards
- Newsletter: Ground Water & Solid Waste Connection (Quarterly)

Order from Minnesota Pollution Control Agency, 520 Lafayette Road N, St. Paul, MN 55155-4194. Visit www.pca.state.mn.us or call the ISTS Information Line at 651-282-6246; to speak to a district representative call 800-657-3864.

National Environmental Training Center for Small Communities

West Virginia University
PO Box 6064
Morgantown, WV 26506-6064
Phone (800) 624-8301
www.netc.wvu.edu

National Small Flows Clearinghouse publication:

- "Basic Wastewater Characteristics," in Pipeline, Fall 1997: 8(4).

Office of Water Programs

California State University, Sacramento
6000 J Street
Sacramento, CA 95819-6205
Phone (916) 278-6142
www.owp.csus.edu

University of Minnesota Extension Service publications:

- Septic System Owner's Guide #06583
- Choosing an Alternative Septic System for a Home Site with a High Water Table #07571
- Choosing an Alternative Septic System for a Home Site with a Steep Slope #07570
- Choosing an Alternative Septic System for a Home Site with Thin Soil over Bedrock #07569
- Understanding Your Septic System #07439
- How Well Is Your Well? #05979
- Innovative On-Site Sewage Treatment Systems #07666
  Publication Collection includes: Single Pass Intermittent Sand Filters; Recirculating Media Filters; Peat Filters; Constructed Wetlands; Aerobic Treatment Units; Drip Dispersal
- Septic System Owner's Guide #06583
- Septic Systems Revealed (video) #06768
- Choosing an Alternative Septic System (video) #07424
- On-Site Sewage Treatment Manual
  Available from the on-site sewage treatment program by calling 612-625-9733)

Order from University of Minnesota Extension Service Distribution Center, 405 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108; 800-876-8636; or from your county extension office. For more information visit www.extension.umn.edu or www.bae.umn.edu/septic

Chapter 4

Wastewater Management Options

JIM KIEHNE

"Say, who's responsible for running that new wastewater plant on Elm Creek?"

"It is already evident that improved operation and performance of onsite/decentralized systems through better management will be essential if the nation's water quality and public health goals are to be attained."

Guidelines for Management of Onsite/Decentralized Wastewater Systems, Environmental Protection Agency, September 2000.

Over the years, many homeowners have followed the *flush and forget* philosophy. Others have thought of wastewater as a *waste product* that can easily be disposed of. Today, we know that neither of those approaches is valid. Forgetting about wastewater has caused premature failure of many wastewater treatment systems as well as produced threats to human health and the environment.

This chapter identifies some management needs and possible options to help your community implement its wastewater project. Management choices are very important. Many people do not realize that they need to manage their wastewater system and frequently there is little or no management. Homeowners need to learn that just as with their cars, houses and other valued items, a little care goes a long way.

Management simply means taking care of something. It has become imperative that all homeowners provide proper management of their wastewater treatment systems, from the simple on-site systems to the more complex community systems. Management of all wastewater treatment systems involves the *monitoring, operation and maintenance* of the system.

Responsible Management Is Important

Management of all wastewater treatment systems involves the monitoring, operation and maintenance of the system.

The benefits of good management of your wastewater system include:

- Reduced costs for repairs, maintenance and replacement
- Longer system life
- Improved system performance
- Increased reliability and overall satisfaction

Living in a rural area has many rights and privileges, but also carries responsibilities. It is the responsibility of every homeowner to invest the time and money needed to provide a properly functioning wastewater treatment system. As was discussed in Chapters 1 and 3, a good wastewater treatment system must be properly designed—and properly managed. It is the homeowner's family, immediate environment and financial investment that is at stake!

Professionals design and install wastewater systems. However, individual homeowners have traditionally been responsible for the proper use and care of their on-site systems. Some new rural homeowners don't properly maintain their on-site wastewater treatment system because they have not needed to deal with this responsibility in the past. Others don't know where to begin. Many people who have lived in the country all their lives don't really understand their wastewater treatment systems and so have not taken care of them effectively.

Managing Your Wastewater System

To protect human health and the environment, communities must have proper design, installation *and management* of treatment systems. When a system that has not been properly maintained fails prematurely, it costs more than just out-of-pocket dollars for the homeowner or community to replace it. There may be the hidden costs of contaminated surface and groundwater, overall water quality degradation and reduced property values. In some cases, homeowners may find there is no place to put another new system. This is especially true for lakeshore properties and small communities, many of which were platted in the 1970s or earlier.

While there are many reasons to take care of wastewater treatment systems, be it your own on-site system or your community's treatment system, the lesson is the same—*Pay now, or pay more later!*

Management Begins in the Home

The residents of every household control the quantity and quality (contents) of the wastewater delivered to their treatment system. They operate the system every time they use water—flush the toilet, wash a load of laundry or take a shower. All of the specific best management practices homeowners can use to improve the performance of their treatment systems are outlined in the Septic System Owner's Guide.[1] These include controlling water usage, disposing of household wastes properly, using appropriate cleaners, avoiding overloading the system, making needed repairs in a timely manner and scheduling maintenance at regular intervals.

Providing homeowners with information they need is the least expensive management strategy, but it provides huge benefits.

Educating individual residents by providing information on best management practices is the quickest, least expensive and most effective first step in managing individual or multi-household wastewater treatment systems. The owner of the system has the most at stake and will reap the greatest benefits. Homeowner education is a basic step managers of any treatment system should take. It is extremely difficult to control how individuals use their system, and no one wants big brother looking over their shoulder! Providing homeowners with information they need is the least expensive management strategy, but it provides huge benefits.

Management Providers

Today, there are many service providers for wastewater treatment systems. They range from *informed* individual homeowners arranging for the pumping of their standard septic system every three years to Class C operators doing daily monitoring, testing and reporting for a complex municipal system.

When choosing a system, be aware of how much care and management each option will require before making the final decision. While there is a lot of interest in new or alternative treatment systems, the standard systems are likely going to require the least maintenance.

Be aware of the long-term management needs of the system you are considering.

Be sure to collect complete information on the management requirements from several sources. Whether you are considering a single homeowner system or a group system, help the designer or engineer understand how the system will be used so they can spell out what the management requirements will be. With this information you can make the best final determination.

Management of multiple-household systems becomes more involved. Depending on the system's design, it may require minimal maintenance or much more involved attention. If your system uses mechanical pumps and electrical timed dosing, it will require a well-qualified service provider. Simple or complex, new system or a repair, be aware of the long-term management needs of the system you are considering. This should be a major factor in your final choice.

● Professional Services

Professional services have been managing municipal wastewater systems for years. They can be Class C Operators or have higher certification, depending on the facility. Or they can be commercial companies that will manage any type of system. You can contact the Minnesota Pollution Control Agency for information on the licensing of these operators.

Sanitary Districts usually employ licensed staff (minimum license is Class C operator) to maintain the pumps, lift stations and lines as well as to handle the aesthetics. It may depend on whether the District has collection systems, contracts locally to a city for treatment services or has a mix of on-site wastewater treatment systems. There may be many specialty licenses required.

● Installers and Contractors

Besides professional wastewater system managers, there are designated registered professional installers and contractors who do maintenance and management of systems. Since they are already familiar with systems they install, there is a natural tendency to have them also manage and maintain them.

In this mix, you may find warranted systems that come with management contracts and warranties that can be extended. Be certain to review these types of contracts carefully, since you may get something you did not anticipate and may not be able to change in the future. Be aware of the costs to manage your system and the credentials and references of those that offer these services.

● Cooperatives and Utilities

Local cooperative rural electrical utilities have shown increased interest in working with the management of individual and group wastewater systems. This is logical because, first, the landowners usually receive their electrical power and their bills from them and are therefore current cooperative members, and, second, the cooperative usually works with the local township governing entity to protect themselves for the recovery of unpaid service charges. The township can budget for repairs through a service district model if used (see Chapter 5). Third, the cooperative will try to keep costs down and be efficient for their shareholders. There is usually good communication with the utilities and minimal intrusion to the area's culture, as

compared to bringing in someone new. Such arrangements seem to help projects go smoothly.

- **Shared Staff**

  If you cannot employ someone directly, you may be able to share a staff person with the nearby local municipality or sanitary district.

Records and Accountability

An important part of the management function is keeping records of pertinent data, which becomes valuable information for use by management in the operation and maintenance of the system(s). It can be very useful to record such things as dates and status of septic tank pumping, pump inspections, alarm checks and flow meter readings.

For example:

> *A volunteer resident living near the pump station that services the cluster records the flow meter reading and calculates the flow every other day at 9 a.m. The typical flow ranges from 1,700 to 2,000 gallons per day (average is 1,857 gallons) for the group of 8 houses. All of a sudden the flow jumps to 2,550 gallons per day.*
>
> *Although the system is designed to handle this flow, the sudden change alerts the volunteer. If it was over a holiday weekend and several homes had visitors, that might be the reason for the change. However, in this case it occurred in the middle of the week and so the volunteer knew there could be a problem. She checked with her fellow residents and it turned out that a toilet valve had developed a serious leak in one home. The homeowner replaced the $2.59 valve and the flow returned to normal.*

This example illustrates that record keeping, regular monitoring and taking appropriate action using the information can eliminate future problems and reduce costs. In this example, the problem might have been detected later by the contracted manager when a drainfield inspection showed significant changes in use, but the early detection corrected the problem and averted a major problem.

It is also necessary for the system manager to be accountable and responsible. The manager's first level of responsibility is to the owners of the system who are depending on it and paying the bill for the management. Another level of responsibility is to the residents of the community who share the same aquifer as their water source. A third level of responsibility could be to a local unit of government that has an ordinance requiring regular evidence of prescribed management practices.

EPA Management Guidelines

The U.S. Environmental Protection Agency (EPA) issued a draft of *Guidelines for the Management of Onsite/Decentralized Wastewater Systems* in September of 2000 "to raise the level of performance of onsite/decentralized wastewater systems through improved management programs." They proposed this set of voluntary national guidelines "to raise the quality

of management programs, establish minimum levels of activity, and institutionalize the concept of management."

Although these are draft guidelines and voluntary, they illustrate the concepts of management and accountability being discussed in the industry and by the government. Not everyone in the industry or at all levels of government agree on the guidelines and models proposed, but they provide a base for discussion and illustrate the range in possible management providers.

In these guidelines, EPA proposes five models with objectives to increase system performance.

● Model 1: System inventory and awareness of maintenance needs

To ensure conventional onsite/decentralized systems are sited and installed properly in accordance with appropriate state/tribal/local regulations and codes and are periodically inspected, maintained and repaired as necessary. Regulatory agency is aware of the location of systems and periodically provides owners with operation and maintenance information.

Typical application: Non-sensitive areas and prescribed system design.

● Model 2: Management through maintenance contracts

To allow the use of more complex mechanical treatment options in areas of higher density or some environmental sensitivity. Requires maintenance contracts to be maintained between the owner and equipment manufacturer/ supplier or service provider over the life of all systems.

Typical application: More sensitive areas such as wellhead or source water protection areas or soils marginal for prescriptive systems.

● Model 3: Management through operating permits

To allow the use of onsite/decentralized treatment on sites with a greater range of characteristics than allowed by prescriptive codes. Establishes specific and measurable performance requirements, renewable operating permits, and regular compliance monitoring reports, in addition to requiring maintenance contracts.

Typical application: Environmentally sensitive areas and specially designed systems requiring monitoring to meet prescribed performance criteria.

● Model 4: Utility operation and maintenance

To ensure that onsite/decentralized treatment systems consistently meet their performance requirements through the creation of public or private utilities that are responsible for the performance of the systems within the service area. The utilities

are issued operating permits for the systems and maintain them, but system ownership remains with individual property owners.

Typical application: Areas of suspected impairment of critical water supplies and natural resources and/or treatment system designs requiring reliable, long-term system operation and maintenance.

- **Model 5: Utility ownership and management**

  To provide professional management of the siting, design, construction, operation, maintenance, etc. of onsite/decentralized systems through the creation of public or private utilities that own and manage systems within the service area.

  Typical application: Areas of suspected impairment of critical water supplies and natural resources. Suggested for new, dense developments.

Management Tips

With proper management tools for the type of system you choose, you will find that the life of the system will be greatly extended. Shown at right are some tips for assuring proper operation and management of your wastewater treatment system.

The costs to replace your system, plus the hidden costs of possible contamination to your drinking water and groundwater supply, are good incentives to do proper management. The type of management you need depends on the type and complexity of wastewater system, whether it serves a single homeowner or a group of landowners, the accountability needed, and the types of service providers that are available in your area.

Continued long-term efficiency and accountability of your wastewater treatment system, whether by yourself or by professionals, will ultimately pay off when you and other landowners want to sell your homes. The saying, "An ounce of prevention is worth a pound of cure," really applies here!

Management Tips for Your Wastewater Treatment System

- The least expensive and most beneficial management step is to educate the homeowner about household best management practices.
- Use Designated Registered Professionals who are currently licensed for their specialty (site evaluator, site designer, installer, inspector, pumper, etc.). Ask them to provide you with their certification license number and put together a service contract that spells out the details and responsibilities of all parties.
- When designing your system, consider the operation and maintenance needs and associated costs. Check to see if you will be required to submit records and obtain a permit yearly. Fit the system to your lifestyle and needs as much as possible.
- Know the management needs of your wastewater system even though you have a service provider taking care of it. Be able to recognize a problem and notify the provider.
- Explore your local area first for a service provider. Many local contractors provide this service. A group wastewater treatment system may need a Class C Operator to do the sampling, analysis and monitoring for you. In some small systems, dedicated community members can perform some basic functions.
- Be able to communicate with your service provider and find out what residents can do to protect their system (for example, low-flow toilets and showerheads, water saver appliances).
- Get costs from several providers in order to get a competitive price.
- Check the service provider's references to see if others are satisfied with them (service calls, regular maintenance done and clean up, communication abilities, turn-around times, etc.).

References

1. *Septic System Owner's Guide.* PC-06583. 1995. University of Minnesota Extension Service, St. Paul, MN. For ordering information, see Resources below.

Resources

Environmental Protection Agency publication:

- Guidelines for Management of Onsite/Decentralized Wastewater Systems September 2000.
  Environmental Protection Agency–Office of Water/Wastewater Management, Washington D.C. Can be downloaded from: www.epa.gov/OW-OWM.html/decent/downloads/guidelines.pdf

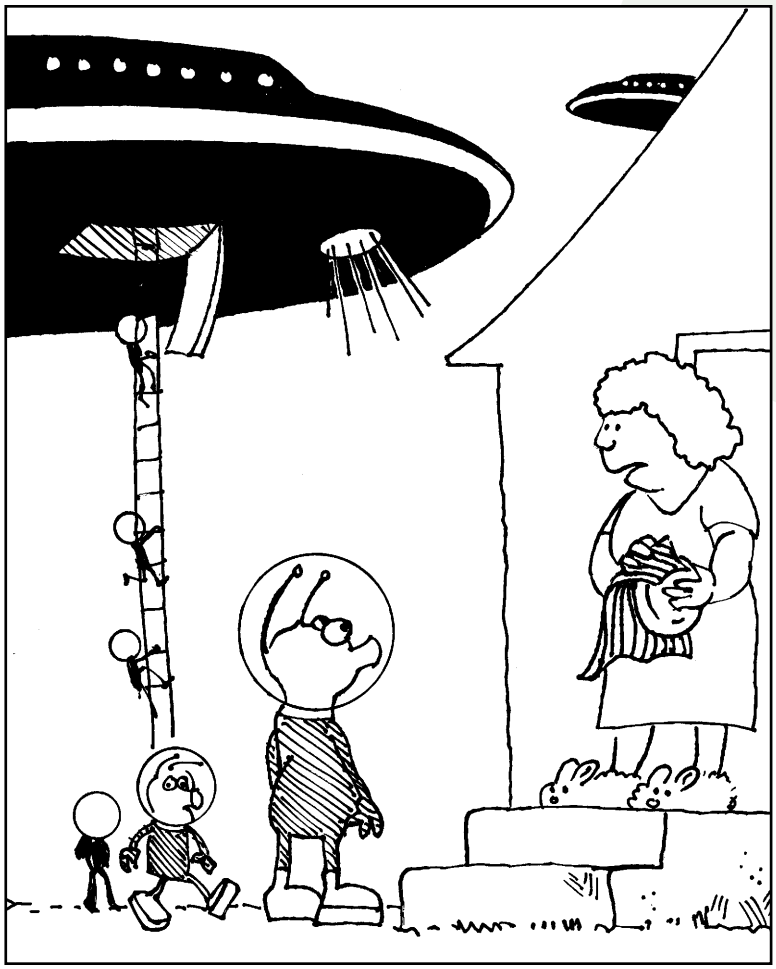
University of Minnesota Extension Service publications:

- Septic System Owner's Guide #06583
- Choosing an Alternative Septic System for a Home Site with a High Water Table #07571
- Choosing an Alternative Septic System for a Home Site with a Steep Slope #07570
- Choosing an Alternative Septic System for a Home Site with Thin Soil over Bedrock #07569
- Understanding Your Septic System #07439
- Septic Systems Revealed (video) #06768
- Choosing an Alternative Septic System (video) #07424

  Order from University of Minnesota Extension Service Distribution Center, 405 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108; 800-876-8636; or from your county extension office. For more information visit www.extension.umn.edu

Chapter 5

Community Organizational Structure Options



JIM KIEHNE

"Well, I'm not sure what our wastewater management organization would think about you using the washroom."

"The structure of a management program depends on the functions to be performed and the resources of the community. The institutional structure should include mechanisms for proposing and enforcing regulations, performing system inspections and maintenance, and monitoring program performance."

Response to Congress on Use of Decentralized Wastewater Treatment Systems, April 1997. U.S. Environmental Protection Agency, Office of Water (EPA 832 R-97-001b)

Someone must be responsible for operation, monitoring and upkeep of your wastewater treatment system. This may well be the homeowner for an individual system. However, for multiple-household and community systems, this important function is going to require a *responsible management entity*, with the legal authority and administrative capabilities to make these arrangements and be accountable.

An organizational structure is necessary to facilitate the ownership and/or management of these more complex wastewater treatment systems. This chapter identifies some organizational tools to help a community implement a wastewater project. It discusses the need for an organizational structure, the kinds of organizational structures available, and the pros and cons of each kind.

Today there is emphasis on managing systems to improve performance that also underscores the need for more accountability.

Ownership of the System

The primary responsibility for a wastewater treatment system is always with the owner. Homeowners have traditionally had the responsibility for owning and managing the individual on-site systems on their own property. As more complex systems have been developed, management of these systems has become more complex as well. Today there is emphasis on managing systems to improve performance that also underscores the need for more accountability.

More and more multiple-household on-site treatment systems are being used to provide effective wastewater treatment for communities. These systems offer new and more complex ownership and management challenges. Citizens expect accountability in the design and management of these systems because of the volume of wastewater treated and the potential for major problems.

No matter who owns the system, one thing is definitely clear—it is in the best interests of the owners and the community to see that everything is covered.

Why You Need an Organization

All of us have organization in our lives. We may have fairly routine schedules for sleeping, working, eating and raising our families, but we may also have complicated organizations in our lives just to get things done—otherwise there would be chaos.

Organization is also needed for a wastewater project. Many landowners just want to get their system fixed and be done with it. However, when there are multiple landowners and properties involved, a legal and responsible entity is usually needed to work on behalf of the community.

This entity, existing or new, can be used to:

- provide continuity and sustainability for the project.
- acquire property and easements where necessary.
- obtain and administer financing.

- negotiate contractual agreements.
- protect individual and community interests.
- develop ordinances, rules and policies to protect property owner's rights and the project.
- enforce laws and rules.
- provide recovery of costs from damages to the system.
- budget and levy to plan, build, manage, repair and replace the system.
- provide on-going evaluation and long-term accountability.
- provide certificates of compliance for property owners.

All of the above services are needed, in one form or another, depending on the number of landowners involved. Several organization types have been used for many years while others are new or variations of existing models.

Types of Organizations

In the late 1960s and early 1970s, the federal government passed the Clean Water Act and amended the Federal Water Pollution Control Act. Congress authorized construction grants and loans to communities that had wastewater concerns in order to help clean up the environment and protect groundwater. It was an era of free-flowing money and innovative approaches to resolve problems.

In Minnesota, environmental protection legislation has been on the books since 1945, but in the late 1960s and early 1970s, additional rules and laws went into effect. Minnesota Statute § 115, *Water Pollution Control; Sanitary Districts*, was expanded and the common term, "Sanitary Districts," came into being.

In 1967 the legislature implemented Minnesota Statute § 116, which created the Minnesota Pollution Control Agency (MPCA) and, in 1971, Minnesota Statute § 116A to regulate public water and sewer systems.

The following paragraphs describe various models used today and provide some information about the differences between them.

When there are multiple landowners and properties involved, a legal and responsible entity is usually needed to work on behalf of the community.

Older Organizational Structures Created by State Statute

● Sanitary Districts under M.S. § 115 (1963)

Sanitary Districts under M.S. § 115.18 to 115.37 can be used for wastewater and solid waste. They usually encompass a large lake area that has had wastewater and water quality problems. Today they also cover townships or other legal entities that ultimately work together. A Sanitary District of this type begins with a petition to the Minnesota Pollution Control Agency (MPCA), which conducts at least one hearing to determine the need for the District. Comments from local landowners are an important component. If the MPCA finds that there

is an environmental need, it will create a District. A Board of Managers representing the entities involved can be created to operate the District. The District has the ability to levy taxes and write and enforce ordinances. Over time the rules and authorities have helped this model to become more efficient.

Advantages:

- ✔ Stands as an independent entity with the tools to complete work
- ✔ Can encompass a large area, providing a big picture look (for example, a regional plan to manage wastewater)
- ✔ Can implement ordinances, bond and apply for grants and loans
- ✔ Can employ staff to maintain and operate a community service

Disadvantages:

- ✘ Covers a large area
- ✘ Takes a long time working with landowners to get agreement for implementation (the larger the district, the longer it will take to implement)
- ✘ Requires a knowledgeable and wise board of managers to keep the District financially solvent
- ✘ Does not have the power to provide water

● Regional Sanitary Sewer Districts (1965)

Regional Districts under M.S. § 115.61 to 115.67 are also created by the MPCA. No Regional Districts have been formed to date. These Districts would be municipal corporations and governmental subdivisions of the state. We mention them briefly since they are part of the statutory law created to provide a way for governmental entities in a drainage area to create a District to prevent water pollution.

● Sanitary Districts under M.S. § 116A (1971)

These Sanitary Districts can be used for water and wastewater services. They usually cross county or township boundaries and frequently involve a body of water. They can be created by a petition or resolution process. Hearings are completed, along with preliminary planning and engineering studies, to determine if the District is feasible and necessary. These Districts are owned and managed by the County in which they are located or, if they cross judicial district lines, they can be created by the District Court and come under jurisdiction of the Court.

The County can retain authority and be directly involved in the management, or can create a Commission to manage the District. Therefore, these systems have the authority to bond, finance and levy user charges. They also have the powers to construct, operate and manage the system. An example of a long-standing 116A District is the Otter Tail Water Management District. (Note: The seven Minnesota metropolitan counties do not have these statutory powers and cannot create these Districts.)

Advantages:

- ✔ Encompass large geographic areas
- ✔ Enable the entity to look at the “big picture” regarding growth and development of the area
- ✔ Can provide both water and wastewater services
- ✔ Are able to plan for long-term population changes

Disadvantages:

- ✘ Require up-front money to conduct engineering studies and conduct hearings
- ✘ Hard to get community consensus over the large area
- ✘ Important to have professional staff to manage daily operations, manage finances and maintain accountability—can bankrupt small communities
- ✘ Frequently takes from 4 to 7 years to get projects completed

Note: This is not a practical model for individual small communities or small groups of landowners.

● Special Legislative Districts

In addition to the above Districts, in the early 1970s and even as recently as the mid-1990s, the Legislature has created several special wastewater districts throughout the state. Some had very contentious beginnings, such as the Western Lake Superior Sanitary District (1971), the Lake Alexandria Sanitary District (1971), and the Metropolitan Waste Commission (1978), which encompasses the Twin Cities seven-county metropolitan area.

Special Legislative Districts are considered to be municipal corporations and governmental subdivisions of the state. They have all the necessary authorities to finance, levy, bond, construct, operate and manage within their jurisdictions. They often have authorities to deal with water, wastewater and/or solid waste.

Recently Developed Organizational Approaches

● Water Quality Cooperative (1999)

Related to the watershed approach, the Water Quality Cooperative is established by M.S. § 115.58 & M.S.§ 308A. Its purpose is to use a cooperative utility, capable of furnishing potable water or water quality treatment and management services, for financing or refinancing the construction, operation and maintenance of treatment works, wastewater systems, storm sewer facilities, water pipelines and the related facilities of and for its coop members and shareholders. While this new concept may have its merits, none is yet in operation as of 2002.

● Subordinate Service Districts (1982 & 1989)

Two service-oriented organizational models have recently been developed and are now being used. Both are called Subordinate Service Districts (SSDs) with the model for water and/or wastewater services tagged as “Environmental” Subordinate Service Districts (ESSDs).

There are two subordinate service district statutes: one for Counties, called Subordinate Service District (1982) under M.S. § 375B, and the other for Townships, called Subordinate Service District (1989) under M.S. § 365A. Their purpose is to provide, to a more

extensive degree within a defined area, a service that they already provide to their constituents. The people that benefit from the service also pay for it. This allows it to be more acceptable to the governing entity, since other people's tax dollars are not used. Since this model is used to retrofit and repair wastewater systems, costs tend to be higher than with a standard system. Involvement throughout this whole process affords landowners the opportunity to have input and ownership. They have ultimately agreed to pay the bill by petitioning for this service District!

Counties have had a little more difficulty in working with their statute because several departments need to work together to resolve budgetary and other concerns. There have been a few County Subordinate Service Districts started, but they take longer to complete and are more complicated.

The County Subordinate Service District can be created either by petition of 10 percent of the qualified tax voters in the proposed *contiguous* area or by resolution of the County Board. Unlike the Township Subordinate Service District, once the district is implemented and passes the sixty-day referendum, it can be dissolved by resolution or by petition of 10 percent of qualified tax voters in the district area by election. This detail can put a County at risk for the costs of a project.

Advantages:

- ✔ Can change and evolve over time as the needs change
- ✔ Relatively easy to create in a short time
- ✔ Costs for services borne only by those who use the services
- ✔ Local residents can find their own solutions.
- ✔ Management can be shared by residents, utilities or other providers.
- ✔ Can encompass varied areas or sizes but never the whole Township or County—it is subordinate to the governing entity that completes it.

Disadvantages:

- ✘ Township SSDs are created by a petition of 50 percent or more of the residents involved. (Suggestion: Provide education early and obtain more than a simple majority to start.)
- ✘ Education and preliminary cost estimates should be done ahead of time.
- ✘ It takes more time working with a governmental entity than doing it yourself.
- ✘ It requires a petition of 75 percent of the property owners to dissolve Township SSD.
- ✘ The Township must make sure that all costs are recoverable and an accountable service provider manages the system.

Other Organizational Models

As interest in the environment has become more focused on "dirty water" or wastewater, a number of nonwastewater organizations have sought legislation to enable them to regulate wastewater.

● Homeowner and Lake Associations

Homeowner Associations are frequently created when parcels of land are subdivided or parceled out through the Subdivision Ordinances, M.S. § 505. Mandatory association membership of the residents and other controlling conditions such as wastewater treatment may be incorporated within the covenants of the subdivision as a condition of final plat approval by the local government. These stipulations are then agreed to when residents purchase property in the subdivision. The conditions owners agree to are usually intended to establish a pleasant subdivision and maintain the aesthetics of the area. Homeowner associations typically operate through a board of directors who manage and maintain the subdivision. A number of ownership associations are organized as nonprofit organizations or limited liability partnerships (frequently used in golf course agreements).

Lake Associations have been strongly involved in lake water quality issues and fighting pollution problems. Like homeowner associations, they may cover part or all of a lake region and can be formally or informally created to take care of the lake and protect it. Sometimes they have been formed as nonprofit organizations with some powers; however, it is difficult for them to take on legal authority to deal with wastewater. Often, lake associations are the catalyst between the landowners on the lake and the local township, city or county governments to help get a project done. Sometimes one of the legal entities will help with funding to get some initial planning completed or be the fiscal host for a survey of onsite wastewater systems in the area. Both of these groups have direct impacts on the landowners they represent.

Advantages:

- ✔ Play a strong role in the early and ongoing education of residents
- ✔ Can help finance projects, especially for early planning phases of projects
- ✔ Valuable in identifying the need for projects
- ✔ Can play a direct role in the management of systems (read meters, etc.)

Disadvantages:

- ✘ May lack long-term accounting and management abilities/skills.
- ✘ Can have difficulty with fee collection and enforcement of rules on fellow members.
- ✘ Commonly lack ability to levy for funds for maintenance and future capital investments.
- ✘ New homeowners frequently lack the knowledge, interest and incentives of the original organizers, especially if they are third- or fourth-generation owners or lack long-term "family" history with the lake.
- ✘ Lack of direct accountability to a governmental entity

● Joint Exercise of Powers Agreements (1943–1999)

Agreements can be made between governing entities that have similar or like powers under M.S. § 471.59. They must hold hearings and complete a carefully outlined and defined agreement that spells out the powers and responsibilities for both entities. Normally a board is appointed to represent the entities and this group would have to be insured.

These agreements have been used for Fire Districts, community halls, and so forth; however, it is not known if they have ever been used to implement and sustain wastewater or water projects. One reason that they might not be used in these instances is that either entity can undo the agreement by written notice and therefore this is not a reliable tool for a long-term project. Second, most entities do not want to bond for these projects and have the debt considered part of their net debt, because if there is a default by one of them, the rest would be required to levy on their constituents for the recovery.

Advantages:

- ✔ Enables problems to be resolved that clearly cross legal/governmental entities
- ✔ Agreements carefully spell out the powers and responsibilities.
- ✔ Are used frequently for special projects

Disadvantages:

- ✘ Either partner may withdraw from the agreement, perhaps leaving the other with on-going financial obligations.
- ✘ Bonding to finance projects may affect the other entity's financial obligations.

● Lake Improvement Districts (1990)

Lake Improvement Districts are created by the County under M.S. § 103B.501 by resolution, or upon a petition of 26 percent of the property owners within the proposed area. The purpose of these Districts is to promote improved lake water quality as well as the public health and welfare of the area. They are typically not wastewater oriented. They usually cover a designated watershed area and concentrate on special projects such as studies and projects dealing with pollution problems, weed control, drainage issues, dams and surface zoning.

In recent years, more powers have been given to these Districts to tackle water quality problems, although the County remains the legal entity for final decisions on levy powers. If the area extends into more than one county, a Lake Improvement District can jointly or cooperatively establish the District. The County is responsible for the bonding, construction, operation and maintenance of the District.

Advantages:

- ✔ Can be created by petition of 26 percent of the affected residents
- ✔ Is focused on promoting water quality
- ✔ Can look at wastewater on a watershed basis

(continued, next page)

Disadvantages:

- ✘ Typically not focused on wastewater issues
- ✘ Can be created with a small percentage of the residents

- ✘ The county remains the legal entity and may not want to manage a small area.
- ✘ All county residents may become liable for costs incurred.

● Rural Water User Districts (1978)

Water User Districts under M.S. § 110A have been used for water pollution issues and thus deserve a note here. They may not be organized in Anoka, Carver, Dakota, Hennepin, Ramsey, Scott or Washington Counties. Their purpose is to regulate the conservation, storage, distribution and use of water. The District is created by a petition to the Court by 50 percent of the landowners and a resolution from the city, if a portion of a city is included. The District does not have the power to levy or to tax. All capital and operating expenses are borne by the users in proportion to their use of water supplied by the district. To date, there are not many of these districts in existence and this model is not being used directly for wastewater use. There are some additional legal and other complex problems with bonding, levy and enforcement powers that need to be reviewed before this model could be considered for use.

● Watershed Management Organizations (1990)

Under M.S. § 103B.205, Watershed Management Organizations (WMOs) are defined as a watershed district wholly within the metropolitan area or a joint powers entity established wholly or partly within the metropolitan area by special law or by agreement that performs some or all of the functions of a watershed district for a watershed and that has the characteristics and the authority specified under M.S. § 103B.211. Lake Improvement or Conservation Districts are not watershed management organizations. WMOs participate in water planning and implementation and its effect on the water quality in the urban growth area.

● Watershed Districts (1990)

Watershed Districts under M.S. § 103D are local units of government implemented to solve and prevent water-related problems and to practice resource conservation within the boundaries of a natural watershed. Usually they are named after that watershed. They may be formed for flood control or water quality protection within that watershed. To form a watershed district, local residents, cities or, usually, county boards petition the Board of Water and Soil Resources (BWSR). Hearings are held and once a Watershed District is created, a Board of Managers is usually appointed by the entities involved to manage it. Recently, some watersheds have considered asking for statutory powers to deal with wastewater pollution issues within their boundaries.

It is important that as you review the different organizational models, you find one that fits your needs and that you can work with successfully.

Finding the Best Fit

There are many reasons to consider an organizational model for your group projects. Some organizational structures have been successful for a long time and cover very large demographic areas, while others have been unsuccessful because they lack statutory powers for

bonding, financing, enforcement and ordinance work. Recently there has been an interest in developing more flexible tools to help landowners in lake regions as well as in subdivisions and areas around cities. The most flexible model has been the Subordinate Service District, which uses the local utility to provide the final component in the picture—management and maintenance as well as long-term accountability.

It is important that as you review the different organizational models, you find one that fits your needs and that you can work with successfully. It is also important to realize that the system will be there for a long time, and therefore, your involvement throughout the project from beginning to end is also very important.

A final tip: When you have decided on the type of organizational model that will fit your needs, be sure to work with an attorney familiar with the model to get it set up correctly.

Resources

Minnesota Board of Water and Soil Resources

1 West Water Street, Suite 200
St. Paul, MN 55107
PH: 651-296-3767

A good contact for information about such organizational tools such as Watershed District, Lake Improvement Districts, Watershed Management Organizations

Minnesota Pollution Control Agency Publications

- Regional Wastewater Treatment: Sanitary Districts and Cooperative Agreements
- Creation of a Sanitary District Under Provisions of Minnesota Statute 115.18 to 115.21
- Frequently Asked Questions About Formation of Sanitary Districts under Minnesota Statutes 115.18 to 115.37
- Checklist for a Complete Petition (Sanitary Districts 115.19 to 115.20)
- Water Quality Cooperatives—Area-wide SDS Permits

Order from Minnesota Pollution Control Agency, 520 Lafayette Road N, St. Paul, MN 55155-4194. Visit www.pca.state.mn.us or call the ISTS Information Line at 651-282-6246; to speak to a district representative call 800-657-3864.

Minnesota State Legislature

You can review the current statutes regarding Sanitary Districts by contacting them at: www.revisor.leg.state.mn.us.

Chapter 6

Financing Wastewater Systems

JIM KIEHNE

"And over here, we have our new self-financing model."

". . . there should be focus on how the costs of a new system can be kept affordable, rather than simply focusing on where to get the money."

—From *Assessing Wastewater Options for Small Communities: Trainer Manual For Local Decision Makers*, National Environmental Training Center for Small Communities

When cost estimates for a wastewater project become known, people start to wonder if there is a source of "free money" they can tap into. This perception was created in the 1970s when federal construction grant funding was flowing freely and everyone was able to get it. Unfortunately, this perception still lives on.

To get the best deal you need to consider all financing options

The truth is that today, short of low-interest loans, most people pay out of pocket to replace or repair their own wastewater systems. Most landowners realize that this is their responsibility, just as they understand they are responsible for purchasing a new car or toaster when the old one breaks down. However, to get the best deal you need to consider all financing options, just as you would for a home loan.

This chapter provides a basic outline of the principles involved in financing wastewater projects. It discusses private and public grants and loans from local, state and national funding sources.

Since financing and grant/loan application rules are always changing, this discussion does not go into detail about how to complete applications. However, it does give you some tips for getting them completed. When applying for grants and loans of any kind, communities may want to use professionals: you may need the services of an attorney, accountant, a grant or loan writer, an engineer and others.

The Genesis of "Free Money"

Back in the good old days, money was abundant, especially for large projects to protect lake areas and clean up the environment. Congress had passed the Clean Water Act and the Federal Pollution Control Act and authorized money to do get the job done. If a project received a high priority rating because of need and water quality problems, it may have been subsidized nearly 100 percent.

Today it is very rare that grant money is available. Grants are normally made for research on new technologies, for planning and feasibility studies for large areas with multiple and complex issues, and to help low income areas. Grants may possibly be used to buy down the initial costs of a project when the debt service and operation and maintenance costs exceed a prescribed percentage of the homeowners' income levels.

Today it is very rare that grant money is available.

In the 1980s, Congress began to cut grant funding and established 20- to 30-year low-interest loans for wastewater systems. Congress also required that federally funded projects set up a *sinking fund*—or depreciation fund—that would provide cash to replace equipment in the system when it wore out. Most projects showed that fund on paper, but when it became necessary to repair or replace equipment, they did not have the cash to do it. Today small communities in rural areas still face major wastewater problems because they were never rated as high priority in earlier legislation. Many rural residents now raise fairness issues and questions of ethics because the new position of Congress is that communities must pay for their own projects, although low-interest loans may be available to help.

There are many concepts and numbers to grasp as your community works through financing a project. If the project is very large, you will need a professional who has had experience organizing finances and completing applications. Look for a grant writer with knowledge, skills, experience and success in these kinds of projects. He or she must be willing to take the time to understand your situation and needs. Be sure to check references. There are no guarantees in applying for grants or loans, but a grant writer who understands your project and has sufficient information to build a good application can be more helpful, and more successful. Keep in mind that even when you *hire* someone to write your application, you may still not get the funding.

Funding Concepts

Life cycle costs and *capacity development* are two terms homeowners should understand before starting to look for financing for a community wastewater project. These terms help you to understand concepts used by engineers and funding organizations.

Life Cycle Costs

The concept of *life cycle costs* is frequently used by engineering professionals but may be unfamiliar to landowners. It simply means looking at the total cost of a project over its life, including design, construction, operation, maintenance, repair and replacement. Life cycle costing includes the capital or construction costs plus related expenses such as land acquisition, engineering, legal fees, etc., and also the operation and maintenance costs of the system over a specified period of time. Usually this is a twenty-year period (standard in the profession), but it can be done for a longer or shorter lifetime as desired.

Doing life cycle costing on a project helps the decision process.

Total life cycle costs can help homeowners understand the project and how it might fit your community. After reviewing a project's life cycle costs, homeowners may better be able to choose one of these two solutions:

- a solution that has a high initial capital cost with low operating and maintenance fees. This may be more appealing to people on fixed incomes who cannot afford high monthly costs; or
- a solution with a low initial capital cost if they are willing to pay higher operating and maintenance fees over the life of the system. This may be more appealing to young families with growing incomes.

Doing life cycle costing on a project helps the decision process. Be careful to consider any differences in the years of life when comparing proposals.

Capacity Development

The concept of *capacity development* has developed popular support and is being readily adopted. This is promoted by the Environmental Protection Agency (EPA) and may ultimately allow

the agency to select financially stable projects to fund. It is currently being used with drinking water systems, but is beginning to be used for wastewater systems as well.

The three components to the capacity of a system are fiscal capacity, managerial capacity and technical capacity. Does the system ***fiscally*** have revenue sufficiency, credit worthiness and good fiscal management and controls? Does the system ***managerially*** have ownership accountability, staffing and organization with effective external linkages to sustain and maintain it? Does the system ***technically*** have the continuing technical knowledge to support it, adequate infrastructure to maintain it, and the ability to implement any necessary changes to sustain it for the long term? If the project developers can answer "Yes" to these questions, and still need funding, money will be lent to help them out. The ultimate goal of the EPA is to have both water and wastewater systems self-sustaining in the future.

There are three levels of financial assistance to be considered—local, state and federal.

These two concepts, *life cycle costing* and *capacity,* will be used when a project requests funding. Therefore, when considering an application, especially at the federal level, be sure to use these concepts to frame your request for financial assistance. A project may receive funding once without a plan using these concepts, but is more likely to get funded and receive more money if it includes both of these proactive approaches.

Funding Resources

There are three levels of financial assistance to be considered—local, state and federal. As you go further up the funding ladder, there are additional strings attached, more hoops to jump through and usually more formality to the application.

Thoroughly review all of the requirements of the potential funding source being considered, because there are times when the reporting and work required to meet the requirements may cost more than the funds applied for. Money is usually requested to do feasibility studies, planning and construction of the project. Occasionally funds for research on a project may help with operation and maintenance costs for testing and analysis, but this is very infrequent.

Local Funding Resources

At the local level there are many resources to consider. Several are described briefly below; however, keep in mind that not all are available statewide and funding varies from region to region. Seek out those in your area, and discuss criteria and timelines with their local contacts before beginning the application. Local contacts are extremely valuable resources; using the information they provide will pay off with a much better application.

- **Local lending agency (bank, credit union, etc.).** You may already be their client, and they may consider it a public service to help a group by offering a lower interest rate when it could help local economic conditions. They may also have a target to help low-

income groups to promote economic development in their communities. Group income levels must be documented.

- **Watershed Districts** may consider financing certain projects such as on-site wastewater surveys and/or feasibility studies and planning.
- **Local lake associations and water quality groups** usually will consider the same projects as watershed districts and may help with education and survey work.
- **County Water Plans.** County water planning agencies identify water quality problems and may allocate money for remedial actions. Contact the county offices to find the County Water Planner for information on this possibility. Although it may be a small funding source, it can get you off to a good start. Your County Soil and Water Conservation District may also be helpful with this, especially if you need help in land restoration.
- **Corporate stewardship funding.** Many large corporate groups make a financial commitment or annual allocation to their communities for protection of the local environment and economy. These include corporations and organizations such as Blandin, McKnight (Initiative Foundation), Potlatch, Bremer Foundation, Water Foundation, Rural Electric Utilities and many others. Availability of funds frequently depends on the economic standing of their corporations at that time.
- **Regional Development Commissions (RDCs).** RDCs may know of specific sources or be able to direct you to other possible contacts. They may also be helpful with some technical assistance. Local county offices should be able to help you locate them.
- **County septic loan programs.** Check with the local County Environmental Services, Planning and Zoning or Health Department. Some have implemented local loan programs from permit proceeds or special state loan funds. Keep in mind that they may have some criteria for giving out these funds.
- **Economic Development Authority (EDAs).** Local EDAs sometimes contribute funds if economic development benefits can be demonstrated.
- **Township/County Subordinate Service Districts under M.S. §§ 365A, 375B.** These governmental entities can secure funding at lower interest rates because governments are tax-exempt and can get lower rates. Townships using the Special Assessment procedure under M.S. § 429 can issue bonds for these projects and work with local banks to negotiate a reasonable interest rate.
- **Iron Range Regional Rehabilitation Board (IRRRB).** In northeastern Minnesota, the IRRRB has often funded projects to help low income, economically depressed and environmentally sensitive areas.
- **Endowments.** Occasionally a private party will endow a project, but this is a rare event.
- **Initiative foundations.** Across the state, the McKnight Foundation funds local initiatives dedicated to the region. Many of these foundations are working successfully with lake regions and economic development programs and may consider an application for some part of a project. They may also offer training to help facilitate a successful process.

To find out more, contact local county and township people as well as the local economic

development authorities. You may need to go directly to the financial contact in some sources. Remember that your project must have merit and be an asset to the area, with a goal of protection of human health, the environment and groundwater quality.

State Funding Sources

At the state level of funding there are typically more hoops to jump through to apply for grants and loans than at the local level. If you do receive a financial award, you will have added the responsibilities of reporting and fulfillment of the contract that you initiate between yourself and the state. You may wish to consider some staffing to do this.

- **State Revolving Loan Funds (SRF funds)** are low-interest loan funds available for municipal wastewater and non-point source projects. The *State Revolving Fund* (also known as the *Water Pollution Control Revolving Fund*) is managed by the Public Facilities Authority (PFA). For municipal wastewater projects, the application process begins by submitting a letter that requests placement on the *Project Priority List* to the Minnesota Pollution Control Agency (MPCA). Once a facility plan has been submitted and approved by the MPCA and is ready for construction, the project can request placement on the *Intended Use Plan*. This is the list of projects to receive loan funds each year. To be eligible for funding, projects must be publicly owned, but all types of systems, including individual septic systems, can be funded if they are publicly owned, managed and maintained under a centralized management structure. The application deadlines are about April 28 each year.

- **Wastewater Infrastructure Funds (WIF funds)** are state grant funds used in connection with the SRF loan program and with USDA Rural Development grant and loan funds. All projects must begin by requesting placement on the MPCA's Project Priority List. Projects that are eligible to apply to USDA Rural Development must follow the Rural Development application process and funding criteria. Projects not eligible to apply to Rural Development must follow the SRF application process described above. WIF grant funds are awarded on the MPCA's Project Priority List and the project's readiness to proceed. WIF grant funds are very limited and there are always more applicants than available funds. That does not mean you should not try for them; just be aware of the eligibility requirements and deadlines and work accordingly.

- **Drinking Water State Revolving Funds** are available for municipal and nonmunicipal drinking water projects. The program is managed by the PFA in conjunction with the Minnesota Department of Health. Applications must first request placement on the Health Department's Project Priority List by late May each year. When projects are ready to proceed with construction, they must request to be placed on the Intended Use Plan prepared by the PFA. The Department of Health will review the technical standards in an application and the MPCA will review the design standards and issue the permits.

- **Individual Sewage Treatment System (ISTS) Programs** are associated with the MPCA, and financed by the legislature. The amount and kinds of funds available vary from year to year. Currently, there are two programs, one for individual system repairs and replacements and one for community wastewater treatment systems. Both programs are in high demand and do have criteria (income levels and others) that must be met before funding is given.

- **Department of Agriculture Best Management Practices Loan Program** is funded in part by the SRF and was designed to help on-site systems and to encourage use of agricultural best management practices. Application is made through counties and Soil and Water Conservation Districts. Recently, the criteria were amended to include homeowners' on-site systems. Only a few counties have made use of this program to date. Check in your county for this program.

- **Clean Water Partnership Program** combines state grant funds and SRF loan funds to fund a variety of nonpoint source projects, including septic system upgrades. The program is administered by the MPCA. Eligible applicants include counties and watershed districts.

- **Small Cities Development Program** is a grant program administered by the Department of Trade and Economic Development (DTED) and funded by federal community development block grants. Criteria allow some wastewater treatment projects when funds are used for remediation or in conjunction with improving housing. The program is very competitive. Applications are due to DTED by October 1. In St. Louis County and the metropolitan area, federal block grant funds are administered directly by the counties.

With all state funding programs it is extremely important to know and meet all application deadlines.

The State Register provides *Notification of Financial Availability (NOFA)*. Along with this notification, they list all the criteria to qualify and deadlines for applications to be received. They are found in local law libraries and on the Internet.

With all state funding programs it is extremely important to know and meet all application deadlines. Most of them have only one or two deadlines each year. If you miss a deadline you may miss an entire construction season! Even when the deadlines are met, if your project needs grant funds, you may find the process takes several years or more until funds are available so the project can start construction. To find out more about these funding resources, contact the agency or department listed for each program.

The concept of a *bond bank* has raised considerable interest in some states. These banks consider funding wastewater projects in communities with populations of less than 10,000. In Minnesota, the PFA is essentially a bond bank involved in the management of drinking water and clean water SRF funds. This allows them to provide low-interest loans to all but the lowest priority projects, and to save borrowers many of the costs they would incur issuing their bonds in the private market.

Federal Funding Sources

When you apply at the federal level for financial assistance, it is highly recommended that you work with a professional. Applications to the federal government have more formality and many legal implications attached to them. They also have strict reporting requirements that most often require knowledgeable staff to meet audit compliance. Usually, an accountant is important at this point.

Frequently homeowner income thresholds determine eligibility for federal loans or grants. Based on the 1990 census, eligibility requirements were a household income threshold of $27,481. While this will likely be changed when 2000 census data is used for recalculation, this income figure provides some frame of reference.

Tips for Applying for Financial Aid

- ***Do your homework*** (needs assessment Chapters 2 and 8) so you know your community's situation, strengths and weaknesses. Then find answers to the weaknesses and turn them into strengths.
- ***Work with funding contacts*** to get information to complete funding applications and be respectful of their time.
- **Attend any workshops** offered regarding the application; they will provide ideas and beneficial networking as well as an opportunity to learn about your competition.
- ***Set up a timeline*** to get work completed.
- Break the application into **working portions.**
- **Write and rewrite; have others review** your application narrative.
- ***Schedule*** and make sure all necessary formal resolutions are ***completed on time!***
- ***Consider comparing and contrasting.*** A cost-benefit analysis that shows and justifies need is usually requested.
- ***Be realistic*** in the amount of the grant or loan you are requesting.
- ***Submit your application as requested and meet deadlines early;*** this reflects interest.
- **Consider expectations** of the lender or grantor: What do they want in return?
- If the project dollar amount is too large, ***consider staging the project*** over a period of years.
- ***Leverage a very large project;*** do not go to just one source. Identify all other sources where you are applying and show a percentage of funding coming from those to meet the projects needs. Ownership and willingness to pay your own portion is one way to show that commitment.

- **USDA Rural Development**, formerly the Farmer's Home Administration, is the most frequently used funding source for small communities under 10,000 population. The application process is coordinated with the state SRF and WIF programs so the first step is submitting a request to the MPCA for placement on the Project Priority List, which is due about April 28 each year. This program will also use matches, such as state WIF and other federal sources, to help out a project if it has the right ranking and need.
- **Intermediary Re-Lending Program (IRP),** also handled through USDA Rural Development, is used for economic development. Recently the criteria have been relaxed and, if certain conditions are met, there could be some funding for feasibility and planning of wastewater projects.
- **319 Clean Water Partnership Program Funding** has an educational component and some selected criteria. It is offered annually and funded by Congress. The funding level is at the political mercy of Congress. The program is administered by the MPCA in coordination with the State Clean Water Partnership funds described above.

Because obtaining funding for projects can be such a foreign, confusing and complicated process, there are many sources of information that must be considered. Many consultants, engineering firms, local government staff and written and Internet sources can be very helpful. Because it is a large, ever-changing set of information, using more than one source and verifying the information received is important.

There are a number of publications that announce grant applications. Subscriptions to these vary from free to as much as $387 annually. A list of these is found at the end of this chapter. A word of caution here: Most of these relate to a more general national arena and will not apply to smaller projects. We suggest that before you delve into these applications you check with others that have used them.

Do Your Homework

It is important to accurately identify your project's goals, resources and the amount of money needed to complete the project. There are many sources of funding from private and public money at the local, state and national level. The larger the project and the higher the level of funding, the more details and information you will need to provide up front and the more oversight and reporting will be required at the end.

Before you accept any type of financial assistance, read the materials carefully to know what you are getting into and what is expected from you.

Sometimes you find the right combination of financing to help your community. The story of Wabedo Township (Cass County, MN) in Chapter 8 is a good illustration of using combinations of financial resources. Other times it seems that the odds are stacked against you. Do not give up, since the rules are always changing. Use this chapter as only a starting point for your search.

Resources

Federal Funding Sources for Rural Areas

This is a resource book from the National Environmental Training Center for Small Communities (NETCSC), a nonprofit clearinghouse located at the West Virginia University in Morgantown, West Virginia. The catalogue number is # FMPCFN 15; order by phone at 800-624-8301.

Federal Register NOFA (Notification of Financial Availability)

Available at local law libraries or by accessing the Internet through EPA web sites.

The Foundation Directory

This is a comprehensive directory of the giving interests from the nation's largest grant-making foundations. It is updated periodically and available from the Foundation Center, 79 Fifth Avenue, 8th Floor, New York, NY 10003. Foundation Center Cooperating Collections are free funding information centers around the U.S. In Minnesota, they are located at the following locations: Duluth Public Library; Southwest State University in Marshall; Minneapolis Public Library on Nicollet Mall; Rochester Public Library; and the St. Paul Public Library on Fourth Street.

Guidebook of Financial Tools

This is a new CD-ROM available from the Environmental Finance Center at Boise State University. It can be downloaded at www.epa.gov/efinpage/guidbk98/index.htm. This guidebook is for the dedicated grant/loan application writers who need ideas and possible funding sources in their state. 692 pages.

Guide to Minnesota Foundations and Corporate Giving Programs for Minnesota

This is a comprehensive directory of the principal grant-making organizations in Minnesota. Address is: Minnesota Council on Foundations, 800 Baker Bldg., 706 Second Avenue South, Minneapolis, MN 55402-3008.

HELP! EPA Resources for Small Communities

Available from National Environmental Training Center for Small Communities (NETCSC). The catalogue number is # GNBLGN 01; call 800-624-8301.

Minnesota Pollution Control Agency Publications

- State Revolving Fund Programs for Wastewater or Storm Water Facilities
  Includes information on Project Priority List, Facility Plan Requirements, Intended Use Plan, Certification, Final Approval Process)
- Facts About Clean Water Partnership
- Facts About Clean Water Partnership Loans Through the State Revolving Fund

Contact Minnesota Pollution Control Agency, 520 Lafayette Road N, St. Paul, MN 55155-4194. Visit www.pca.state.mn.us or call the ISTS Information Line at 651-282-6246; to speak to a district representative call 800-657-3864.

Public Facilities Authority Publications

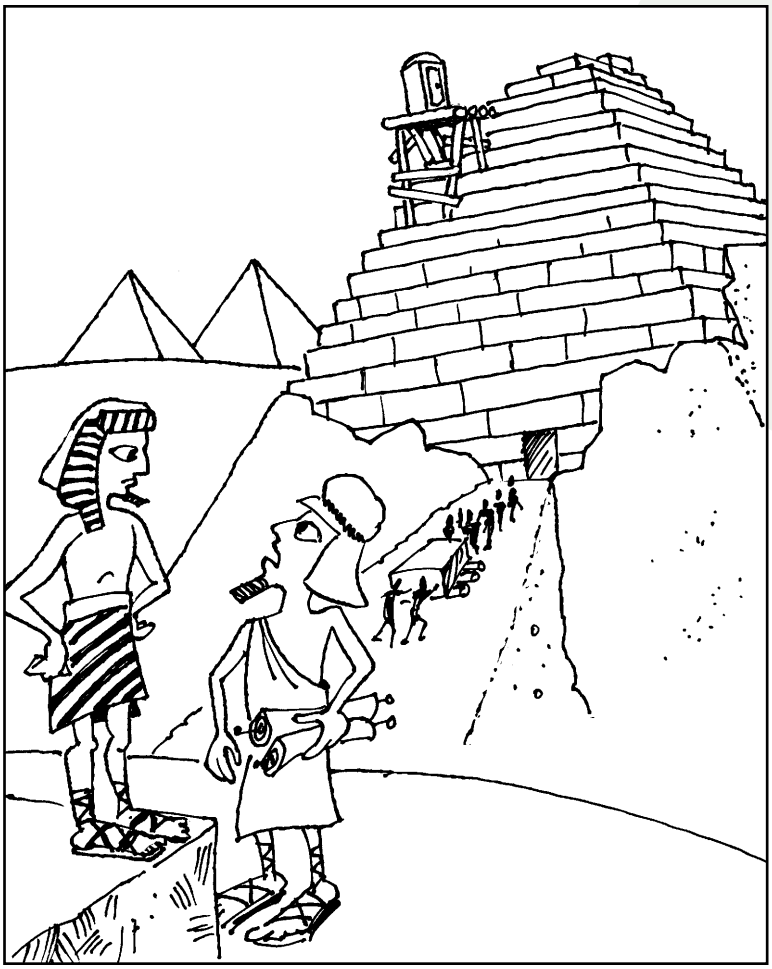
- Drinking Water Revolving Fund
- Small Cities Development Program
- Water Pollution Control Revolving Fund
- Wastewater Infrastructure Fund

Fact Sheets available at www.dted.state.mn.us (follow: "Community Development" and "Assistance Programs"). Public Facilities Authority–Minnesota Department of Trade and Economic Development; 500 Metro Square, 121 7th Place East, St. Paul, MN 55101-1246; 800-657-3858.

US Department of Agriculture (USDA) Rural Development Website

www.usda.gov/rus/water/programs.htm

Chapter 7 Working with Professionals



JIM KIEHNE

"Some of the workers aren't too happy with that waste management consultant you hired, Rameses."

"Many professionals may be biased toward particular technologies, so they may not seriously consider options they are unfamiliar with or simply don't like."

From *Assessing Wastewater Options for Small Communities: Trainer Manual for Local Decision Makers,* National Environmental Training Center

As you assess your community's wastewater needs and available options, you may need to consult and otherwise work with many different people and groups. Some of these people may be biased toward particular technologies or options. The ability to recognize these biases can help the steering committee address community concerns.

This chapter is designed to help your steering committee work with the broad spectrum of consultants you may need to assist you as you work to meet your community wastewater needs. You will learn guidelines for picking a qualified consultant who will fit into your community effort and establish a way to evaluate proposals.

Screening proposals, interviewing candidates, checking references and involving the community in the process are time-consuming tasks, but they are all necessary because your community will be living with the consultant's work for many years to come.

Be Aware of Possible Bias

No one is free of bias. Life experiences and values shape the way people perceive and interact with others. For example, in the context of this guidebook, *wastewater treatment* connotes the safe and adequate handling of sewage to prevent degradation of public health or the environment. However, for some people the idea of wastewater treatment may evoke strong concerns about increasing suburbanization of a rural landscape, or escalating costs for infrastructure operation and maintenance. Both interpretations could be correct, and neither may be—each person imposes meaning on the words based on his or her concerns and experiences. As your steering committee members listen to and interact with each other, community members and professionals involved in working on such a complex effort as identifying appropriate wastewater treatment options, they may discover that many familiar words were used, but radically different meanings were communicated.

Everyone has some bias and vested interest in the outcome of a project.

A goal of this guidebook is to help community planners become *critical thinkers* with respect to the information, concerns and recommendations of the people they need to work with. It provides the tools they need to assess data and to make independent, informed judgments and choices. Everyone has some bias and vested interest in the outcome of a project. Accepting this makes it easier to understand how concerns can be effectively addressed to the maximum benefit of the community. Indeed, the bias any project participant shows can help identify the project's legitimate weaknesses or areas requiring careful consideration in order to develop the best possible outcome.

Some Examples of Bias

Listed below are some people and groups you may need to consult, please, or work with as you assess your community's wastewater needs and options. *The list shows possible biases such people may have, but remember these are stereotypes and generalizations and may not always be true.*

Engineering or consultant firm

- Prefers high-tech solutions
- Profit margin is greater on larger projects
- Prefers familiar technologies
- Familiarity with new information

Wastewater Regulator

- Prefers familiar technologies
- Prefers systems easy to inspect and maintain
- Prefers proven technologies
- Prefers to let someone else deal with difficult situations/problems

Community Planner

- Personal preference (for example, to protect rural densities or encourage urbanization)
- Prefers familiar options
- Restrained or pressured by elected officials or a planning board who view situations differently

Resident on Fixed Income

- Worried about ability to pay, impact on tax values, monthly utility bills and other corollary costs

Community Expert

- Advocate for familiar technologies; may be unwilling to consider alternative ideas or options

Economic Development Advocate

- Desire to provide excess capacity to accommodate potential growth

City Administrator

- Desire to have the city grow and prosper under their administration
- Desire for prestige and rewards associated with a burgeoning community

Educator/Researcher

- Prefers familiar technologies
- Research results may lack proof in real-life applications
- Prefers new/high-tech solutions

The ability to recognize these biases can help the steering committee address community concerns.

Chapter 1 recommended steps and actions to help community members shape and guide the changes they want to occur. These steps, which are further explained in Chapter 8, are:

- Form a Steering Committee
- Articulate a community vision
- Develop a work plan
- Keep Everyone Informed
- Implement and evaluate the project

Be sure the door is open to the entire range of options to meet the needs of the community.

As Chapter 8 leads you through articulation of a community vision, it intentionally focuses on the positive outcomes (and limitation of negative consequences) rather than any specific technology. This process lets you be sure the door is open to the entire range of options to meet the needs of the community. However, the ability to continuously recognize the bias throughout the entire community process remains a constructive tool to help the steering committee fully address legitimate concerns, and not dismiss legitimate options before they have been adequately evaluated.

Because professional relationships by definition include a fiscal relationship and potential liability, the following section pays special attention to protection of all parties. Although nonprofessional relationships do not typically require definition of duties or development of contractual obligations, the guidance included in this section on defining your community needs prior to identifying solutions is also likely to be useful in these more informal relationships.

Likewise, the suggested ways of fairly and equitably ranking options or candidates may be more formal than a nonprofessional relationship requires. They are based on the principals of fairness and respect for all parties, qualities most likely to help maintain a constructive atmosphere and attitude for all parties that participate in the community process.

Working with Consultants

A consultant is defined as *any professional associated with a private firm, nonprofit organization or university who provides specific information, training or services in exchange for a fee.* Some, such as attorneys and engineers, are licensed and regulated by the State of Minnesota. This regulation assures that the consultant meets a minimum standard of training in accepted professional practices in his or her discipline.

The following section can help community groups work with the broad spectrum of consultants in the areas of wastewater system design, installation, inspection, management, or administration activities. The same principles apply to other consultants who provide assistance in environmental assessment and analysis, lake management, aquatic habitat restoration, governmental experience and knowledge, or any specific area of expertise.

How to Hire a Consultant

Some firms and individuals may have expertise in many or all of the activities listed above. Your key concern is how to pick a *qualified* consultant who will complement and fit into your

community team effort. Once you have determined that a specific consultant is necessary to solve the problems at hand, here are the steps to take.

1. Define Your Problem

You must be able to describe the problem and the services that you need from the consultant, otherwise the consultant will define them for you. This can be wasteful and is often dangerous. The more specifically you can define your needs, the more likely you are to get what you need.

To better define your problem, discuss the matter with a number of consultants over the phone. You will find a thorough listing of consultants in the Yellow Pages under the appropriate listings, such as **Engineers-Environmental**. Short phone consultations are free and most consultants will tell you whether they are interested and capable of providing the services that you want.

Another source of consulting expertise is the faculty of local colleges and universities. Faculty can sometimes provide such services, either as part of their academic duties or as an adjunct activity. A third source of referral is other communities, neighborhoods, lake associations or groups with a similar problem. Find out from them how they resolved it and who helped them.

If the services you require are routine, a consultant with general abilities will be satisfactory. However, you may need a specialist if the problem and the scope of services required are unique. For example, many engineers have a general knowledge of wastewater treatment, but a far smaller group specializes in low-cost systems for rural communities with shallow depth to groundwater. If the problem is very unusual, it may be necessary to seek a consultant outside your immediate geographic area. Just remember, a specialist or a nationally known expert will cost you more money.

One of the best ways to guard against a consultant's bias for a particular technology (or management model, or fiscal structure) is to be familiar with your options. If you question the counsel you receive, don't hesitate to seek additional opinions. You wouldn't undergo radical surgery without seeking a second opinion; likewise, don't commit substantial amounts of your community's money or risk implementing an inadequate treatment system for fear of questioning "the experts."

What Consultants Do

- **Attorney**

  Interprets federal, state and local laws, rules and regulations and written policy. Represents clients in legal proceedings, including development and administration of contracts.

- **Civil, Sanitary or Environmental Engineer**

  Designs and supervises all elements of construction of buildings, roads, sewers, water lines, power generating facilities, etc.

  May also provide technical advice on zoning and subdivision regulations, lake restoration efforts and environmental impact studies.

- **Licensed Surveyor**

  Prepares legally enforceable maps of real property.

- **Architect**

  Designs residences and commercial buildings.

- **Landscape Architect**

  Prepares landscaping plans for properties.

- **Planner**

  Develops long-range plans for the development of local infrastructure and government services.

- **Scientist**

  A professional with expertise in areas such as soils, geology, ecology or environmental chemistry who provides technical assistance in his or her areas of expertise.

2. Develop a Request for Qualifications (RFQ) or Request for Proposals (RFP)

Once you have defined your problem you are ready to develop a Request for Qualifications (RFQ) or a Request for Proposals (RFP). The RFQ is a formal request for a listing of qualifications from firms or individuals that you may consider working with. The RFP indicates that you will review specific proposals and hire someone for your project.

The more specifically you can define your needs, the more likely you are to get what you need.

A *Request for Qualifications* is general and easily reviewed. It is used to narrow the field of candidates with whom you plan to share the RFP. The more specific you are in your RFQ the better the firms will be able to demonstrate their experience and ability in providing the type of work you are seeking. A well-written RFQ asks for:

- specific licenses, certifications, education or other credentials you require;
- deadlines, limits to proposed activity or other time constraints;
- types of references needed (for example, a specific type of wastewater project for rural communities with a population under 2,000);
- completed projects nearby;
- types of services offered;
- types of equipment or special services available; and
- a fee schedule or price structure.

After discussing the issue with a number of consultants, develop a *Request for Proposals,* which states the problem and details the scope of proposed services to be provided by the consultant. The RFP may or may not include consultant minimum qualifications or estimated cost of the services to be rendered. You might also want someone from your County Environmental Services or Planning and Zoning Department to look over the RFP before you transmit it. Governments do not normally provide lists of qualified consultants, but they will, time permitting, review RFPs and proposals that are subsequently received. Transmit the RFP to at least five, and preferably ten, consultants. A well-written RFP includes:

- a deadline for response;
- the name of a community contact, with phone number and e-mail in case the contractor has questions about the RFP;
- similar contact information from the firm seeking the job;
- request for proof of license/certification and/all insurance coverage inclusive of professional liability insurance;
- a request for references, including some for work done that was similar in scope and size to the project you anticipate;
- a statement of the problem or situation, clearly specifying known data and where it can be found (and in what format);
- scope of services;
- request for proof of license/certification and/or professional liability insurance if appropriate; and
- a request for references, including some for work done that was similar in scope and size to the project you anticipate.

Additional features you may desire are:

- a required format for responses (for ease of review and comparison); and
- your willingness to host a preproposal or site visit prior to accepting proposals.

3. Establish a Scoring System for Evaluating Proposals

After all proposals are received, screen them for such factors as the consultant's training and accomplishments on similar projects, cost and how well the consultant has understood the contents of the RFP. In general, big consulting firms are more capable but less responsive than individuals and small firms. An academic consultant will likely provide more services at a lower cost, but the quality can vary and time deadlines may not be met. The best approach to evaluating proposals is to speak to other clients of the consultant. In general, let the buyer beware. The environmental consulting industry has its share of charlatans. No amount of government regulation of an industry or profession will eliminate the small amount of unethical behavior that exists.

One of the most challenging elements of selecting a consultant is finding one that represents or addresses your needs, rather than trying to push his or her own technology or area of familiarity. However, you may not find just one consultant that covers all your needs, and may need to work with several.

You may not find just one consultant that covers all your needs, and may need to work with several.

A sample evaluation scoring sheet has been included as Appendix F. Before employing this type of tool, the search/interview committee should agree on the range of values they wish to assign to each category, and discuss what their standards for ranking the candidates will be.

A community is always wise to check references! Ask for a list of similar projects that have been in operation for several years: Are the host communities still happy with the outcome? Was work done on time and on budget? Has maintenance cost and time been about as expected? Will they attend meetings and how well did they deal with the public? (See Appendixes D and E for suggested questions.)

4. Select Two or Three Final Candidates

Request that each candidate make a formal oral presentation. Each consultant should be interviewed without the others present. Allow time for both a formal presentation and an informal question and answer period. Although unusual, it is not unheard of for a community to recognize that each of the finalists has strengths lacking in the others; you may wish to inquire if consultants are willing to collaborate or provide only a portion of the services you require.

5. Develop a Contract

When the consultant has been selected, prepare the formal work plan between you and the consultant. The work plan should state the objectives of the effort, the products, the time frame, the project organization structure and a detailed budget. It should also spell out how the consultant will work with you. Will they attend meetings? How will they respond to phone calls and provide progress reports? Depending on the scale of the project, an attorney should be consulted to review the contract.

The work plan should provide for scheduled meetings at which the consultant informs you of progress and problems associated with the project. If appropriate, the consultant should produce a final report that can be used at a later date for reference.

The consultant must be made responsible for obtaining all governmental permits and conforming to all existing laws, rules and regulations. Associations and individuals may be liable for the illegal activities of a consultant. All of these details, along with specific dates and performance standards for each deliverable should be summarized in the *scope of work*.

Scopes of work should include:

- Deadlines for completing project phases and final product. You can require written authorization to proceed prior to each phase of any project
- Payment schedule and terms. Identify if partial payment is expected prior to project completion, and the procedure for change orders if necessary.
- Clear distinction as to whether any out of scope services will be permitted, what type (oral or written) of approval is needed and how the consultant will be reimbursed (usually on a time and materials basis). Out of scope services are any efforts not defined in the work plan or contract and can be a major expense. Many groups establish a maximum amount or a percent of the contract amount allowed for out of scope services, or require that a consultant agree that the services described can be provided with no out of scope work. Even then, these services must be justified upon request.
- Specific format and delivery considerations for the final report, including whether it is to be written and/or oral, are included in the scope of work, along with the number of copies of the final report you require.
- Specifications of any other deliverables that will belong to the community, and whether any portion of the project is the proprietary—or intellectual—property of the consultant.

Any work not clearly defined in your scope of work may be considered out of scope, and grounds for additional charges from the consultant you choose.

A strong protection against the consultant who "discovers" that the technology you need is the one they specialize in is to require that they review specific technologies that you believe may be appropriate, and provide pros and cons of each. In this way you can assure your community that your ultimate choices are based on a complete and accurate assessment of all the options.

Three Things to Remember

These tips are from the National Small Flows Clearinghouse.[1]

- **Consultants are not all the same.**

  Communities should hire consultants based on a variety of factors, including their experience and success in working with other small communities on similar projects.

- **It's your project!**

  To repeat our analogy, planning a wastewater project is like buying a car. You wouldn't go shopping without first knowing something about what you want, what you can afford and the options available. You also wouldn't ask a stranger to pick out a car for you and expect to be satisfied. Communities need to choose consultants who are willing to *work with them* to achieve their goals.

- **Take your time.**

  Screening proposals, interviewing candidates, checking references, and involving the public in the process are time-consuming tasks, but they are all necessary to conducting a successful search. Any extra time spent carefully choosing a consultant can be justified when you consider that most wastewater treatment systems are designed to serve a community for 20 to 30 years or longer. Your community will be living with (and paying for) the results of the project and the consultant's work for many years to come.

References

1. "Choose the Right Consultant for your Wastewater Project," *Pipeline,* Winter 1997, Vol. 8, No. 1. National Small Flows Clearinghouse, West Virginia University, Morgantown.

Resources

Midwest Assistance Project

P.O. Box 81
New Prague, MN 56071
Phone: 952-758-4334 or 800-822-2981
Fax: 952-758-4336
email: map1@bevcomm.net

This organization provides technical assistance to mid-western communities.

National Small Flows Clearinghouse (NSFC)

http://www.nsfc.wvu.edu
P.O. Box 6064
West Virginia University
Morgantown, WV 26506-6064
Phone: 800-624-8301 or 304-293-4191
Fax: 304-293-3161

NSFC offers a variety of technical assistance and free or low-cost information and materials about wastewater technologies for small communities. Services include a toll-free technical assistance hotline, an Internet-based discussion group, computer databases, newsletters and other publications.

The Rensselaerville Institute Publications

- *Selecting Your Engineer: How to Find the Best Consultant for Small Town Water and Wastewater Projects.* Jane W. Schautz and Christopher M. Conway, 1998.
- *The Self-help Handbook for Small Town Water and Wastewater Projects.*

Order from:
Small Towns Environment Program
The Rensselaerville Institute
P.O. Box 128, 63 Huyck Road
Rensselaerville, NY 12147
Phone: 518-797-3783

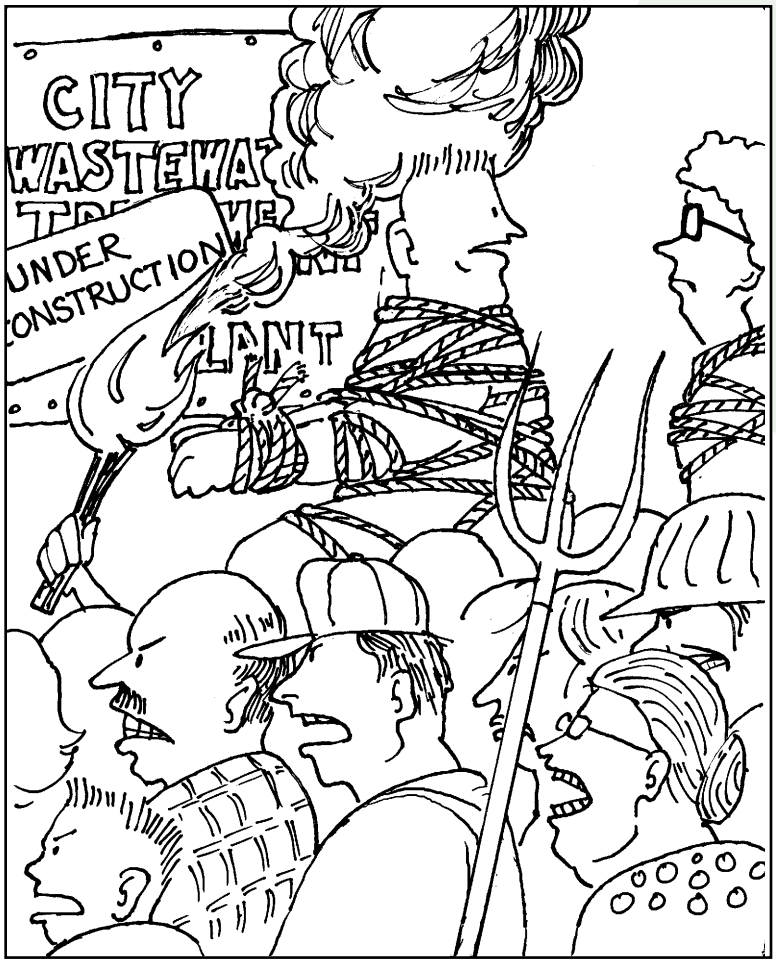
Rural Utilities Service (RUS)

Minnesota Rural Development
Water and Environmental Programs Staff
410 Agri Bank Bldg.
375 Jackson Street
St. Paul, MN 55101

RUS Water and Environmental Programs (WEP) provides loans, grants and loan guarantees for drinking water, sanitary sewer, solid waste and storm drainage facilities in rural areas and cities and towns of 10,000 or less. Public bodies, nonprofit organizations and recognized Indian tribes may qualify for assistance. WEP also makes grants to nonprofit organizations to provide technical assistance and training to assist rural communities with their water, wastewater and solid waste problems.

Chapter 8

Implementation: What, When, Who, How?



JIM KIEHNE

"But on the bright side, since no one seems to be happy, the decision process must have worked."

"Never doubt that a small group of thoughtful, committed citizens can change the world; indeed it's the only thing that ever does."

Margaret Mead

All the planning in the world does no good without implementation. This final chapter discusses implementation beginning with a true story of how one community implemented a wastewater treatment project. It goes on to provide ideas about how community process works and ends with a list of specific steps a community can take to move through the five distinct phases of community process to implement a project.

Case Study: Wabedo Township

This case study has been used nationally as an example of a community's self-determined interest in getting a project completed and has received local, state and national awards. This is an example of what, when, who and how this community did it. Hopefully it will give your community some ideas for your project.

Problem Defined

Cass County is a tourism center: if its many lakes are perceived to have any water quality problems it would affect the economics of the region. In 1994 Cass County did a diagnostic study of the Boy River Watershed Area with funding from the Clean Water Partnership Fund and the help of the Minnesota Pollution Control Agency (MPCA). In this study, lake areas were evaluated for potential ground, lake and drinking water problems. *Best management practices (BMPs)* were developed to help sustain and improve affected lakes.

Wabedo Township, in the middle of Cass County, was experiencing rapid lake development and change. Older cabins were being sold and remodeled, old resorts were being developed as condominiums or small parcels were being sold off, high water tables had made onsite systems nonconforming and many other conditions were causing problems. In addition, the county had implemented stronger sanitary codes. Some property owners with failing on-site systems were unable to sell their homes until the problem was solved.

Plan Developed

In Wabedo Township, nine homes situated on a point of land on a very popular lake had problems because of their small sites and the high water table. These were seasonal properties, part of an old resort that had been sold piecemeal long ago, and the owners had no recourse. Cass County contacted the Town Board to see if they would work with their community and the county to resolve this problem.

They began with landowner meetings and educational materials. The landowners agreed to work with the township to solve the problem. The group agreed that the Subordinate Service District model was user friendly for smaller groups and could be adaptable for everyone. Through their water plan, Cass County employed an experienced project coordinator for one year whose job was to find money to develop a working model for wastewater, work with the township and its residents to implement this model and find a way to manage the new wastewater collection system.

The coordinator applied to the Board of Government Innovation and Cooperation and was successful in receiving a two-year grant of about $60,000. Another $10,000 was granted by the

Central Minnesota Initiative Fund. The grants paid for the coordinator, legal issues and engineering, but were not to be used for construction costs.

Capacity Issues

Capacity deals with the technical, managerial and financial issues for a project. In this case the township needed to develop a structure to provide the service, find a wastewater treatment that would work for a group of homes, and then find the funding to put it into place. They also needed to find a manager for the system and financing to continue caring for it.

The Subordinate Service District model (Minnesota Statutes 365A) allowed the township to be the legal entity for the described area and provide services to the residents as necessary. It also requires that the township work with residents to get this done. Grants and loans paid for development of the model, and construction and maintenance of the system were financed through a five-year property tax charge and development of an operating budget paid through user fees collected twice a year. The system was designed by an engineer, who found suitable land for a standard drainfield nearby. The engineer also considered maintenance expenses to make sure the costs would not be unduly harsh on the landowners. Long-term management was contracted with the local rural utility cooperative, which agreed to provide maintenance and billing for the system at a fee just above cost, since the landowners were already electricity customers.

One owner stated that being involved in the final decisions helped him realize the investment that he had and he was proud to have been involved!

Implementation of the Project

Once the capacity issues had been agreed upon, a petition of 99 percent of the landowners allowed the township to create the Subordinate Service District. The township used its authority to lease a treatment site, finalize a design, prepare an ordinance, call for bids and implement insurance for the project. Construction was funded through a Certificate of Indebtedness secured by the township from a local bank. Construction costs of about $35,000 were repaid by the landowners themselves. Landowners were given the options of paying up front (allowed for a 3-month period), putting the cost on their taxes or financing payment through an agreement with the township. There was a mix of all the options. The township's tax-exempt status and ability to take out a short-term Certificate of Indebtedness for the project saved the landowners a great deal of interest cost. The landowners came up with other cost-saving ideas that further helped the project become very efficient. One owner stated that being involved in the final decisions helped him realize the investment that he had and he was proud to have been involved!

Lake and landowners associations in the area had the lake assessment tools to evaluate the lake and project potential. The township board, project coordinator, county staff and local landowners spoke at their meetings to explain the process and share their experiences as they went along. The landowners took a keen interest throughout the process. They worked with the project coordinator and town board on easements, water meters, user fees, ordinances and construction issues. They were involved in pre-bid meetings, design approval, a homeowner walk-through and a video. When all was completed, everyone felt that they had helped in some way or another.

Evaluation, Management and Next Steps

The township made arrangements with the local rural utility to manage the project. The utility provides power, manages security, mows and maintains the area, checks the system monthly, pumps the landowners' tanks on a three-year basis, pumps the stilling tank annually and does the billing. After their annual audit of the system, they meet with the landowners, town board and county staff to determine if things can be done more efficiently. They also provide emergency maintenance when necessary and help to develop the annual working budget for the system with the town board. Properties near the nine included in the project are monitored yearly and when they are nonconforming will come into the system.

Some minor clean-up details were covered by a $5,000 grant from the Central Minnesota Initiative Fund to complete the project. The final budget came in $10 in the black. A video was made to showcase the project and help others do similar projects in the future. Currently this project is in its sixth year of operation and another project has been completed in the township. This second project utilized tax-forfeit land about a quarter-mile distant, saving a lot of cost for those landowners.

This story is a testament to the spirit of the first seasonal landowners who were willing to work together with their township and county and to the funding agencies that helped the project when it was needed.

A properly prepared citizen-based group can successfully address wastewater issues through a sound community decision-making process.

Bringing About Community Change

The first seven chapters in this book provide community residents basic information about small community wastewater issues. This chapter addresses how to assure an outcome that is a socially, economically and environmentally responsible method to safely recycle community wastewater. To find a viable solution to its wastewater problems a small community needs to involve a team of community residents and other people. As illustrated in the Wabedo Township story, a properly prepared citizen-based group can successfully address wastewater issues through a sound community decision-making process. Proper groundwork allows the process to be as smooth as possible and results in a more viable outcome.

Five Steps to Gaining Community Endorsement

Decisions about a basic community infrastructure need, such as wastewater treatment, are usually difficult when it is a significant change from the way things have operated in the past. This is especially true when the local government unit has never previously dealt with wastewater. Chapter 1 suggested five early steps that are key to gaining community endorsement

of the changes that need to take place. Using the steps described here ensures that members of the community will feel adequately represented and fairly treated, regardless of the choices made along the way.

1. Form a steering committee

As critical as community-wide participation and endorsement is for the long-term sustainability of any project, much of the work of assessing community needs and readiness, communicating options and consequences, developing consensus and implementing action steps will likely be done by a small, diverse steering committee.

Don't underestimate the hidden and yet-to-be-developed potential available from within a community

Steering committee members should be willing to contribute time and expertise. This committee should recognize that the road to resolution tends to be a long one (typically three to seven years), and its members must be willing to commit to participation over the long haul. An ideal steering committee reflects the demographic community it is trying to assist in respect to economic and educational status, geographical distribution and political alliance. If a diverse steering committee can identify options that address its members needs, your political challenges are already partly won. Don't ignore potential critics at this stage; excluding them now will enhance their ability to later charge that they were kept in the dark.

The ideal steering committee also includes diverse talents. Search out people who have the ability to:
—converse with engineers and regulators;
—develop practical, effective and regular communication to community members;
—evaluate and manage fiscal information;
—organize and mobilize community groups that have opinions about or interests in the project;
—review or develop legal contracts or other binding agreements; and
—help develop strategic implementation plans.

Although your community may feel challenged to provide all of these skills, you need to recognize what skills are missing so that professional support can be provided as needed. Don't underestimate the hidden and yet-to-be-developed potential available from within a community—often from unlikely people!

In addition to membership issues, the steering committee needs to consider two questions: 1) What natural or political boundaries contain the existing problems or potential solution/service area? and 2) Is community education needed so everyone recognizes and understands existing or future conditions?

Practical conditions typically determine the answers to these questions, which may evolve over time as different technologies are considered. If education is needed to help a broad community understand the magnitude of a problem or the range of options available, try to present material in a factual and non-sensational manner—hyperbole or exaggeration can undermine long-term credibility.

2. Develop a community vision

Lacking a structure to do anything else, many communities unfortunately begin their process by hiring an engineering firm and asking them to do an analysis and recommend a solution. A common result of this strategy is a report that states that the firm has "reviewed all of the available technologies," and recommends one—which they happen to be the experts in developing!

Whatever choices a community ultimately makes won't please everyone.

The *community engagement alternative* to this approach is to gather concerned community members in a town meeting to listen to hopes and concerns. This can be a constructive and focusing event. The meeting should be facilitated, either by a neutral local leader, who is trusted and considered unbiased, or by an outside professional facilitator without an agenda to promote. The primary goal of this initial community meeting is to establish a shared vision of what the community hopes to achieve or maintain.

Identifying community values. A vision is a realistic statement of what we want to be or achieve, which focuses attention, energy and efforts on common values and resources. It is valuable only to the extent that people are committed to it and are willing to base their actions on it. It follows that the process used to develop the vision is as important as the vision itself. If you want people to change their behavior, you had better be sure they subscribe to the outcomes you are promising to help them achieve.

A successful visioning process:
- —is open, visible, and understandable;
- —includes all stakeholders;
- —allows for different levels of involvement; and
- —acknowledges and celebrates success along the way.

The first step of this first town meeting is to identify the positive values the community wishes to preserve, whether it is existing home density or increased density to help distribute costs, protection of an existing ground or surface water resource or protection of public health. These discussions are bound to be very value laden, and it is important to remember that no one is wrong in the values they hold. Whatever choices a community ultimately makes won't please everyone. However, making a sincere effort to recognize the values and concerns of everyone in the community will give the steering committee strong direction.

Ensuring everyone's voice is heard. These rules have been developed to ensure that everyone is heard in this visioning process:
- —Use "go-arounds" (nominal group process) so everyone has an opportunity to contribute to a topic.
- —Give everyone a chance to speak once before someone speaks twice.
- —Respect and record the contributions of everyone—there are no "dumb" concerns or ideas.
- —Don't allow side conversations—each person speaking deserves everyone's attention.

Depending on the size of your meeting, you may need to establish time limits to give everyone the opportunity to contribute. As a meeting progresses and comments become redundant, the facilitator can suggest that support for previously mentioned positions

can be expressed without a lot of detail. Challenges should be honestly identified and shared, without rejection or dismissal.

When all positive values have been identified, organize these expressions of hope and vision into a clear mission statement that will help guide activities throughout the project.

Assessing your community's existing assets. A description of the current situation and trends affecting the community should be presented at this initial meeting (Chapter 2). It is important that this assessment be unbiased and present a complete picture. For example, it may be true that a community is expanding and requires additional wastewater treatment capacity, but if the assessment ignores issues such as ability to pay, an aging population or a desire for increasing lot size, it will undermine your ability to identify and develop solutions that are sustainable.

It is important that this assessment be unbiased and present a complete picture.

It is highly likely that going through these steps will show that more information is needed. Keep the process flexible and open so that new or updated information can be incorporated into the decision-making process without abandoning the original vision.

Getting good meeting participation. These suggestions will help you get strong participation at your community meeting:

—Serve food.
—Feature visual displays and/or decorations.
—Invite people to bring photos of what they most love or wish they could change in their community.
—Communicate ground rules clearly and administer them consistently and fairly.
—Use a variety of recruitment tools—promotion on the pop music station will encourage different people to come than will a legal ad or display advertisement in the local daily paper. The best recruitment tool is personal invitation.
—After the visioning session, have a small team summarize the data and distribute it to those who were unable to attend.
—Consider barriers that might limit participation: Is day care readily and conveniently available for young parents? (Perhaps high school students can provide it next door.) Is your facility handicapped accessible? Does the time of day limit participation by students, working adults, or seniors concerned about staying out after dark?

3. Develop a work plan

When you have established a vision and mission, develop a preliminary action plan that identifies goals and specific actions to take to get there. This plan should include:

—clear goals and actions that are practical and measurable (What do we want to achieve?).
—responsibility (Who will implement and measure?).
—timeline (What are the implementation steps and when will they happen?).
—criteria for making decisions and measuring success (How will you know you have been successful, or that you need to change plans?).
—budget (What will materials, labor and other items cost? Where are potential sources of revenue?)

As you develop the work plan and goals, it is important to remember the unifying mission. Ask practical questions, such as: What resources are needed (and available) for each step? Will this step actually achieve the goal? What partnerships or collaborations can be formed? Are other partners willing? What might be the negative impacts or consequences of a given action or step?

In addition to establishing practical goals, the steering committee should identify benchmarks and indicators of progress and success. What will you measure to assess progress? Is this information readily available? Can it be measured objectively? Is it a measure of results, or merely effort? What is the baseline against which you will measure change?

4. Keep everyone informed

It is important to communicate at every turn. Remember that you want your community to give you advice and expect that in return they will guide and support you as you try to provide practical solutions. Once you have involved the community it is vital to keep everyone informed of progress made and decision opportunities. Most of us have short attention spans, and progress will seem to many to be incremental, unless you help them understand the lessons learned along the way. Continue to provide opportunities for both informal and formal input. A newsletter, coverage by the media and community gatherings will keep the people engaged in your project. This is the best way to develop solutions that are supported by the community at large—so long as you listen to the advice you are given.

5. Implement and evaluate

Regardless of your success in engaging the community in the process described above, ultimately the steering committee and task leaders are responsible for seeing that progress is made, that time and money are invested responsibly and that action steps are implemented in an (reasonably) orderly manner.

Success occurs when people can use their strengths and minimize their weaknesses.

Identify task leaders, and recognize them as valuable, sustainable resources. If a few people feel they must do all of the work themselves, they may burn out before the project is complete. Do what you can to support one another, use community assets and volunteers whenever possible, delegate as much as you can and find ways to manage barriers to getting things done.

Encourage task leaders to recognize their strengths and limits, and to seek assistance in the areas where they are not strong. Some of us are good at fiscal management, others at promotion and communication; some people are big picture visionaries, others are skilled at detail management. Success occurs when people can use their strengths and minimize their weaknesses. No one should be shy about acknowledging that they, too, are human and need guidance or assistance on a given task or skill.

Even though you are working on a scientific or engineering issue, remember you are dealing largely with the needs and concerns of humans. Given the human factor, missteps are inevitable; ideas that work on paper may not be functional or acceptable

in your community. Integrate evaluation tools into your action steps as often as you can so that you can recognize mistakes early, learn from them and not lose significant momentum.

Once the community team has followed these initial steps, fully understands their situation and knows their options for wastewater treatment, management, community structures and financing, it is time to turn that knowledge and energy into action. This is often the most challenging phase. It will be the test of their learning, communication and conflict management skills.

The steps a community takes to change depend greatly on the reason for changing the management of its wastewater, and by the community's familiarity with, and perception of the need for a change. First steps and methods used may be very different, depending on the situation. Consider these two very different situations:

Situation # 1: The community's drinking water supply has been contaminated by improper sewage treatment facilities, or the majority of the residents already have a genuine concern about wastewater. It may be relatively easy to engage the homeowners in an effort to change or improve their wastewater treatment efforts.

Situation # 2: Only a few people have a concern, or people are in the community for only a few weekends each year, or a government agency wants the change to meet a new government regulation. It may be a challenge to get people interested in a concern most of them do not recognize.

In either situation, the community engagement process outlined above must be used to ensure that all homeowners are involved and informed throughout.

What Makes Projects Work

For several years, the Initiative Foundation in Little Falls has supported community-articulated vision processes throughout their 14-county central Minnesota service region. They have developed this list of top ten characteristics, which is a good predictor for which communities will implement successful programs.

1. A steering committee is identified and brought on board. It includes community spark plugs—people who care about the community and will keep the process moving forward.
2. Leaders are willing and able to adapt the program based on findings. They do not ignore vision or assessment results that lead in a direction not anticipated.
3. The host community and funders are kept informed. Regular information updates are distributed and meetings are planned and publicized in advance and are open to all.
4. Small, early successes build trust and confidence in the group.
5. Progress is recognized as incremental, and the group identifies and celebrates early successes. Small projects implemented or milestones reached bring the community together and create visibility.
6. Responsibility is shared. Decisions and implementation actions are not limited to a small group of leaders or steering committee members.
7. A leadership structure is established, either through direction from elected officials or creation of a responsible leadership body.
8. Elected officials and/or governmental staff are represented on the leadership/steering committee efforts.
9. A clearly defined outcome or endpoint is reflected in a community plan. The group is able to always keep their eyes on the prize.
10. The leadership group and the community as a whole maintain a commitment to a process of establishing a shared vision, mission and goals. They continue to assess what works and what doesn't and refine and improve a work/implementation plan.

Every community would naturally like to skip all of the struggle and go right to the solution.

What Do We Do Now? Five Phases of Community Process

To implement a community process that will be able to move the project to completion, the community team must work with the entire community, *including the naysayers* and those who have the legal authority to make official community decisions. As can be imagined, there can be many barriers to face and hurdles to overcome throughout the process. Luckily, there are also many things that can be done to make the process move more smoothly.

Every community would naturally like to skip all of the struggle and go right to the solution. It doesn't work that way! It is the *struggle* that stimulates the people in the community to learn, to understand and negotiate their differences, and to come to a conclusion that everyone can live with. Some people say that if a decision is made that no one is completely happy with, it must be the right one!

In the context of a community wastewater decision, the solution chosen could be that wastewater is adequately treated at a reasonable cost and it accommodates the plans of the community into the future. To accomplish a task of this proportion, it usually takes three groups of citizens with different levels of involvement:

- Steering committee (5-10 people) with deep commitment;
- Action teams, with special interests and skills; and
- Informed citizens, including all residents.

The entire process from start to finish breaks into five distinct phases:

Phase 1 — Understanding the Situation
Phase 2 — Exploring the Options
Phase 3 — Making Informed Decisions
Phase 4 — Implementing Decisions
Phase 5 — Managing the System

The following outline provides the detail to each of the phases. It suggests the potential answers to the questions *what*, *when*, *who*, and *how*, but your community must provide the community-specific answers.

Phase I: Understanding the Situation: Defining the Problem, Collecting and Interpreting Community Information

Often a community first becomes aware of a wastewater or water system problem because of a violation, inability to transfer a property title, wastewater surfacing, a contaminated well or a green lake. When one or more homeowners becomes concerned about such a problem, they must help the rest of the community understand the situation and define the problem.

The typical timeline for this phase is 6 to 12 months.

Actions

1. **Collect relevant community data.** (Chapter 2)
   - —Comprehensive Land Use Plan
   - —Sanitary ordinances
   - —Shoreland regulations
   - —Zoning ordinances
   - —Temperature and precipitation
   - —Soil temperatures/depth of frost/snow cover
   - —Wildlife habitat potential
   - —Native plant and animal species
   - —Building site suitability
   - —Sanitary site suitability
   - —Topography
   - —Wellhead Protection Areas
   - —On-site suitability characteristics survey
   - —Parcel ownership
   - —Current sewage treatment method by parcel
   - —Sewage treatment Certificates of Compliance
   - —Septic pumpers' records
   - —Current community demographic information
   - —Future community demographic projections
   - —Sewage treatment plants in neighboring communities
2. **Collect individual community member data.** (Chapter 2)
3. **Interpret the data and develop a vision for the community.**
4. **Communicate the information to citizens.**

Results

- —Establish mission and vision for the community—written down and agreed upon.
- —Establish a preliminary list of decision-making criteria—written down.
- —Compile community data for use by professionals throughout the process.
- —Establish and begin using communication links to community, such as newsletter, newspapers, radio and TV.

Suggestions to enhance the results of Phase I

- Collect only relevant data on homeowner survey.
- Conduct wastewater informational meetings for homeowners. End by introducing the homeowner survey and the purpose for it. Result: improved response rate.
- Be sure the steering committee members understand the time and effort commitment necessary to complete the process.
- Delegate responsibilities to avoid burnout. Honor volunteers' time and hold people accountable for commitments.
- Realize that sometimes there may be multiple sources of information and other times information may seem impossible to find. There may also be costs to obtain the information, but often fees can be waived to accommodate a special community project.
- Discuss the current status and potential future changes to comprehensive land use plans with key people.
- Meet with officials of neighboring communities to assess surrounding municipal wastewater plants.
- Carefully examine the community for community members with diverse interests and points of view on the wastewater issue as you enlist volunteers and professionals in the analysis of the situation.
- Consider using multiple community communications venues–existing and new.
- Complete data collection and interpretation before moving on to Phase II.

Potential resource people to involve in Phase I

- —County staff: environmental, sanitary, educators
- —University of Minnesota Extension Service staff
- —Private consultants
- —Resource people within the community, retired or otherwise
- —Regulators: violations, crisis involvement, etc.
- —Local government units: city, township, county, watershed, etc.
- —Soils scientists: private and public (SWCD, NRCS, others)
- —Local wastewater professionals: inspectors, designers

The key to success is involving residents and government officials in the project through informational meetings and discussions. They must be a part of formulating the community's vision, including the plan for managing wastewater, and in outlining the mission of the wastewater team. To buy in, they need basic information about wastewater, the problems created by wastewater and the many factors that need to be considered in finding solutions. They can be instrumental in interpreting the data and developing a community process plan. Working together is necessary and will happen through meetings and personal and mass communications, but this is the beginning step.

Possible costs in Phase I

—Consultant fee
—Homeowner survey and newsletter development and mailing costs
—Meeting publication and notice costs
—Purchase of data, educational materials
—Site evaluation data
—Private soil scientists, ISTS professionals

Making an informed decision involves having adequate knowledge of all potential solutions.

Phase II: Exploring the Options: Treatment, Management, Organizational Structures, Funding

Once community members have completed Phase I, they should be fired up to find the solutions to all of the problems. Making an informed decision involves having adequate knowledge of all potential solutions. This investigative phase is an opportunity for all the people with interest or skills in the various categories to participate. Involving a larger group than the steering committee will prevent burnout, bring diverse views to the table, facilitate a thorough investigation of the options and provide a broader base of involved residents. Team leadership and leadership skills are very important here.

The typical timeline for this phase is 18 to 36 months.

Actions

1. **Study options for your community in these areas:**
   —Wastewater treatment options (Chapter 3)
      Centralized and decentralized treatment systems
      Standard treatment technologies
      Alternative treatment technologies
      Management requirements of all options
   —Management options (Chapter 4)
      Management requirements of all technologies
      Decentralized management
      Centralized management
   —Organization options (Chapter 5)
      Private structures—homeowners, lake association, utility
      Public structures—sewer districts, SSDs, special districts

—Financial options (Chapter 6)
Local options
State options
Federal options

2. **Inform residents via newsletter, newspaper, etc.**
3. **Acquire professional engineer assistance.** (Chapter 7)
   —Seek qualifications for engineers (Request for Qualifications or RFQ)
   —Seek proposals from qualified engineers (Request for Proposal or RFP)
   —Seek consultant/grant writer/other

Results

—Basic understanding of all treatment options, centralized and decentralized
—Management requirements of each
—Preliminary assessment of applicability to your situation
—Consensus on the need for management and assessment of management approaches
—Preliminary cost estimates
—Basic understanding of funding source options
—Written RFQ and RFP for consultants and engineers
—Written list of potential consultants and engineers

Suggestions to enhance the results of Phase II

- Use multiple sources of information. Everyone has individual values, biases and agendas.
- Be sure everyone knows the process to be followed and that they are invited to attend meetings.
- Consider all options.
- Find some money to fund early planning costs. Look for an existing fiscal agent for the funds, such as a lake association, township, etc.
- Obtain information and samples of RFQs and RFPs from other communities.
- Continue to encourage homeowner attendance and participation.
- Find a skilled community resource person to help facilitate the process.

Potential resource people to involve in Phase II

—County staff
—University of Minnesota Extension Service staff
—Minnesota Pollution Control Agency staff
—Local wastewater professionals: inspectors, designers
—Consultant
—Attorney
—Grant writer, loan writer
—Funding agency staff
—Local regulators

Community members must be involved in this phase by attending meetings of the investigative teams learning about the options, providing initial funds that might be necessary for this work (through organizations, taxes, others) and staying informed via newsletters and mass media sources.

Possible costs in Phase II

—Meeting postings, publications and notices
—Attorney or consultant fees

Frequently the decision about organizational structure comes first.

Phase III: Making Informed Decisions: Sorting Out the Options

Phases I and II provide the complete information to enable your community to begin making informed decisions in Phase III. Depending on the situation, frequently the decision about organizational structure comes first. This structure is often necessary to enable the community to acquire funds and make legal commitments. In this phase, attorneys and engineers enter the picture. There will be a lot of details to work out and negotiations with service providers, regulators and funding sources.

The typical timeline for this phase is 3 to 12 months.

Actions

1. **Identify treatment technology options for the project.**
   —Send out RFP for option(s) and check references
   —Interview and determine engineer
   —Negotiate contract and scope of work
2. **Establish organizational structure for the community.**
   —Work with local governmental unit
   —Set up advisory group
   —Initiate new organizational structure, if required
3. **Authorize preliminary engineering report.**
   —Identify technology options to be considered
   —Review total life cycle costs for project
   —Use report for financing methods
   —Evaluate options based on criteria identified earlier
4. **Employ grant writer, if necessary.**
   —Negotiate contract with terms and conditions
   —Identify funding package(s) for solicitation
5. **Inform residents via newsletter, newspaper, etc.**

Results

—Select engineer and/or consultant based on objective criteria, interviews and references.
—Process in motion to establish the legal structure (if none existed).
—Comprehensive list of all options (treatment, management, structures, financing) completed, listing the strengths and weaknesses of each.

Potential resource people to involve in Phase III

—Professional engineer
—Attorney
—University of Minnesota Extension Service staff
—Grant writer, consultant
—County staff and support staff
—Local unit of government

Community involvement is important as decisions are made. If residents have been included in Phases I and II, they will now be able to keep informed of details by attending informational meetings and using media information sources. They can influence the official decisions by discussing the options with authorized people.

Possible costs in Phase III

—Meeting and newsletter costs
—Employment of engineer
—Employment of attorney
—Employment of grant writer
—Preliminary Engineering Report

Suggestions to enhance the results of Phase III

- Use resource people to help the process stay on track, follow established principles and help the community learn in the midst of differing opinions.
- Establish the legal entity first (if one doesn't exist). This provides authority to handle funds, hire professionals and seek assistance.
- Make sure the community stays in charge. The resource people, engineers, consultants and others should provide information, not make the decisions for the community.
- Continue to provide information to the entire community, not only on decisions but also on the status of the project.

Phase IV: Implementing the Decisions: Final Plans and Construction

Phase IV puts into action the decisions made in Phase III. Implementation of decisions is always exciting, but following legal processes is important. If residents have been informed and involved, they will support and legitimize the decisions. However, if they have not been informed and involved, this phase can be subject to significant community unrest and turmoil.

The typical timeline for this phase is 1 to 24 months.

Actions

1. **Form organization structure (legal entity).**
   —Set up project files
   —Set up accounting system
   —Set up internal organization
   —Record legal entity
   —Develop and implement ordinance(s)
   —Determine treatment site(s)
   —Seek insurance for legal entity
2. **Review preliminary engineering report.**
   —Determine project costs and funding sources
   —Prepare financial package with grant writer
3. **Authorize design of the community system.**
   —Authorize and prepare bid specifications
   —Advertise for construction bids
4. **Legal entity begins operation.**
   —Initiates construction easement/permanent
   —Secures financing
   —Seeks necessary permits with engineer
   —Opens bids and awards contract
   —Looks at contractor's bid for cost-saving measures that will not compromise quality.

—Does walk-through with the community
—Oversees construction
—Identifies management service providers
  - Permit requirements
  - Review of system needs
—Authorizes construction.

5. **Inform community via newsletter, newspaper, etc.**

Results

—Final treatment decisions are made
—Financial commitments are made
—Construction is authorized and completed
—Residents are responsible for their commitments

Suggestions to enhance the results of Phase IV

- Be sure the community makes the decisions using all of the predetermined criteria and information provided by professionals and others.
- If no one in the community has project construction supervision experience, find or hire someone who has the experience to oversee the project.
- Work closely with local regulators to keep them informed, involved and proactive on your project.

Potential resource people to involve in Phase IV

—Engineer
—Attorney
—Grant writer
—Funding agency staff
—Local county officials and support staff
—University of Minnesota Extension Service staff

The ***community keeps involved*** during Phase IV by staying in tune with the legal decisions being made by authorized community leaders and by giving them input and support. This can be done through participating in hearings on ordinances and meetings to review preliminary engineering reports and final design review. Homeowners should pay attention to media reports and newsletters.

Possible costs in Phase IV

—Creation of organizational entity, if necessary
—Employment of engineer, others
—Purchase of treatment area(s)
—Financial application work
—Project work
—Attorney fees
—Administrative costs for organizational entity
—Publication of legal notices, bid specifications, newsletters, etc.

Phase V: Managing the System: Monitoring, Operation, Maintenance and Administration

Phase V begins when the wastewater system(s) become operational. Systems are operating, the management plan is functioning and citizens are paying for the services they're receiving. Everyone is carrying out their responsibilities and is accountable for them. Periodic review of the plan is important and community leaders understand how wastewater needs may change in the future.

The timeline for this phase is ongoing, until changes need to be made.

Actions of the organizational structure

1. **Completes construction.**
   - —Oversees construction and holds final walk-through
   - —Obtains Certificate of Completion
   - —Holds hearings for charges
   - —Sets up repayment and operating fee schedules
   - —Obtains insurance for project
   - —Interviews for management and maintenance
   - —Sets up analysis testing, if required
2. **Secures a management service provider.**
   - —Interviews service providers, private or public
   - —Secures contract and bonding
   - —Trains service provider, if necessary
   - —Identifies and develops maintenance and management logs
   - —Conducts annual audits, on-site and administration
   - —Holds annual meetings with users of system
3. **Performs administrative functions.**
   - —Submits annual reports
   - —Sets rates, fees and charges annually
   - —Remits payment on bonding, etc.
   - —Develops short-term and long-term plans for community project
   - —Is responsible for enforcement; can possibly negotiate agreement with County
   - —Keeps citizens informed

Suggestions to enhance the results of Phase V

- Provide continual information to the community about:
  - —Best Management Practices to follow in water and product use
  - —Treatment performance, costs, maintenance and monitoring of the systems
- Send reminders for the pumping of tanks
- Follow a strong but friendly enforcement policy

Results

- —System is operating
- —Residents are following household best management practices
- —Monitoring and maintenance are being done according to management plan
- —Operating fund is adequately financed, with annual review of fee structure and adjustments made as needed
- —Organizational structure is functioning; a monitoring system and service providers are in place and performing assigned administrative functions

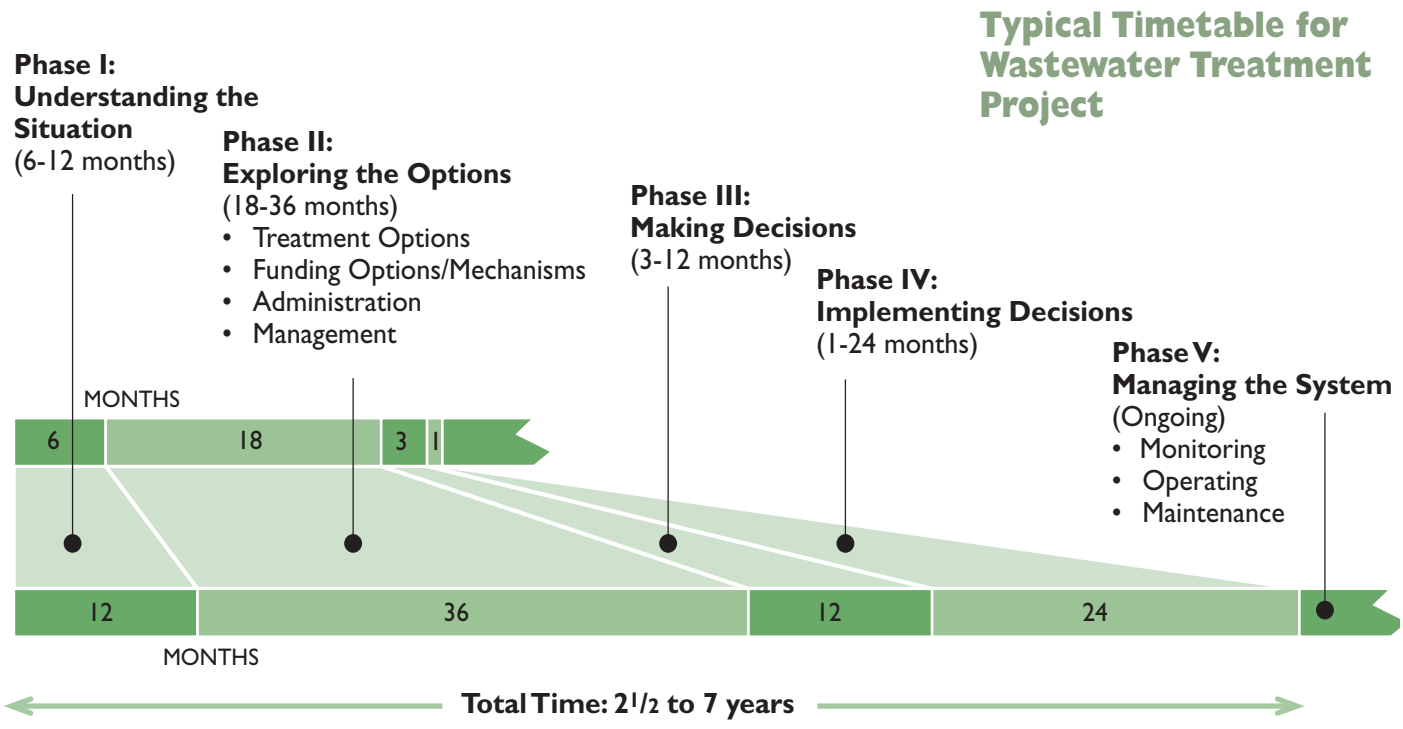
Potential resource people to involve in Phase V

—Engineer
—Attorney
—Consultant, grant writer
—Minnesota Pollution Control Agency staff
—County staff for support and enforcement
—University of Minnesota Extension Service staff

Phase 5 lets ***community involvement*** take over. Homeowners begin using the system(s) and paying the costs. Residents are pleased with the service provided and feel that the payment and fee schedule are affordable and fair. People keep informed about the operation and performance of the systems: they attend meetings, use information provided by the organization and support needs as they arise. They enjoy a safe and healthy environment and its water resources.

Possible costs in Phase V

—Engineering costs
—Attorney fees
—Administrative fees for project
—Service charges for management, maintenance
—Recording fees
—Publication of legal notices, meetings, etc.



How Long Will Implementation Take?

As noted in Chapter 1, the process of finding a viable solution to a community wastewater issue can take from three to seven years from inception through implementation. Each phase has a range of time needed to accomplish its goals. Some phases will take more or less time because of the differences in the situations, people and processes used. Below is a typical timetable for assessment, implementation and evaluation of wastewater treatment options.

Resources

Community Toolbox: Bringing Solutions to Light

http://ctb.lsi.ukans

This website was created in 1995 by the University of Kansas Work Group on Health Promotion and Community Development in Lawrence, Kansas and AHEC/Community Partners in Amherst, Massachusetts

Summary:

It's Up to You!

People who use water are also responsible for recycling it! Healthy communities are those with people who work together to address what matters to them. They depend on properly functioning wastewater treatment systems to protect human health and preserve environmental quality.

When your community faces the need to address wastewater treatment issues, a successful outcome may depend more on the process you use to address the issue than on sewage treatment technologies. People need to have a shared community vision and clear mission, leadership that will help them turn plans into action, and human, financial, and social resources to produce an outcome that meets everyone's needs and fits their behaviors.

Solving your community's wastewater problems is not an easy, quick task, but taken one step at a time it is doable. Property owners will need to become involved in identifying current and future wastewater treatment problems, evaluating options, and making appropriate and informed decisions about financing, monitoring, operating and maintaining cost-effective sewage treatment systems in the community.

To be successful in finding a viable solution to wastewater issues, community members need to clearly understand their current situation before they start looking for solutions, have a clearly defined mission and appropriate goals and examine all options before making decisions. They will need to develop a steering committee to gather information from as many sources as possible and keep everyone involved and informed all along the way.

Every community has to decide which type of organizational structure will best be able to make, implement and manage a wastewater treatment decision. Your community will need to find ways to fund the project and will have to hire professionals and seek assistance from other resource people to make informed decisions.

If your community group is informed and fully prepared to address wastewater issues, the decision making will be easier and will result in a viable solution that is a socially, economically and environmentally responsible method to safely recycle your community's wastewater.

Improving the overall management of a community's wastewater can be a challenging but rewarding goal. Many communities have successfully found viable solutions to wastewater treatment by following the principle of making sure that all wastewater is delivered to a well-designed and well-managed wastewater treatment facility.

Glossary

Activated sludge: Sludge clumps produced in an aeration tank by the growth of organisms in the presence of dissolved oxygen.

Aerated pond: A wastewater treatment pond in which oxygen is incorporated into the wastewater through mechanical or diffused-air aeration equipment.

Aerobic: Aquatic life or chemical processes that require the presence of oxygen.

Algal bloom: An unusual or excessive abundance of algae.

Alkalinity: Capacity of a substance to neutralize acid (having a pH above 7.0).

Alternative technology: Wastewater treatment systems that are new or different from the standard systems defined in codes and those typically used in a certain area.

Anoxic: Describes a water column or lake with absence of oxygen and presence of nitrate, such as at the bottom of a eutrophic lake in the summer or under the ice in the winter

Benthic: The bottom zone of a lake, or bottom-dwelling life forms.

Best Management Practice: A practice determined by a state agency or other reliable authority to be the most effective, practicable means of preventing or reducing pollution.

Bio-accumulation: Build-up of toxic substances in the flesh of fish or other living organisms. Toxic effects may be passed on to other animals or humans eating the fish.

Biological aerobic organisms: Living organisms that break down organic solids in the presence of oxygen into inorganic and stable organic solids.

Biological oxygen demand (BOD): The amount of oxygen required by aerobic microorganisms to decompose the organic matter dissolved or suspended in water. Used as a measure of the degree of water contamination.

Centralized wastewater treatment system: A wastewater treatment system in which the wastewater is collected from many homes and treated at a single facility and nearly always discharged to a surface water body.

Certificate of compliance: A document reporting the results of an inspection of a system to determine its compliance or noncompliance with applicable requirements in force at the time of the inspection.

Chlorination: The application of chlorine to water or wastewater for the purpose of disinfection, oxidation, odor control or other desired effects.

Clarifier: A settling tank, sedimentation tank or basin in which wastewater is held for a period of time to allow the heavy solids to settle to the bottom and the lighter solids to float to the surface.

Class C wastewater treatment operator: An operator licensed by the Minnesota Pollution Control Agency to manage and operate a municipal wastewater treatment plant under the terms and licensure of a Class C level license.

Clean Water Partnership (CWP) Program: A program created by the legislature in 1990 to protect and improve groundwater and surface water in Minnesota by providing financial and technical assistance to local units of government interested in controlling nonpoint source pollution. Funding comes through the 319 Federal Clean Water Partnership funding program.

Combination wastewater system: (Also referred to as **dual** or **separation technology** or **treatment train.**) A wastewater treatment system that uses more than one technology to treat the wastewater. Frequently one of the technologies is a composting or incinerating toilet and the other is a septic tank/drainfield or an aerobic tank with a soil treatment and dispersal unit used for the balance of the wastewater.

Comminutors: Devices such as grinders, cutters and shredders used to reduce the size of solids found in wastewater.

Compliance inspection: An evaluation, investigation, inspection or other such process to determine if a treatment system meets all of the applicable local and state requirements, which usually results in a certificate of compliance or a notice of noncompliance being issued.

Compliant septic system: An individual or multiple household wastewater treatment system that meets all applicable local ordinances, state statutes and Minnesota Chapter 7080 rules.

Composting toilet: (Sometimes referred to as a **dry, biological or waterless toilet.**) A toilet that uses little or no water to deliver human wastes to a container where free oxygen supports aerobic bacteria that oxidize and break down organic matter and destroy pathogens. Periodically the contents must be churned and the soil-like final product removed.

Constructed wetlands: There are two types. A *lined constructed wetland* is a man-made natural-looking, marsh-like pretreatment unit in a watertight container that cleans wastewater by filtration, settling, plant nutrient utilization and bacterial decomposition. It is preceded by a septic tank and followed by a final soil treatment/dispersal unit. An *unlined constructed wetland* is a similar final treatment and dispersal unit that disperses the water into the soil beneath it. It is always preceded by a septic tank and often by a pretreatment unit.

Construction grant funding: Funding that is provided to the applicant without need for repayment for construction of a wastewater treatment system to help defray costs to the landowners in a project. Such nonrepayment funding has very limited availability.

Consultant: Any professional associated with a private firm, nonprofit organization or university who provides specific information, training or services in exchange for a fee.

County water plan: A document written by each Minnesota county that assesses the status of the county's water surface water and groundwater resources. It provides assessment data, establishes goals and outlines strategies to meet the goals. The general format is prescribed by the Minnesota Board of Soil and Water Resources. Plans are administered locally by a County Water Plan Coordinator and a citizen committee, and updated every five years.

Decentralized wastewater treatment: A concept of wastewater treatment for a low population density area using individual and/or multiple household on-site wastewater treatment technologies (nearly always with subsurface dispersal) to protect human and environmental health.

Disinfection: The chemical or physical process of reducing or destroying pathogens not previously eliminated by primary treatment of wastewater.

Distribution system: The network of pipes or tubes through which wastewater is dispersed into the soil or other treatment component.

Drinking water state revolving funds: Federal funds given to states to use for municipal and nonmunicipal drinking water projects. They are managed in Minnesota by the Public Facilities Authority (reviews design standards and issues permits) and the Department of Health (reviews technical standards).

Dual or separation wastewater treatment systems: *See Combination wastewater system.*

Effluent: Partly treated wastewater or other liquid flowing from a basin, treatment plant or septic tank.

Eutrophication: The aging process by which lakes are fertilized with nutrients, potentially including nutrients coming from wastewater.

Eutrophic lake: A nutrient-rich lake, usually shallow, green and with limited oxygen in the bottom layer of water.

Grit chamber: A detention chamber or an enlargement of a collection line designed to reduce the flow velocity to permit separation of heavy minerals by sedimentation.

Groundwater: Water found beneath the soil surface between the soil particles; groundwater is a primary source of drinking water and recharge to lakes.

Hard water: Water with relatively high levels of dissolved minerals such as calcium and magnesium.

Imhoff tank: A two-story sedimentation and sludge digestion tank.

Impervious surface: Pavement, asphalt, roofing materials or other surfaces through which water cannot drain. The presence of impervious surfaces can increased the rate and speed of runoff from an area, reducing groundwater recharge and adding to overland flooding potential.

Individual sewage treatment system (ISTS): A wastewater treatment system serving a dwelling or business or group thereof using a septic tank or tanks and optional pretreatment unit followed by a soil treatment and dispersal unit that discharges below grade. They are located on or near the owner's property. The term includes holding tanks and privies.

Influent: Wastewater or other liquid flowing into a reservoir, basin, septic tank or treatment plant.

Inorganic solids: Particles of mineral origin (not plant or animal matter) that are not readily biodegradable, for example, sand, grit or glass.

Intended use plan: A plan that describes the intended uses of the available funds. It is required as part of the capitalization grant application for federal funds (see Project priority list).

Intermediary Re-lending Program (IRP): A federally funded low-interest loan program generally used for economic development. This program is administered through USDA Rural Development.

Lake Improvement District: A legal entity created in 1990 by the Minnesota legislature to promote improved lake water quality as well as the public health and welfare of the identified area.

Life cycle cost: All costs associated with a product or facility from initial planning through its death, including planning, construction, installation, monitoring, operation, maintenance and repair costs. Frequently this is calculated on a 20-year period to coincide with financing processes.

Lined wetland: See Constructed wetlands.

Local unit of government (LUG): (Sometimes referred to as a local government unit). A unit of government at the township, city or county level.

Macronutrients: Nutrients essential to plant growth in relatively large quantities: nitrogen, phosphorus, and potassium.

Mesotrophic lake: A lake that is midway in nutrient concentrations (between a eutrophic and an oligotrophic lake), characterized by periodic problems with algae blooms or problem aquatic vegetation.

Micronutients: Nutrients essential to plant growth in small quantities: sulfur, zinc, iron manganese, copper, boron, calcium, magnesium, carbon, oxygen, hydrogen.

Municipal system: Usually a wastewater collection and treatment facility that serves a large, densely populated area, such as a city, part of a city or more than one city. They nearly always discharge treated water to a surface water body.

Nitrate (NO_3): A water soluble form of nitrogen.

Nominal group process: A structured problem-solving or idea-generating strategy in which individuals' ideas are gathered and combined in a group situation. It is a round-robin method that guarantees opportunity for input from all group members.

Nonpoint source: Diffused source of pollutants—not discharged from a single point. Generally associated with land use such as runoff from feedlots, fertilized lawns and agricultural fields or contaminated groundwater flow.

Nonstandard wastewater system: A wastewater treatment system other than the typical systems prescribed by regulations.

Notification of financial availability (NOFA): Both the state and federal registers are used to notify interested parties about financial funding availability. They usually include criteria for the funding as well as the deadlines for receipt of applications.

Nutrient: An element essential for support of plant or animal life. A substance that provides food or nourishment, such as usable proteins, vitamins, minerals or carbohydrates. Fertilizers, particularly phosphorus and nitrogen, are the most common nutrients that contribute to lake eutrophication and nonpoint source pollution.

Oligotrophic lake: A relatively nutrient-poor lake, characterized by outstanding water clarity and high levels of oxygen in the deeper waters.

Organic solids: Particles of plant or animal origin with a basic carbon structure, subject to decay.

Out of scope: Work performed by a contractor for a project that is outside of the proposal or contract. This work is billed separately from the contracted work.

Pathogens: Disease-causing organisms, such as bacteria, viruses, and protozoans.

pH: The scale by which the relative acidity or alkalinity of a substance is accessed. A pH of 7 is neutral.

Phosphorus: A nutrient essential to plant and animal life in relatively large quantities. Tightly held by soil particles in unsaturated soil conditions.

Photosynthesis: The process by which green plants produce oxygen from sunlight, water and carbon dioxide.

Phytoplankton: Algae, the base of the lake's food chain; algae also produce oxygen.

Point source pollution: Specific sources of pollutants, discharged from a single point into a water body, for example, a stormwater discharge pipe.

Polishing pond: A tertiary/advanced treatment pond designed to remove nutrients or additional BOD and TSS following a conventional secondary treatment process.

Pre-aeration process: A mechanical process that removes oil and grease from raw wastewater and adds dissolved oxygen.

Preliminary engineering report: An initial or preliminary report from a consultant or engineering firm that identifies and discusses potential options and project life cycle costs for communities to determine a general direction for a project. Final decisions are not made from this document, but it serves as a beginning point for discussions.

Pretreatment: A wastewater treatment step preceded by a preliminary treatment unit (septic tank or sedimentation device) and followed by a final treatment and dispersal unit. It provides additional treatment and cleaner effluent to the final steps.

Primary treatment: The first major unit in a wastewater treatment process that uses physical sedimentation (biological decomposition in an on-site system) to remove and reduce organic and inorganic solids.

Project priority list: A ranked listing of funding applications based on a prioritized point system established by the MPCA to identify wastewater projects that are potentially eligible to receive funding. The prioritizing system ensures that loan and grant funds go to those projects that most closely meet the state's priorities of protecting human health and the environment.

Protozoans: A group of microscopic one-celled animals that feed on bacteria, other small animal cells and bits of plant life.

Recycling: The process of preparing a product or commodity for reuse.

Request for proposals: A process utilized by a community to solicit proposed methods and costs for treating wastewater from selected engineering firms. This process should be initiated after the "request for qualifications" has been completed and qualified engineering firms have been selected.

Request for qualifications: A process used by a community to solicit information from professionals and engineering firms about their experience and ability (qualifications) to address the community's wastewater treatment needs. The goals of the process are to focus the project, save time and money and reduce the potential for mistakes by narrowing the field of professionals from which to solicit "requests for proposals."

Riparian: The natural ecosystem or community associated with a river or lake shoreline.

Rotating biological contactors (RBCs): A bed of partially submerged synthetic media rotating in a tank through which wastewater flows. The film of living organisms on the media breaks down the organic matter in the wastewater.

Sanitary District: Created by the legislature in 1963 with modifications in 1965 and 1971 and the addition of Special Districts in the 1970s.These models are frequently used for water quality and/or wastewater quality problems, as well as for solid waste and drainage area problems.

Scope of work: Identified components of a contract between a community and the contractor. Used in a "request for proposals" and the final contract to specify the work to be performed.

Secondary treatment: The process by which dissolved and suspended materials are converted to settleable forms to be removed from wastewater. This is usually accomplished by using biological treatment processes such as activated sludge, trickling filters, stabilization pons, rotating biological contactors, etc. Has a defined outcome of 25 mg/l BOB and 30 mg/l TSS.

Secchi disc: A device consisting of a multicolored disc on a rope used to visually measures the depth of light penetration in water.

Sedimentation tanks: (Also called **settling tanks.**) Containers that allow suspended solids to separate from the liquid by gravity.

Septic system: (Also referred to as an on-site sewage treatment system or as an individual sewage treatment system.) A wastewater treatment system that uses an anaerobic tank to separate the solids from the liquids, biologically decompose the organic solids and deliver the liquids to a subsurface soil treatment and dispersal site. They generally serve one or more homes and businesses on or near the property where the wastewater is generated.

Settling tanks: *See sedimentation tanks.*

Sinking fund: A depreciation fund that provides cash to replace equipment.

Sludge: The settleable solids separated from liquids during processing or accumulated on the bottom and edges of wastewater collection lines. Solids are both organic and inorganic.

Sludge digester: a tank in which sludge is placed to further break down the organic matter and reduce the number of pathogens.

Sludge lagoon: A pond in which sludge is placed to reduce the volume by removing a portion of the liquid and to decompose the organic matter, forming relatively stable organic and inorganic compounds.

Small Cities Development Program: A grant program administered by the Department of Trade and Economic Development (DTED) and funded by federal community development block grants.

Soil treatment unit: The final stage of a septic system that distributes liquid effluent from the septic tank or pretreatment unit into the soil for final treatment of pathogens and nutrients. It can use a series of trenches, mound, at-grade or drip dispersal.

Special Legislative District: A defined area created for a special purpose by the legislature, through a bill introduced by the area's representative. It defines the purpose of the project and statutory rules necessary to complete the work.

Spray irrigation: A method of applying septic tank or pretreatment unit effluent to the surface of a soil treatment area using a system of pipes and spray nozzles. The effluent must be kept from human contact or chemically treated. The method is also used to apply partly treated wastewater from a lagoon system to farm fields or open meadows.

Stabilization pond: A secondary treatment system using an interaction of algae and bacteria under controlled conditions in a shallow, man-made pond to purify wastewater. Treated water is usually released seasonally to a surface water body, but may be irrigated onto farm fields or meadows.

Standard system: A treatment system design that has proven effective and is prescribed by law to treat wastewater.

State Revolving Loan Funds: Funds provided to states through the Clean Water Act to finance water pollution control projects. These funds capitalize a state revolving loan fund to be used for both point and nonpoint source water pollution control projects.

Stream purification: The natural ability of flowing water to reduce bacterial content, stabilize organic material and return dissolved oxygen to the levels prior to discharge of wastewater into the stream. This occurs in a series of overlapping zones: zone of degradation, zone of decomposition, zone of recovery and zone of clean water.

Subordinate Service District (SSD): A service district petitioned by landowners of a defined area that does not encompass an entire township or county created to provide a service for and financed by the property owners.

Tertiary or advanced treatment: Treatment in addition to normal or conventional secondary treatment methods, usually for the removal of additional nutrients or organic and total solids.

Textile filter: A pretreatment device using a fabric material instead of sand or peat as a growth medium for biological organisms to further treat septic tank effluent before delivering it to a soil treatment unit.

Total maximum daily load (TMDL): A calculation of the maximum amount of a pollutant that a water body can receive and still meet water quality standards, and an allocation of that amount to the pollutant's sources. It is the sum of the allowable loads of a single pollutant from all contributing point and nonpoint sources and includes a margin of safety for the designated purpose of the water body and seasonal variation in water quality.

Total suspended solids (TSS): The organic and inorganic solids that remain suspended in the liquid effluent leaving a septic tank or initial treatment unit.

Trickling filter: A biological treatment process that slowly moves wastewater through a media bed full of microorganisms.

Trophic status: The level of growth or productivity of a lake as measured by phosphorus content, algae abundance and depth of light penetration.

Ultraviolet light: A method of disinfecting wastewater using the band of electromagnetic radiation having wavelengths from 5 to 400 nanometers.

Viruses: Submicroscopic agents capable of causing disease that grow inside living cells.

Wastewater Infrastructure Funds (WIF funds): State grant funds used in connection with the State Revolving Loan program and USDA Rural Development grant and loan funds. They are awarded through the project priority list and intended use plan processes when all of the criteria are met.

Water quality cooperative: A cooperative created by the legislature in 1999 to deal with water quality problems on a basin management basis using a cooperative utility model.

Watershed: The surrounding land area that drains into a lake, river or river system.

Watershed District: A local unit of government created by the legislature in 1990 to address water-related problems and practice resource conservation within a natural watershed.

Watershed Management Organization (WMO): A district wholly within the Minnesota metropolitan area created in 1990 to perform the functions of a watershed district, such as water planning and implementation in the urban growth area.

Wellhead protection area (WPA): The surface and subsurface area surrounding a well that supplies water to a public water system through which contaminants could move and reach the well.

Zooplankton: Microscopic animals.

Appendix A.

Sample Surveys

Residential Sewage Treatment Information

(To be used by a community task force to collect pertinent information voluntarily from the owner about each property. Distribution may be via mail, hand delivery or completed in an interview. Survey should be modified to collect only necessary information.)

All of this information is important to access the sewage treatment needs of our community. Individual information will not be used for enforcement purposes. Renters: please forward to your landlord. Thank you for your assistance!!

Parcel Number (from tax statement _____

1. Owner's Name & Permanent Mailing Address: (from tax statement)

   _____

2. Phone:_____(permanent residence)_____(cabin)_____(winter)

3. Size of Parcel: Approximate dimensions _____ X _____ or if large: Acres _____

4. Own more than one parcel? Yes ___ If so, how many?_____ Other Parcel #'s _____

5. Type of building(s) and usage: (Check all that apply)

   Residential: **Commercial:** **Industrial** _____

   ____Primary ____Resort

   ____Rental ____Food Service

   ____Seasonal ____Other

   ____Multi-residence

   ____Other _____ (explain)

   Usage: Live year around ____ Summer____ Winter ____ Weekend

6. Number of bedrooms: _____ Number of persons normally living here: _____

7. Water Use Appliances: Mark which of the following you have:

   Garbage Disposal: ___ Water Softener: ___ Dish Washer: ___ Washing Machine: ___
   Hot Tub / Sauna / Whirlpool Tub: ___ Humidifier on furnace, etc: ___

   Others: Name _____

8. Well Information:

	Well #1	Well #2
Type - dug, sand point, drilled	_____	_____
Depth – approximate	_____ feet	_____ feet
Year installed	_____	_____
Installed by: Contractor or owner	_____	_____
Test Results (Nitrates – ppm, Coliform Bact)	_____N _____Bact	_____N _____Bact
Status – used/abandoned/sealed	_____	_____
Shared with another home – Name	_____	_____

(OVER)

9. Sewer System:

   Type of system: Holding tank _____Septic tank/drywell/cesspool _____Septic tank/mound _____Septic tank/trench

   _____Other: Please Identify _____ _____ Unknown

   _____Shared with another home (Name) _____

   Distance from well? _____ feet Distance from lake or river? _____ feet

   Year of Installation: _____

   Contractor who completed Installation: _____

   Any changes to system: If so, please indicate what and when done [i.e. adding to drainfield, replacement of tank, etc]

   _____

   Frequency of septic tank pumping? _____Every year _____2 years _____3 years _____4 years _____Long time/Never ___

10. Do you have any plans to convert from a seasonal to full-time residence or for future additions such as bedrooms, etc. If so, please indicate here and comment: _____

    _____

    _____

    _____

11. Draw a sketch of property below; label buildings, well, septic, lake/river/wetland

12. Attach a copy of any other documents—permit, pumping record, well test

Please return this survey to: _____

_____

by _____(date)

Thank you for your participation!!

Municipal Treatment Plant

(To be used by a community task force to collect pertinent information about municipal wastewater treatment facilities in all surrounding communities. Information should be based on an interview of a qualified official. Survey may be modified to collect necessary information.)

1. Town/location of Facility: _____
2. Distance from our community to closest sewer connection: _____miles

Person Interviewed:

Name _____Title_____ Phone # _____

3. Year facility was built: _____ Last major modifications (year) _____
4. Type of treatment system: _____
5. Discharge point: _____
6. Total design capacity of facility (gal/day): _____
7. Current operating capacity (% of design capacity): _____%
8. Projected changes in volume for existing & committed service area: _____decrease _____stable _____increase
9. Performance of current facility:

   ____Always meets/exceeds minimum standards ____Regularly meets minimum standards ____Frequently misses minimum standards

   ____Has been cited by MPCA for problems
10. Future plans for sewage treatment plant: (describe) _____

    _____

    _____
11. Community policy towards outlying/unserved areas:

    ____Accepts septage free of charge ____Accepts septage; charges fee ($_____/_____)

    ____May be interested in serving larger area if annexed

    ____May be interested in serving larger area without annex
11. Other information gathered: _____

    _____

    _____

    _____

    _____

Team member Collecting Information:_____ Date: _____

Current Land Use Policy for Our Community

(To be used by a community task force to collect pertinent information about the current land use plan and the perspectives of a variety of persons regarding plans for the future for the community and surrounding areas. Information should be based on interviews of a variety of qualified officials, community leaders and residents. Some persons may not be able to or need to answer all questions. Survey may be modified to collect necessary information.)

Person Interviewed: (Name) _____

Capacity: ____Planning/Zoning Staff ____ Township Officer ____County Commissioner

____Long-term Resident ____New Resident ____Planning Commission Member Other _____

1. Does the county, township or city have a comprehensive land use plan? _____
2. Does all of our area fall under: ____one ____more than one local jurisdiction for land use policy?
3. Who are they? ____County_____

   ____Township_____ ____City _____
4. When was the last plan last adopted? _____ Reviewed? _____
5. When will the plan be rewritten or reviewed again? _____
6. How long has it been between major policy changes? _____years
7. What is the current zoning classification: (Obtain a copy of the plan and zoning map if possible)

Classification	**Your Community**	**Surrounding Area**
Urban – Residential	_____	_____
Urban – Expansion	_____	_____
General Ag/Dev (incl. Rural Res)	_____	_____
Shoreland	_____	_____
Long-term Agricultural	_____	_____
Commercial	_____	_____
Other	_____	_____

8. Ideas about the future direction of land use policy affecting our community:
   Do you think the current land use plan for our area will change in the near future? If so, how?

   Would you like to see it change? If so, how?

   What is the probability of a change like this? What factors would cause the change?

   Who else do you think I/we should talk to about the direction of land use policy for our community?

9. What is the current local policy/position on individual and multiple household sewage systems?

2. Are there any other local restrictions that may affect sewage treatment Decisions? What are they?

Team Member: (Name)_____ Date of Interview _____

Appendix B.

Summary of Treatment Options

Space requirements, suggested management provider, and sensitivity of the system to changes in flow and/or harmful products in wastewater:

Treatment Option	Relative amount of space required on home site [1]	Suggested Management Provider	Sensitivity to harmful products [2] & large variations in flow [3]
Decentralized:			
Septic tank	◗	Informed homeowner	XX
Pre-treatment device:			
Aerobic treatment unit	◗◗	Qualified professional contractor	XXXX
Single pass media filter (sand, peat, textile)	◗◗◗◗	Qualified professional contractor	XXX
Re-circulating media filter (sand, peat, textile)	◗◗◗	Qualified professional contractor	XXX
Constructed lined wetland	◗◗◗◗◗◗	Qualified professional contractor	XXXX
Final Treatment—Dispersal:			
Trench or Bed	◗◗◗	Informed homeowner	XXX
Mound	◗◗◗◗	Informed homeowner	XXX
At-grade	◗◗◗	Informed homeowner	XXX
Drip dispersal	◗◗◗◗◗	Qualified professional contractor	XXX
Constructed unlined wetland	◗◗◗◗◗◗	Qualified professional contractor	XXXX
Separation/Dual System:			
Composting/Incinerating Toilet		Informed homeowner or qualified professional contractor	XXX
Dual system	◗◗ — ◗◗◗◗◗ (Depending on the system chosen)	(Depends on system chosen—see above)	XX — XXXX (Depending on the system chosen)
Centralized: Municipal Collection & Treatment	◗	Licensed operator at municipal plant	X

1 Relative amount of space required on home site: requirement varies by volume of water use (size of home/s) and soil type (sand, loam, clay). ◗ = small space required; ◗◗◗◗◗◗ = large space required.

2 Harmful products include anti-bacterial soaps, bleaches, disinfectants, medications and other "disinfecting" products.

3 Sensitivity to harmful products & large variations (high & low) in flow. X = low sensitivity; XXXX = highly sensitive.

Appendix C.

Typical Sewage Treatment System Performance

	BOD (mg/l)	TSS (mg/l)	Fecal (MPN/100ml)	N Lbs./year	P Lbs./Year
Raw Sewage from a Typical Home	270–400	300–400	1M-10M	37–45 lb.	4–15 lb.

Treatment Method:	**Concentration of the discharge**	**Concentration of the discharge**	**Concentration of the discharge**	**% Removed**	**% Removed**
Centralized: surface discharge	25	30	1,000[1]	0–951	0–95[2]
Decentralized: subsurface discharge					
Septic tank with mound, trench or bed	0	0	0	Trench: 20–50% Mound: 40–60%	100
Septic tank,, with pretreatment and mound, trench or bed	0	0	0	30–90[3]	100
Separation/Dual Systems	Dependent on the combination of systems chosen				

1 May be higher during the winter because of reduced potential for human contact.

2 The wide range depends on the kind of procedure used at each facility. Generally, the newest facilities designed to meet Total Maximum Daily Load (TMDL) requirements of the receiving water body have the most advanced equipment providing the highest level of removal.

3 The range in performance varies by pre-treatment device, soil treatment type and season of the year.

Appendix D.

Questions to Ask a Consulting Firm's References

1. What services did the firm provide for your community? (for example, feasibility study, funding application, design, construction)

2. Were you satisfied with the quality of the work? Were they able to provide you with a cost-effective system?

3. Was the firm able to meet the time frame and schedules agreed upon in your contract?

4. Did the consultant have other projects scheduled that caused time delays in your project?

5. Were the costs and charges reasonable in relation to the work actually performed?

6. Who was the consultant assigned to your project, and was he/she knowledgeable about the funding program and its requirements?

7. Did the firm assist you with your application to your funding source? Was that application successful?

8. Was the consultant willing and able to work closely and effectively with your community and/or district board?

9. Did you experience any problems that would discourage you from hiring this firm again?

10. If you could start over with the knowledge you have gained during your experience in working on this project, what would you do differently?

Appendix E.

Sample Consultant Interview Questions

1. What experience does your firm have in working with communities or districts such as ours?

2. Are you familiar enough with our situation and the local area to know some of our particular needs?

3. What is the design philosophy of your firm? Are you willing to look at innovate and/or alternative designs? What examples of this can you provide from past projects?

4. Are you familiar with various funding programs within Minnesota for wastewater as they relate to communities or wastewater districts? What has been your experience in working with these funding agencies? Has your firm assisted communities with grant writing or funding applications? What has been the success rate of the applications?

5. If we told you that our goal is to keep the costs of treatment methods below $12,000 per user, do you feel your firm could produce a solution to meet this requirement?

6. Who specifically in your firm would be working directly with our board? Will the lead consultant be willing and able to attend public meetings to discuss the project?

7. What other projects are you currently working on that could take precedence and time away from our project? Is your firm under any time constraints for this year?

8. How much of the work on our project would be subcontracted?

9. Do you offer to "carry" communities for the cost of the study until funding is obtained, or is partial payment expected?

10. What time schedule does your firm propose for completing the feasibility study?

11. Are there specific itemized services that your firm cannot provide?

Appendix F.

Generic Ranking System for Interviewing Engineers or Consultants

These general topics may be discussed when interviewing a consultant about a variety of the tasks necessary to develop new wastewater treatment systems. The search committee should review these issues before the interview, agree on the total number of points you want to assign to each category, and provide clear guidance on the scoring scale. For example, you might rank each on a scale of 1 to 5, where:

1 = No experience/clueless;
2 = Subcontractor on project similar to ours;
3 = Active participant in project similar to ours;
4 = Designed, installed or managed project similar to ours; and
5 = Clearly expert on this issue or situation

Evaluating engineering firms is similar to interviewing new employees. To the extent possible, ask for specific experiences and examples that address the issues described below. If an answer is unclear or not specific, ask the same question in a different manner. If a group is interviewing the consultant or engineering firm representative, rotate the role of questioner so that everyone has the opportunity to interact with the interviewee. Review insights or reactions immediately after the interview while impressions are still fresh. Take notes during the interview so that you can explain your ranking to the others.

Evaluation Criteria for Assessing Engineering Firms

	Firm #1	Firm #2	Firm #3	Firm #4
Understands the Problem (understands the objectives of our community)	_____	_____	_____	_____
Experience in communities similar in size to ours	_____	_____	_____	_____
System Design Experience (what types of systems has this firm recommended, designed or installed in other communities?)	_____	_____	_____	_____
Experience with financial institutions and funding agencies	_____	_____	_____	_____
Experience with state and county agencies	_____	_____	_____	_____

Evaluation Criteria for Assessing Engineering Firms (continued)

	Firm #1	Firm #2	Firm #3	Firm #4
Willingness to work with and for our community	_____	_____	_____	_____
Meeting Time and Budget Requirements	_____	_____	_____	_____
Record of performance with respect to:				
Cost Control	_____	_____	_____	_____
Quality of work	_____	_____	_____	_____
Ability to meet schedules	_____	_____	_____	_____
Staff Capabilities				
Licensing	_____	_____	_____	_____
Staff experience	_____	_____	_____	_____
Present and Project Work Load (Can they meet our needs without interruption?)	_____	_____	_____	_____
Soundness of Approach	_____	_____	_____	_____
Technique of analysis	_____	_____	_____	_____
Sequencing of project	_____	_____	_____	_____
Method of project management	_____	_____	_____	_____
Location/Home Office (Proximity to and familiarity with our community)	_____	_____	_____	_____
TOTAL POINTS	_____	_____	_____	_____

Appendix G.

Useful Contacts and Web Sites

Board of Soil and Water Resources (BWSR)
651-296-3767
www.bwsr.stste.mn.us

Metropolitan Council
651-602-1000
www.metrocouncil.org

Minnesota Department of Agriculture (MDA)
651-297-2200 or 800-967-2474
www.mda.state.mn.us

Minnesota Department of Health (MDH)
651-215-5800
Environmental Health Division—651-215-0870
Well Management Section—651-215-0811
Source Water (Wellhead) Protection Program—651-215-0800
www.health.state.mn.us

Minnesota Department of Natural Resources (DNR)
651-296-6157 or 888-MINNDNR
Ecological Services—651-296-2835
Enforcement—651-296-4771
Fisheries—651-296-3325
Waters—651-296-4800
Trails and Waterways—651-297-1151
Regional Offices:
Region 1—Bemidji—218-755-3955
Region 2—Grand Rapids—218-327-4455
Region 3—Brainerd—218-828-2561
Region 4—New Ulm—507-359-6000
Region 5—Rochester—507-285-7420
Region 6—Metro—651-772-7900
www.dnr.state.mn.us

Minnesota Department of Trade and Economic Development (DTED)
Public Facilities Authority (PFA)—651-297-1291 or 800-657-3858
www.dted.state.mn.us

Minnesota Department of Transportation (Mn/DOT)
651-296-3000 or 800-657-3774
www.dot.state.mn.us

Minnesota Historical Society—651-296-6126
www.mnhs.org

Minnesota Office of Environmental Assistance (OEA)
651-296-3417 or 800-657-3843
www.moea.state.mn.us

Useful Contacts and Web Sites (continued)

Minnesota Planning
651-296-3985
Environmental Quality Board (EQB)—Water Resources—651-296-0676
www.mnplan.state.mn.us

Minnesota Pollution Control Agency (MPCA)
651-296-6300 or 800-657-3864
Regional Offices:
Brainerd Office—218—828-2492
Detroit Lakes Office—218-847-1519
Duluth Office—218-723-4660
Mankato Office—507-389-5977
Marshall Office—507-537-7146
Rochester Office—507-285-7343
St. Paul Office—651-296-6300
Willmar Office—320-214-3786
www.pca.state.mn.us

Minnesota statutes and rules
www.revisor.leg.state.mn.us

University of Minnesota Extension Service
On-Site Sewage Treatment Program—612-625-7243 or 800-657-3516
www.extension.umn.edu or www.bae.umn.edu/septic

U.S. Army Corps of Engineers
651-290-5200
www.mvp.usace.army.mil

U.S. Department of Agriculture (USDA) Rural Development
651-602-7800
www.rurdev.usda.gov/mn

U.S. Environmental Protection Agency (EPA)
Washington D.C.—202-260-2090
www.epa.gov
Region 5: Chicago—312-353-2000
www.epa.gov/region5

U.S. Geological Survey in Minnesota (USGS)—Department of Interior
763-783-3100
mn.water.usgs.gov

Appendix H.

Summary of Scientific Abbreviations and Measurements

BOD	Biological Oxygen Demand
°C	degree(s) Celsius
cfs	cubic feet per second (a common measure of rate of flow)
cfu	colony forming units (a common measure of bacterial concentrations)
chl *a*	chlorophyll *a*
cm	centimeter
COD	chemical oxygen demand
Cond	conductivity
DO	dissolved oxygen
FC	fecal coliform (bacteria)
ft	feet
IR	infrared
K	potash
l	liter
m	meter
mg	milligram
ml	milliliter
N	nitrogen
NH_3-N	ammonia nitrogen
NO_2	nitrite nitrogen
NO_3	nitrate nitrogen
NTU	Nephelometric Turbidity Units, standard measure of turbidity
OP	ortho-phosphorus
P	phosphorus
ppb	parts per billion
ppm	parts per million
SD	standard deviation (statistical variance)
sf	square feet
TDS	total dissolved solids
TN	total nitrogen
TP	total phosphorus
TSI	trophic status index
TSI (C)	trophic status index (based on chlorophyll *a*)
TSI (P)	trophic status index (based on total phosphorus)
TSI (S)	trophic status index (based on Secchi disc transparency)
TSS	total suspended solids
µg/l	micrograms per liter
µmhos/cm	micromhos per centimeter, the standard measure of conductivity
UV	ultraviolet

Appendix I.

Guide to Common Acronyms

State and Federal Agencies

BWSR	Board of Water & Soil Resources
COE	United States Army Corps of Engineers
DNR	Department of Natural Resources
DOJ	United States Department of Justice
DOT	Department of Transportation
DTED	Department of Trade and Economic Development
EPA	United States Environmental Protection Agency
EQB	MN Environmental Quality Board
IRRRB	Iron Range Resources & Rehabilitation Board
LCMR	Legislative Commission on Minnesota Resources
MDH	Minnesota Department of Health
MPCA	Minnesota Pollution Control Agency
OEA	MN Office of Environmental Assistance
OSHA	Occupational Safety and Health Administration
NCRS	Natural Resources Conservation Service (formerly SCS, Soil Conservation Service)
SWCD	Soil & Water Conservation District
USDA	United States Department of Agriculture
USDARD	US Department of Agriculture, Rural Development (formerly FmHA, Farmers Home Administration)
USGS	United States Geological Survey
USFWS	United States Fish & Wildlife Service

Regional, Watershed, Community Development, Trade and Advocacy Groups

AMC	Association of Minnesota Counties
APA	American Planning Association
BCIP	Blandin Community Investment Program
COLA	Coalition of Lake Associations
IF	Initiative Foundation
LMC	League of Minnesota Cities
MAT	Minnesota Association of Townships
MLA	Minnesota Lakes Association
MHB	Mississippi Headwaters Board
RCM	Rivers Council of Minnesota

Codes and Regulations

110B	The Minnesota law that regulates nonmetro-area county water plans
BOA	Board of Adjustment
Chapter 7080	Individual Sewage Treatment Systems program
Class V	Class Five injection well; any well that receives discharge
CUP	Conditional Use Permit
CWA	Clean Water Act
EAW	Environmental Assessment Worksheet
EIS	Environmental Impact Statement
GD	general development (lake classification)
LGU	local governmental unit
LMP	Lake Management Plan
LUG	local unit of government
MAP	Midwest Assistance Program
NE	natural environment (lake classification)
NOFA	notification of financial availability
OHW	ordinary high water
PUD	planned unit development
RD	rural development (lake classification)
ROD	record of decision
ROW	right-of-way
SBC	State Building Code
SDWA	Safe Drinking Water Act
SIZ	shoreland impact zone
SQG	Small Quantity Generator (of hazardous waste)
SWMP	Stormwater Management Plan
UBC	Universal Building Code
WHPA	wellhead protection area

Find more University of Minnesota Extension Service educational information at

www.extension.umn.edu

on the World Wide Web.

Send copyright permission inquiries to: Copyright Coordinator, University of Minnesota Extension Service, 405 Coffey Hall, St. Paul, MN 55108-6068. E-mail to copyright@extension.umn.edu or fax to: (612) 625-2207.

Additional copies of this item can be ordered from the University of Minnesota Extension Service Distribution Center, 405 Coffey Hall, 1420 Eckles Avenue, St. Paul, MN 55108-6068, e-mail: order@extension.umn.edu, or place credit card orders at (800) 876-8636.

Produced by Communication and Educational Technology Services, University of Minnesota Extension Service.

Printed on recycled paper with minimum 10% postconsumer waste, using agribased inks.

IN PARTNERSHIP ...

College of
Natural Resources
UNIVERSITY OF MINNESOTA

UNIVERSITY OF MINNESOTA
Extension
SERVICE

BU-07734-??