

SMARTER LAND USE WITH ONSITE SYSTEMS: ONE STATE'S PROCESS

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Introduction

Communities in the State of Maine face difficult choices as they try to protect the natural environment from the impacts of development, minimize administrative burdens, and still provide employment opportunities and safe housing. The creation of welcoming, walkable, village-style neighborhoods is re-emerging as a favored land use pattern, both in Maine and across the country. One of the biggest challenges facing towns in Maine is how to grow successfully without using centralized sewers. Communities want to direct growth through their comprehensive plans to the most suitable areas of town, near existing services or expanding traditional villages, but have no prospect of public sewer lines to serve these areas. Thus, new development must rely on soils, usually on a lot-by-lot basis, to handle wastewater. Conventional wisdom says that on-lot wastewater treatment and dispersal using septic systems means low development densities, negating the effectiveness of a growth area. An essential element of this project was to provide community leaders and developers with science-based information and tools to create neighborhoods with smarter land use through decentralized methods of water resource management.

Maine is a state of widely varying conditions and capacities in community size and professional staffing, economic prosperity, natural land use constraints (such as soil types or slopes), and land use controls. Nearly everywhere, however, the dominant pattern of development has become one of large lot development in the towns surrounding regional and smaller subregional job or service centers. Development of large lots, with onsite septic and water systems requiring little maintenance, has been considered the “safe” and economical way to allow development with little oversight. However, the result is sprawl, with its fiscal and environmental costs. This pattern of development is inconsistent with the village-and-countryside pattern in which Maine historically was developed.

Alternatives to traditional onsite septic systems and wells have existed for some time, though information about the performance of such alternatives and methods to construct and maintain them has not been widely distributed. The tools exist to operate and manage onsite systems as well as cluster or community systems that result in multiple lots cooperating to find common solutions.

Designing innovative systems is predicated on a thorough understanding of site conditions. Soil type, depth to groundwater, slope, and depth to refusal or bedrock are a few of the site criteria considered in making traditional systems work. With alternative systems, these same criteria apply; however, the use of electrical-powered components, new materials, and management structures allow for development on more compact sites and on marginal sites. The notion of a minimum lot size becomes less relevant once new technologies are factored in. This approach allows broader

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planning goals, societal values, and other policy issues such as transportation, wildlife habitat, affordable housing, and air quality to play stronger roles in setting land use policy.

Moving to a science-based system of managing wastewater and water supply does have its challenges. Innovative onsite systems require greater maintenance and have less tolerance, and therefore greater opportunity for failure, if not maintained. Community and cluster systems require new management models, whether through the municipality or through homeowners' associations. Finally, the use of innovative onsite systems requires changes to the traditional way of thinking and thus requires time to educate decision makers about the technologies that are available and to provide solutions to their concerns.

Background

Since 1974, when the state overhauled its external plumbing code and moved from percolation tests to a system of site evaluations, Maine has been a leader in the regulation of soil-based treatment and dispersal of wastewater. The Division of Health Engineering within the Department of Human Services has continually reviewed and refined the regulations to accommodate new science and technologies, while achieving its main objective: the safe and sanitary treatment and dispersal of human waste where public treatment plants are unavailable.

The regulations represent an interplay among soil characteristics (parent materials, depth to bedrock, and drainage class), system design, and setbacks from sources of drinking water and water bodies. They are implemented on a day-to-day basis by qualified soil evaluators and licensed plumbing inspectors, all working within a framework of statewide rules (Maine Department of Human Services, 2002). The design- and performance-based nature of the rules make prescriptive standards for lot sizes secondary and perhaps even unnecessary: there is no one minimum lot standard that correlates with the safe and sanitary onsite treatment and dispersal of wastewater. Some situations require very large lots or very low densities (e.g., to prevent the migration of nitrate-laden groundwater from reaching estuaries), while others tolerate lots that are quite small. Any correlation that may have existed between site conditions and lot size was further reduced by the introduction of designs for alternative individual systems and community systems.

Nevertheless, in state law and especially municipal zoning and minimum lot size ordinances, lot size standards play as much of a controlling role in the regulation of land that relies on onsite treatment and dispersal as do the rules governing the design of the systems themselves. Typically, these standards take the form of large minimum lot size requirements — for example, 2 to 5 acres — that have been widely recognized as a cause of “sprawl.” The reasons for this disproportionate and probably unjustified role of large minimum lot size requirements include:

- Minimum lot size laws pre-dated contemporary design-based rules for soil-based waste water treatment and dispersal and, in the absence of the level of knowledge about soil and hydrologic processes we have today, were purposely set to allow ample margins of safety. Experience with failed (or nonexistent) underground systems on very small lots in old compact settlements seemed to confirm the need for this approach. Maine's Minimum Lot Size Law, enacted in 1973, set the standard at 20,000 square feet. Conventional wisdom

suggested that this was a bare minimum, suitable for sites with the best soils. Sites with less suitable conditions needed larger lots depending on soil profiles and conditions, in order to contain underground wastewater plumes.

- As suburbanizing towns in Maine began to enact zoning ordinances of their own in the 1970s, they adopted minimum lot requirements much larger than the state minimum. The requirements both met the safety margins for soil-based waste treatment and dispersal and fit with other goals: attempts to slow growth, preserve rural qualities, give reasonable equity among property owners, and discourage low-cost housing. The need for safe and sanitary waste water treatment and dispersal was the public health justification for standards intended to meet multiple purposes.

This approach has been institutionalized in zoning and municipal policy because it is convenient and is the least demanding administratively. Fixed, conservative lot standards accommodate a passive, seemingly “maintenance-free” approach to domestic wastewater treatment and dispersal, and this appeals to many consumers and municipal officials. The combination of thoughtful, enforceable statewide standards for the design and installation of septic systems and large lots, which are likely to contain any failures should they occur, means that once the system is in there need be little future concern about it. This is an illusion, but the large lot requirements create a comfort zone that small towns, with limited staff and no prospect for central sewer systems, like.

These forces, which are helping to drive land use patterns in Maine, are in many ways contrary to the goals of Maine’s Comprehensive Planning and Land Use Act (30 MRSA, § 4301 et seq., a.k.a Growth Management Act). In particular, they frustrate the goal of

“...encouraging orderly growth and development in appropriate areas of each community, while protecting the State’s rural character, making efficient use of public services and preventing development sprawl. “

The problem is compounded by the fact that an estimated 60% of Maine’s housing units rely on onsite waste treatment and dispersal, and the percentage is growing (U.S. Census). If the State is to achieve “orderly development” that makes efficient use of public services and prevents development sprawl, alternatives to conventional septic systems on large lots are a prerequisite.

The Maine State Planning Office determined the best approach to these challenges was to begin a discussion with key audiences such as municipal officials, developers, regulators, other state departments and advocates, and citizens with interest. They determined that creating a suite of outreach materials would facilitate dialogue by providing good information from which to begin discussions.

The consulting team proposed to accomplish these objectives through creation of a simple logic loop: Start with science, gain stakeholder input and support (build champions), provide quality outreach materials, provide training and/or education opportunities; all resulting in bringing people back to the science. In this way, it is believed, issues such as “sprawl vs. smart growth” or fear of

new permitting systems may be avoided by allowing real issues to be raised and answered through the science that is the basis of the analysis.

Start With Science, Blend with Management and Planning: Making the Case

Good science and sound management of infrastructure have been staples of centralized water resource systems for decades. The science for the design of decentralized systems has improved greatly during the past couple of decades. Consideration of appropriate management systems for decentralized infrastructure has only emerged as a constructive option during the past few years. For decentralized infrastructure to blend with current planning models, use of the best science and implementation of appropriate management systems will be essential. Only with such base systems in place may decentralized infrastructure be considered to support denser, traditional village (or growth area) development models.


To provide this strong basis for planning, the team developed four technical assistance bulletins for the Maine State Planning Office: Decentralized Wastewater and Water Supply: Further Reading; Decentralized Wastewater and Water Supply Technologies and Performance; Management Policy Options; and Guidance for Water Supply and Decentralized Wastewater. A synopsis of each bulletin is contained in the following sections.

Decentralized Wastewater and Water Supply: Further Reading

This bulletin provides references and website links for further research. It intends to provide enormous amounts of material to the reader with a thirst for even more knowledge on these topics. It also intends to provide information about the extensive research performed for the two companion papers.

Broad areas of references include the following:

- Wastewater treatment technologies and processes
- Wastewater treatment system design
- Septic system performance and potential impacts
- Choosing options at the community level
- Water supply systems and environmental protection
- Decentralized wastewater management options
- Electronic tools for management assistance
- Land use planning and decentralized system options

TECHNICAL ASSISTANCE BULLETINS	Decentralized Wastewater and Water Supply: Further Reading
<p>A technical assistance series prepared by:</p> <p>Maine State Planning Office Maine Department of Environmental Protection Maine Department of Human Services, Division of Health Engineering State Environmental, Inc. Evan D. Richard</p> <p>With input from a number of professional and citizen planners</p> <p>Inside</p> <ul style="list-style-type: none"> • Wastewater Treatment Technology • Wastewater Design Textbooks • Septic System Performance Impacts • Choosing Treatment Options • Water Supply Protection • Decentralized Waste Water Management Options • Electronic Management Tools • Land Use Planning Options <p>TA Bulletin # 12</p> <p>This TA Bulletin is one in a series of documents intended to provide guidance to relevant local and statewide members on specific planning topics.</p> <p>Financial assistance for the development of this document was provided by the National Oceanic and Atmospheric Administration.</p> <p>December, 2003</p>	<p>Decentralized water supply and waste water treatment and disposal technology choices have a significant impact on meeting development density goals and replicating traditional New England village land use patterns. Decentralized management of water supplies and waste water treatment systems can be set up in existing communities and in areas of new development that use onsite and clustered systems of any size for residential and commercial waste water treatment and disposal. These onsite and clustered systems are protective of public health, drinking water supplies, and the quality of water resources if they are properly planned, installed, operated, and maintained. When they are managed properly, these systems can also protect property values, preserve tax bases, result in life-cycle cost savings, and further Maine's ultimate goals for intelligent development and land use. Current state regulations, recent technology improvements (including management system technologies for smaller systems), and new management models give development planners and designers more options for meeting land use planning and public health and environmental goals.</p> <p>This document provides references and website links for further research, including and complementing the information and references supplied in TA Bulletin 9, 10, and 11. The references are organized first by general topic, then alphabetically by author within each topic.</p>  <p>Example of a development that combines smart growth principles with diffuse waste water disposal technology. Source: <i>Natural Lands Trust, Inc.</i></p>

Decentralized Wastewater and Water Supply Technologies and Performance

This bulletin is the heart of the science of decentralized infrastructure as it relates to the State of Maine's rules. The objectives of the document are to provide scientific and technical information on the following:

- Traditional and pre-treatment septic systems, components, characteristics and sizes of treatment and dispersal areas, and relative costs;
- Cluster wastewater collection, treatment and dispersal systems and how they can be used to meet development goals;
- Water supply options and how they impact onsite septic systems and land use;
- Septic system performance; failing systems vs. functioning systems; how systems can impact environmental receptors, groundwater, freshwater and coastal waters; and
- Technology choices relative to land use - applying performance standards in environmentally sensitive areas.

TECHNICAL ASSISTANCE BULLETINS

A technical assistance series prepared by:

Maine State Planning Office

Maine Department of Environmental Protection

Maine Department of Human Services, Division of Health Engineering

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With input from a number of professional and citizen planners

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TA Bulletin # 9

This TA Bulletin is one in a series of documents intended to provide guidance to volunteer board and committee members on specific planning topics.

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Decentralized Waste Water and Water Supply Technologies and Performance

Onsite water supply and waste water treatment and disposal technology choices can have an impact on meeting development density goals of replicating traditional New England village land use patterns. The areas needed for individual septic systems, or minimum lot sizes, are based on local site and soil conditions, including maintaining several minimum setbacks, such as those to onsite water supply wells, property lines and surface waters. The cumulative perceived impact of onsite water and septic systems and their setbacks in individual lot-by-lot development or multiple lot subdivisions has triggered land use patterns that utilize large amounts of open space and contribute to open space fragmentation. Current state regulations, recent technology improvements (including management system technologies for smaller systems), and new management models give developers, planners, and designers more options for meeting land use planning, public health, and environmental goals.

The objectives of this paper are to provide scientific and technical information on the following:

- traditional and pre-treatment septic systems, components, characteristics and sizes of disposal areas, and relative costs;
- cluster waste water collection, treatment and disposal systems and how they can be used to meet development goals;
- water supply options and how they impact onsite septic systems and land use;
- septic system performance; failing systems vs. functioning systems, how systems can impact environmental receptors, groundwater, freshwater and coastal waters; and
- technology choices relative to land use - applying performance standards in environmentally sensitive areas.



The first two topics essentially describe what the elements of such systems contain, how each is treated under Maine law, and how special situations - such as pretreatment systems, shoreland zones, obtaining variances, or using alternative or experimental technology systems - may alter the viability of use or add to design or management needs. Figure 1 shows many of the different options for decentralized wastewater systems in one easy-to-understand diagram.

Following these introductory sections, the bulletin addresses the issue of land use requirements necessary for the use of decentralized water and wastewater systems, with particular emphasis on Maine's

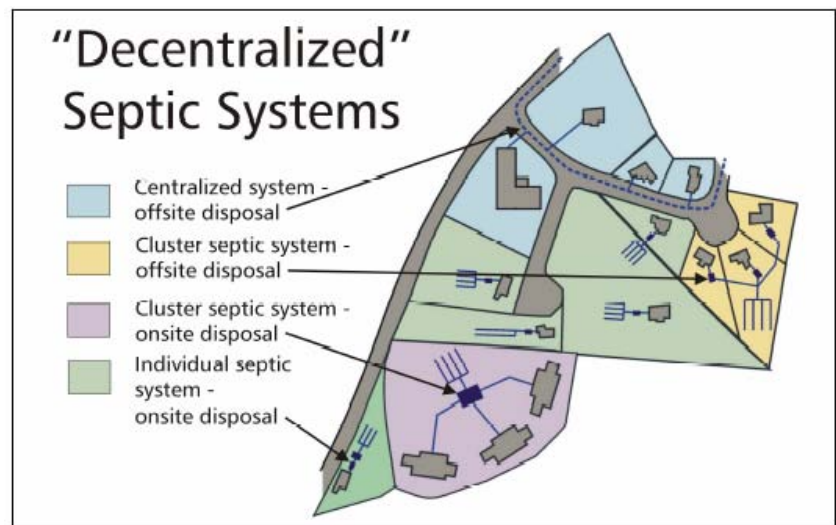


Figure 1. Schematic Illustration of Some Decentralized Options

rules.

The State of Maine's Minimum Lot Size Law (12 MRSA 4807-D) is administered through the Minimum Lot Size Rules (10-144 CMR Chapter 243). The law requires a minimum size of 20,000 square feet for single-family residences, and their equivalent. The lot sizes increase or decrease by an adjustment factor for anticipated wastewater strength, with a residence being the factor of 1. The rules also have a minimum frontage (100 feet for every 300 gallons per day) on surface water bodies.

Generally, the area needed for a residential lot with onsite water supply and septic system above the 20,000 square foot minimum is dependent on the various site conditions and type of water supply and septic system. A drilled well has the smallest setback distance for onsite water supplies. Community water supply service will further reduce the area needed, since the water supply source does not require onsite protection.

Advanced pre-treatment of the wastewater can reduce the size of a system on slowly permeable soils by half, or potentially eliminate the need for fill extensions due to the allowances given for the pre-treatment system.

Cluster septic systems can greatly reduce lot size requirements, making them similar to the minimum lot sizes needed to accommodate a municipal sewer. The offsite cluster system area needed may include room for access for construction and maintenance, room for tanks and pre-treatment systems, and room for the primary treatment and dispersal field and a reserve area. As an example of the land needed for wastewater treatment and dispersal using a large cluster system, dispersal areas were developed for 4,000 gpd and 10,000 gpd cluster systems on differing soils. A 4,000 gpd system area ranges from 0.6 to 1 acre. The area needed for a 10,000 gpd system ranges from 1.2 acres to 2 acres. A 4,000 gpd system could serve up to 14 single family residences, and a 10,000 gpd system could serve up to 37 residences.

With Maine's rules relating to wastewater as a starting point, one needs to look at the water supply sources and system options to round out the infrastructure possibilities. Again this was conducted with emphasis on Maine's rules.

The Maine Rules (Chapter 7, Disposal System Setbacks) describe the required setbacks for first-time treatment and dispersal systems. Reductions in setbacks for bedrock wells are listed on a table based on the depth of casing in the well. The Bureau of Health (Chapter 232, Well Drillers and Pump Installers Rules) governs the location and installation of new wells. Reductions in setbacks are allowed for bedrock wells that are similar to those listed in the subsurface rules. Gravel water supply wells are not allowed a setback reduction unless a Specialty Well application is submitted and approved. The well rules also specify construction materials, special requirements for wells in unconsolidated materials, disinfection, and flow rates.

Ninety percent of Maine's rural residents rely on groundwater sources for their drinking water. The most common types of water supply wells include bedrock, overburden, and dug or shallow wells. Most drilled wells in Maine are bedrock wells. Wells that are serving more than a single-family residence may fall under one of several categories of shared wells and community water systems.

Each has to meet the requirements of State laws regarding siting, testing, design, construction, maintenance and monitoring. Areas near these wells that are identified by the Maine Public Drinking Water Program as Source Water Protection Areas should include a protective setback to septic systems of varying sizes.

Septic system performance was addressed next in the bulletin to provide a sound analysis of what may be expected from decentralized systems in treating the typical constituents entering wastewater systems. Typical constituents and treatment expectations from differing systems are listed in Table 1. How constituent treatment occurs is described to provide the reader with a firm understanding of what to expect of treatment from decentralized onsite systems.

Table 1. Wastewater constituents of concern and representative concentrations in the effluent of various treatment units (U.S. EPA, 2002).

Constituents of concern	Example direct or indirect measures (units)	Tank-based treatment unit effluent concentration					SWIS percolate into ground water at 3 to 5 ft. depth (% removal)
		Domestic STE ¹	Domestic STE with N-removal recycle ²	Aerobic unit effluent	Sand filter effluent	Foam or textile filter effluent	
Oxygen demand	BOD ₅ (mg/L)	140-200	80-120	5-50	2-15	5-15	>90%
Particulate solids	TSS (mg/L)	50-100	50-80	5-100	5-20	5-10	>90%
Nitrogen	Total N (mg N/L)	40-100	10-30	25-60	10-50	30-60	10-20%
Phosphorus	Total P (mg P/L)	5-15	5-15	4-10	<1-10 ³	5-15 ³	0-100%
Bacteria (e.g., <i>Clostridium Perfringens</i> , <i>Salmonella</i> , <i>Shigella</i>)	Fecal coliform (organisms per 100 mL)	10 ⁵ -10 ⁶	10 ⁴ -10 ⁵	10 ³ -10 ⁴	10 ¹ -10 ³	10 ¹ -10 ³	>99.99%
Virus (e.g., hepatitis, polio, echo, coxsackie, coliphage)	Specific virus (pfu/mL)	0-10 ⁵ (episodically present at high levels)	0-10 ⁵ (episodically present at high levels)	0-10 ⁵ (episodically present at high levels)	0-10 ⁵ (episodically present at high levels)	0-10 ⁵ (episodically present at high levels)	>99.9%
Organic chemicals (e.g., solvents, petrochemicals, pesticides)	Specific organics or totals (mg/L)	0 to trace levels (?)	0 to trace levels (?)	0 to trace levels (?)	0 to trace levels (?)	0 to trace levels (?)	>99%
Heavy metals (e.g., Pb, Cu, Ag, Hg)	Individual metals (mg/L)	0 to trace levels	0 to trace levels	0 to trace levels	0 to trace levels	0 to trace levels	>99%

¹ Septic tank effluent (STE) concentrations given are for domestic wastewater. However, restaurant STE is markedly higher particularly in BOD₅, COD, and suspended solids while concentrations in graywater STE are noticeably lower in nitrogen.

² N-removal accomplished by recycling STE through a packed bed for nitrification with discharge into the influent end of the septic tank for denitrification.

³ P-removal by adsorption/precipitation is highly dependent on media capacity, P loading, and system operation.

Source: Siegrist, 2001 (after Siegrist et al, 2000).

A watershed or community approach to land use planning can include a step-by-step process for choosing the appropriate options for onsite or cluster water supply and wastewater systems. Levels of wastewater treatment can be chosen based upon land use density goals in relation to sensitive environmental receptors.

In the U.S. Environmental Protection Agency (U.S. EPA) 2002 Design Manual, a probability of environmental impact decision tree identifies each resource and its sensitivity to impacts from septic

systems, with the outcome given in terms of low, moderate or high potential for impact. The EPA's decision tree was simplified and modified to fit Maine's conditions. The modified decision tree includes possible wastewater performance standards to address the potential for impacts. Examples of performance standards from the EPA 2002 Design Manual are shown in Table 2, while Maine's modified decision tree is shown in Table 3 on the following page. The performance standards can then be related directly to approved technologies for wastewater treatment in Maine. There are five steps to follow when using the decision tree.

- Identify Drinking Water Source Environmental Receptors
- Identify Surface Water Environmental Receptors
- Identify Land Use Density Goals
- Identify Potential Impact of Traditional Systems
- Choose Wastewater Treatment Performance Standards

These steps provide a sound basis with which to consider various decentralized infrastructure technologies, based both on land use goals and particular treatment requirements and desires. This results in a sound, reasonable, scientific approach to blending these oft-competing goals.

Table 2. Onsite System Treatment Performance Standards for Decision Tree (U.S. EPA, 2002).

Standard	BOD (mg/L)	TSS (mg/L)	PO ₄ -P (mg/L)	NH ₄ -N (mg/L)	NO ₃ -N (mg/L)	Total N (% removed) ^a	Fecal coliforms (CFU/1000 mL)
TS1 - primary treatment							
TS1u - unfiltered	300	300	15	80	NA	NA	10,000,000
TS1f - filtered	200	80	15	80	NA	NA	10,000,000
TS2 - secondary treatment	30	10	15	10	NA	NA	50,000
TS3 - tertiary treatment	10	10	15	10	NA	NA	10,000
TS4 - nutrient reduction							
TS4N - nitrogen reduction	10	10	15	5	NA	50%	10,000
TS4P - phosphorus reduction	10	10	2	10	NA	25%	10,000
TS4NP - N and P reduction	10	10	2	5	NA	50%	10,000
TS5 - bodily contact disinfection	10	10	15	10	NA	25%	200
TS6 - wastewater reuse	5	5	15	5	NA	50%	14
TS7 - near drinking water	5	5	1	5	10	75%	<1 ^b

NA = not available.

^a Minimum percentage of reduction of total nitrogen (as nitrate-nitrogen plus ammonium nitrogen) concentration in the raw, untreated wastewater.

^b Total coliform colony densities < 50 per 100 mL of effluent.

Source: Hoover et al., 1998.

Management Policy Options and Guidance for Water Supply and Decentralized Wastewater


Decentralized management of wastewater treatment systems can be set up in existing communities, and in areas of new development that use onsite and clustered systems of any size for residential and commercial wastewater treatment and dispersal. Onsite and clustered systems can protect public health, drinking water supplies, and the quality of water resources if they are properly planned, installed, operated, and maintained. When they are managed properly, these systems can also protect property values, preserve tax bases, and result in life-cycle cost savings.

Small communities across the United States are implementing programs designed to better manage their decentralized water and wastewater resources. Many guides and electronic resources such as management handbooks, model programs, and tracking databases are readily available to groups beginning this process. In Maine, much of the legal authority that municipal departments, quasi-municipal agencies (such as water or sewer utilities), or private organizations (such as homeowners' associations) need to begin successful management programs is already in place.

The elements constituting a comprehensive, decentralized wastewater management program, regardless of its intensity, include sets of activities focused within three functional categories: program planning and administration; treatment system installation and operation oversight; and compliance assistance and assurance. The management model that a particular community or service area selects should be based on environmental sensitivity, public health risks, the complexities of the wastewater treatment technologies that might or should be implemented, and the size or density of development.

Although it is often difficult to measure and document specific cause-and-effect relationships between onsite wastewater treatment systems and the quality of water resources, it is widely accepted that improperly managed systems contribute to major water quality problems. In the National Water Quality Inventory Report to Congress, (U.S. EPA, 1998), state agencies designated the top 10 potential contaminant sources that threaten their groundwater resources. The second most frequently cited contamination source was improperly functioning septic systems. This report also noted that onsite systems in Maine directly discharge the largest volume of nonpoint source pollution into the subsurface environment, including contaminants such as nitrates, bacteria, viruses, and toxic chemicals from household products.

The Guidelines for Decentralized Wastewater Management Programs (U.S. EPA, 2003b) consist of five models that reflect an increasing need for comprehensive management as the sensitivity of the environment or the degree of technological complexity increases. An individual program may easily include elements of several management models. These combination programs may be appropriate where site conditions vary within the community. Different levels of management may also be established in communities where both centralized and decentralized treatment systems are present.

TECHNICAL ASSISTANCE BULLETINS	Management, Policy Options, and Guidance for Water Supply and Decentralized Waste Water
<small>A technical assistance series prepared by: Maine State Planning Office Maine Department of Environmental Protection Maine Department of Health Services, Division of Health Engineering Special Environmental, Inc. Evan D. Richart With input from a number of professional and citizen planners</small>	<small>Decentralized management of waste water treatment systems can be set up in existing communities and in areas of new development that use onsite and clustered systems of any size for residential and commercial waste water treatment and dispersal. Onsite and clustered systems can be protectors of public health, drinking water supplies, and the quality of water resources if they are properly planned, installed, operated, and maintained. When they are managed properly, these systems can also protect property values, preserve tax bases, and result in life-cycle cost savings.</small>
<small>Issues</small> <ul style="list-style-type: none">• Background Information• Legal Management Options• The Role of Comprehensive Planning• Appendix: Ordinance Language	<small>Small communities across the United States are implementing programs designed to better manage their decentralized water and waste water resources. Many guides and electronic resources such as management handbooks, model programs, and tracking databases are readily available to groups beginning this process. In Maine, much of the legal authority needed for municipal departments, quasi-municipal agencies (such as water or sewer utilities), or private organizations (such as homeowners' associations) to begin successful management programs is already in place.</small>
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<small>Financial assistance for the development of this document was provided by the National Oceanic and Atmospheric Administration.</small>	<small>Septic systems that use alternative technology, such as this trickle filter system, generally require regular maintenance that can be included in a management program.</small>
<small>December, 2003</small>	

In some cases, it may be feasible for the entity that manages the centralized wastewater treatment facility to manage the decentralized systems as well.

Operation and maintenance needs of different onsite technologies vary considerably. Conventional onsite systems usually require only a tank pump-out once every few years with an accompanying system inspection. Mechanical systems such as activated sludge-based units require servicing three to four times per year to ensure that aeration tank solids concentrations do not increase to the point that they are “belched” out with the effluent and cause infiltrative surface clogging or receiving water quality problems. Other mechanical or electrical systems also require more frequent (usually annual) inspection to ensure proper operation of electro-mechanical components. Newer modem- or internet-based packages can monitor and control many of these mechanical components, thus reducing the frequency of inspection and keeping labor costs affordable. Well-conceived operation and maintenance O/M programs as part of a wider management program are facilitated by better design (e.g., risers that are easily accessible from the surface), real time accessibility to system records by field personnel, and automated monitoring that can warn or even adjust operational sequences to avoid imminent problems in pre-treatment systems.

Many states do not allow alternative onsite treatment technologies because they cannot mandate the increased O/M required to keep them performing as designed. Currently, Maine’s Subsurface Wastewater Disposal Rules allow treatment system designs that include alternative wastewater treatment technologies, such as peat filters and sand filters, and alternative dispersal technologies, such as subsurface drip distribution. However, these rules do not specifically mandate maintenance requirements for conventional or alternative systems, for annual system inspections, or for documentation of the performance of maintenance activities (such as septic tank pumping or back flushing of subsurface drip distribution and dispersal systems).

In preparing a management program, the planning committee or management entity should include an O/M component to ensure that systems under the entity’s purview continue to operate properly and meet established performance standards. A variety of people will play a part in successful O/M efforts. For example, the homeowner or a management entity may hire licensed septage haulers to perform regular septic tank pumpouts. Licensed system designers or engineers may perform regularly scheduled inspections, especially for larger systems or for systems using alternative technologies. If a system is large or complex enough, it may be necessary to hire a part- or full-time licensed wastewater system operator to watch over the system. Town clerks, or staff hired by a homeowner’s association or management entity, can perform important record-keeping functions such as recording inspection results or sending out maintenance reminders.

The homeowner is very important in most O/M efforts, particularly in the lower level management programs. In all management programs the homeowner must be aware of the damage that can be caused to soil-based treatment and dispersal systems by driving heavy vehicles over the ground surface or by paving. Owners must also be aware of the effects of strong acids or bases, toxic compounds, oils, and greases on the performance of these systems and on the receiving waters. System owners and service providers should also know about the effects of water conservation, garbage grinders, and water softeners.

Planning

After developing a basis of sound science and management for decentralized infrastructure, a careful look at how planning goals could be accomplished was undertaken.

In Maine, towns must identify “growth areas” in their comprehensive plans. One of the stiffest challenges to implementing these plans is deciding how to accommodate new development in locally designated growth areas that do not have public sewers. Many rural and suburbanizing towns in Maine face this question. They want to direct growth to the most suitable areas of town - near existing services, such as fire stations and schools, for example, or as extensions of existing villages - but have no prospect of public sewer lines to serve such areas. New development must rely on soils, usually on a lot-by lot basis, to handle wastewater. According to conventional wisdom, that means low densities of development, thus negating the effectiveness of a growth area.

The Town of Bowdoinham’s comprehensive plan, which is not unusual, describes the situation:

“The Village has grown to its maximum residential capacity over the past 100 years. This is because the lot sizes are considerably smaller than in the rural areas. The lot sizes range from ¼, ½, to 1 acre. Also the suitability of soils for septic systems is very poor....”

As a result, towns in their land use regulations do not feel able to make a meaningful distinction between densities of development allowed in their identified growth areas versus the rest of town or to take the steps needed to direct new development into their growth areas.

In this bulletin, three approaches are offered (and a fourth “none of the above”) to making designated growth areas work without public sewers and / or water supply. Each approach is based on situations adapted from actual, approved, comprehensive plans in which the community has (explicitly or implicitly) designated growth areas that do not have public sewers. In each case, the lack of public sewers appears to be a barrier to implementing the plan.

The approaches focus on a strategy of relying on individual lots to provide either wastewater treatment and dispersal or wells, but not both. That is, the strategy is to move one or the other of these functions into a community facility with related good management. The logistics of doing so are not complicated. The reliability of a community system, with management by a third party, is good, and the costs readily absorbed by the users of the system. The three approaches are:

- Turnkey ownership of a community system by an existing Sanitary District:
- New Decentralized Community Sanitary District:
- Taking advantage of public water supply

TECHNICAL ASSISTANCE BULLETINS

A technical assistance series prepared by:
Maine State Planning Office
Maine Department of Environmental Protection
Maine Department of Human Services, Division of Health Enforcement
Stone Environmental, Inc.
Evan D. Richer
With input from a number of professional and citizen planners

- Inside**
- CASE ONE: Turnkey Ownership of Community System by an Existing Sanitary District
 - CASE TWO: New “Growth Area” Community Wastewater Sanitary District
 - CASE THREE: Taking Advantage of Public Water Supply
 - NONE OF THE ABOVE: An Innovative Perspective on Subsurface Waste Water Disposal

TA Bulletin # 11

This TA Bulletin is one in a series of documents intended to provide guidance to volunteer board and committee members on specific planning topics.

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December, 2003

How to Make Growth Areas Work Without Sewers: Three Approaches Plus “None of the Above”

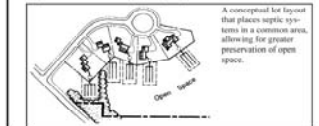
One of the stiffest challenges to implementing comprehensive land use plans is how to accommodate new development in locally designated growth areas that do not have public sewers. Many rural and suburbanizing towns in Maine face this question. They want to direct growth to the most suitable areas of town - near existing services, such as fire stations and schools, for example, or as extensions of existing villages - but have no prospect of public sewer lines to serve such areas. New development must rely on soils, usually on a lot-by-lot basis, to handle wastewater. The conventional wisdom says that means low densities of development, negating the effectiveness of a growth area.

The Town of Bowdoinham’s comprehensive plan, which is not unusual, describes the situation.

“The Village has grown to its maximum residential capacity over the past 100 years. This is because the lot sizes are considerably smaller than in the rural areas. The lot sizes range from ¼, ½, to 1 acre. Also the suitability of soils for septic systems is very poor....”

As a result, towns in their land use regulations do not feel able to make a meaningful distinction between densities of development allowed in their identified growth areas versus the rest of town or to take the steps needed to direct new development into their growth areas.

However, towns without public sewers have more options than they may realize. In this paper, we offer three approaches (and a fourth “none of the above”) to making designated growth areas work without public sewers work. Each approach is based on situations adapted from actual approved comprehensive plans, in which the community has (explicitly or implicitly) designated growth areas that do not have public sewers. In each case, the lack of public sewers appears to be a barrier to implementing the plan.



The last section of the paper, “None of the Above,” anticipates that many communities will continue the long practice of relying on individual wells and septic systems, even in their growth areas. It suggests that, even in that case, growth areas can be more meaningful than may be assumed. One of these approaches is presented here for illustrative purposes.

Case Study

In this case, the community is a small (but geographically large), suburbanizing town with extensive rural lands throughout the town. It has designated three growth areas in different parts of the town, each around or near a long-time settlement. The largest of the growth areas encompasses an existing village, a community school complex, and a westerly extension of the village along an arterial that already has some homes and small businesses (Figure 2).

The part of the growth area that extends from the village area along the arterial has been designated in the Town’s Comprehensive Plan as a “planned development.” It was found to have acceptable soils for subsurface wastewater treatment and dispersal systems, to not have major environmental limiting conditions, to have good road access, and it already includes commercial activities.



Figure 2. Existing village area (right) and designated growth area (left) for the case study.

The Comprehensive Plan specifies that the district “allow a mix of both residential and commercial uses,” with buffer and road landscaping standards.

While the Comprehensive Plan prescribes a mixed-use area “designed to shift development pressure from rural portions of the town” and “able to accommodate the growth anticipated by this Comprehensive Plan,” the proposed lot sizes reflect perceived concern about subsurface waste treatment and dispersal and are not conducive to an effective growth area. They are one acre per residential unit and two acres for each commercial use.

The Conditions

The growth area contains just less than 975 acres, including both the village and the planned development area to the west. Nearly two dozen of the parcels within the growth area each contain

small stores with up to 100 employees. This mix of activity, following the kinds of design standards implied by the town's Comprehensive Plan, might require on the order of 20 acres, including parking (note: if desired, it also could be designed compactly, in more of a village style, which would require less land).

This would leave about 100 acres for residential purposes, including open space. Again, in keeping with the concept of "planned development," this may be an ideal area near the schools for a mix of small-scale multifamily development and single family homes. In theory, the Minimum Lot Size Law would allow more than 200 dwelling units on the 100 acres. However, following the normal zoning protocol of subtracting out acreage dedicated to the community waste treatment and dispersal system, streets, etc., reduces that number to 150 units.

The size of the community wastewater system needed to accommodate this number of units depends on the mix of residential units. The area available for the subsurface wastewater treatment and dispersal system for this portion of the development is about 4 acres and could accommodate a flow of at least 31,500 gpd. This would support 150 units if 100 were 2-bedroom apartments and 50 were 3-bedroom single family homes. Alternatively, it could support 50 2-bedroom apartments and 80 single family homes area or 25 2-bedroom apartments and 100 single-family homes.

In any case, these numbers suggest that this portion of this growth area could safely absorb 30% to 40% of all the housing growth forecast by the Comprehensive Plan to occur in town over the next decade. The overall density of the residential portion of the development would be 1.2 to 1.3 units per gross acre.

The community wastewater system also would require a 300-foot setback from individual wells, which would increase the area earmarked for the system to about 7 acres. The multifamily units might utilize a community well. If so, the wellhead protection area may contain an area larger than the 300-foot radius, particularly in the up gradient direction.

In sum, the potential development program for this illustration might be:

- 6 to 10 small businesses with off-street parking
- 25 to 50 2-BR apartments
- 80 to 100 single family house lots
- 20 to 25 acres of open space (including preserved wetland)
- 2 community subsurface wastewater systems, one for the commercial activity and one for the residential, using about 12 acres of land, including land for setbacks that can become part of the open space system
- A community well for the multifamily units

Managing the System

Title 38 of MRSA, chapter 11 (State of Maine, 2002), provides the town with the tools needed to implement its "planned development" vision for this growth area. This law enables communities to establish Sanitary Districts covering a whole town, a section of a town, or a combination of towns.

At the end of this section, we will discuss the limitations of, and possible amendments to, the current act in the context of decentralized wastewater treatment and dispersal.

The district's mission would be to own and operate small-scale, community underground wastewater treatment and dispersal systems serving the designated growth area, which would be its defined jurisdiction. Working with owners of developable tracts of land in the growth area, the district typically would acquire land for community wastewater systems in advance of development. The district would finance the construction of the treatment and dispersal system as it saw fit, potentially in phases, and likely through a combination of "readiness to serve" charges to the benefiting property owners and low-interest loans from the State Sewer Revolving Loan Fund. As land in the growth area is developed, the developers would be responsible for installing the collection system at their cost according to specifications of the district and the state's wastewater treatment and dispersal rules. Once completed and inspected, the collection system would be turned over to the district, which through easements would have the right and responsibility to maintain the wastewater treatment and dispersal system. Property owners connected to the system would be charged monthly fees to pay for the operating and maintenance of the system, including outstanding loans, just as property owners connected to conventional public sewer systems are charged such fees.

If a proposed development were large enough, the developer and district would also have the option to have the developer construct the community wastewater system for dedication to the district upon completion. This approach would be viable if (1) the district has not yet built a facility accessible to a particular developer's land and (2) the developer believed the size of the development and pace of sales would allow recovery of the capital costs of the wastewater facilities within a reasonable period of time.

In any case, the Town's land use regulations must establish, up front, that:

- Consistent with the stated intentions in the Comprehensive Plan, land in the growth area could be developed at a density of no less than 2 units per net residential acre (and no more than the density allowed by the State Minimum Lot Size Law, which is 1 unit per 20,000 square feet of gross area); and
- All properties intended to be served by the community wastewater systems are required to connect to them as they are developed. This requirement is typical of all public sewer districts. Pre-existing development within the area would not be required to connect, and indeed may not have the choice to unless the system was sized to handle extra wastewater flows (in addition to flows anticipated from new development). If problem systems exist in the area and need an alternative, the community system may be consciously designed to bring them in. This, in turn, may qualify the system for grants or low district loans through the district.

Amending Title 38, Ch. 11, to Meet the Needs

In its present language, the Sanitary District Act is quite flexible to meet the needs of communities in different situations. However, because the bulk of it was written 20 to 30 years ago, little specific provision is made for (1) subsurface wastewater treatment and dispersal - the bias is toward

discharges to surface waters, or (2) decentralized community systems - the assumption was that “public sewer system” means large-scale and centralized.

Several procedural requirements and some of the powers and authorities of a sanitary district may not be necessary or appropriate for decentralized community systems that essentially serve a single neighborhood. For example, a sanitary district can only be established within a community upon the filing of an application with the Board of Environmental Protection (BEP) by the municipal officers, a positive finding by the BEP, and a referendum vote by “the legal voters residing within the portion of the municipality, municipalities or unorganized territory that falls within the proposed sanitary district.” In the case of decentralized community systems serving a relatively small number of properties, decisions by the municipal officers in consultation with the affected land owners and by the BEP may be sufficient. Further, certain powers of a typical sanitary district, in particular the power of eminent domain, may be unnecessary in the case of decentralized community systems, and perhaps should simply continue to rest with the municipality.

Creating Outreach Materials – Information for Every Audience

This project ultimately aims to influence decision-makers about environmental and land use policies and practices regarding:

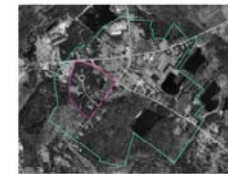
- Growth center development without centralized sewers or water supply
- The necessity and/or role of minimum lot sizes
- Choosing technology and systems for water resource management
- Maintenance of these systems
- Environmental protection
- Land use patterns
- State and local control

Creating Communities with Decentralized Waste Water Solutions

ONE OF THE BIGGEST challenges many Maine communities face is the implementation of comprehensive land use plans in growth areas that do not have public sewers. These areas want to direct growth to the most suitable areas of land—near existing infrastructure and services, or adjoining existing villages—that have the potential for public sewer lines to serve such areas. However, towns without public sewers may have more options than they realize.

The Setting and Current Conditions
The community in this study is a well-established suburb within a geographically large town. A portion of the community is intensively developed and served by public water and public sewer services, which are managed by a shared district. The community also has an extensive rural area, a small part of which is a long-settled hamlet with a smaller number of homes and several small businesses. The town designated this hamlet as a growth area and served by public sewer.

Community Systems Allow More Options in Decentralized Areas
To illustrate the potential of a community waste water system, an extension to the larger lot model currently used in the growth area, an area of about 41 acres was chosen to illustrate the potential of a community waste water system. The parcel has already been developed as a contemporary subdivision of 16 lots, averaging around two acres each with individual wells and septic systems. This case study presents an alternative development strategy for this parcel of land using a community waste water system.



This parcel has an area of 41 acres and is currently developed as a contemporary subdivision of 16 lots, averaging around two acres each with individual wells and septic systems. This case study presents an alternative development strategy for this parcel of land using a community waste water system.

Partners in Building Maine's Future: Decentralized Waste Water and Smart Growth

ONE OF THE BIGGEST challenges facing towns in Maine is how to grow successfully without using central sewers. Communities want to direct growth to the most suitable areas of land—near existing infrastructure and services, or adjoining existing villages—that have the potential for public sewer lines to serve these areas. These areas want to direct growth to the most suitable areas of land—near existing infrastructure and services, or adjoining existing villages—that have the potential for public sewer lines to serve these areas. These areas want to direct growth to the most suitable areas of land—near existing infrastructure and services, or adjoining existing villages—that have the potential for public sewer lines to serve these areas.



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To be successful, this project needed to provide scientific credibility to these challenging discussions. Then, this information must be understandable to both decision-makers, to other target audiences and to citizens chatting on the street corner.

To accomplish this goal, the technical bulletins were transformed into a suite of simple outreach materials. To ensure that the materials would “speak to” the people of Maine and accurately capture local issues and conditions, both the technical assistance bulletins and the outreach materials were developed in conjunction with a broad-based steering committee SAC. This committee represented municipal government, state government, real estate, regional interests and advocates. It added excellent information to the base of knowledge as well as being a barometer of the readability and message of the outreach materials.

Six outreach materials were developed for this project, with a goal of providing access to interested audiences through three styles. The materials were four two-page topical papers, a more comprehensive brochure and a PowerPoint presentation. All materials build on the science and planning work developed in the Technical Assistance Bulletins discussed earlier, but with a critical eye to theme, style and graphics.

The four topical papers are intended to provide enough information to arouse a person's interest and, hopefully, compel them to pursue the issue further. The titles and themes selected, in close consultation with the SAC were:

- *Technology Choices for Developers and Subdividers in Non-Sewered Areas*
- *Management of Decentralized Wastewater Systems in Maine*
- *Creating Communities with Decentralized Wastewater Solutions*
- *Partners in Building Maine's Future: Decentralized Wastewater and Smart Growth*

Technology Choices for Developers and Subdividers in Non-Sewered Areas



DECENTRALIZED WASTEWATER technology choices can be used to meet development diversity goals in diverse growth centers. Based on today's technology systems, using large lots to provide public health and the investment in not necessarily sound science, an understanding of today's technology coupled with good planning, and a commitment to maintenance and management, is a vital way towards safely developing diverse growth areas.

What is a "Decentralized" System?
Decentralized systems include traditional septic systems that serve individual homes or businesses, advanced pre-treatment and disposal systems, and advanced collection, treatment and disposal systems. Decentralized waste systems can also include a mix of individual units (like tanks, and shared or commonly owned septic systems) to make for compact development.

Components of a Septic System
Traditional septic systems typically include a 1,000 gallon septic tank, a distribution box in the main house, and a disposal field of subsurface drip pipes or a trench. The septic tank settles out solids and gases and provides primary treatment. The waste water effluent then either flows through a distribution box or directly into specially constructed perforated pipes, which is a more dispersed throughout the subsurface disposal field. Most disposal areas are installed at an above the existing ground, providing the necessary separation to protect groundwater or bedrock.

Decentralized Septic Systems

- Treatment tank
- Distribution box
- Disposal field
- Subsurface drip pipes

Pre-treatment systems can be added prior to the disposal field. Adding pre-treatment may reduce the size needed for a disposal field significantly by one-half. However, no reduction in horizontal or vertical separation distances are gained.

Disposal fields typically include perforated PVC pipes placed in stone aggregate and covered with filter fabric, and spaced. Substrates like stone, high capacity or plastic chambers, other proprietary disposal devices, pipe, slow-release pipe, and subsurface drip disposal. The location, size, and burial elevation of disposal systems are determined by the soils and site conditions based on the property. The position in the landscape, slope, and setbacks from water bodies and wells are also considered when locating septic systems. Pre-treatment systems are not allowed when the depth to natural high groundwater table, restrictive layer, or bedrock is less than 12 inches below ground surface of finished 2nd floor and 24 inches below finished 2nd floor. A first-time system installation permit may allow new systems to be installed with an SBR as a septic tank in certain water table or soil conditions. Installation of pre-treatment is one way to save space.

Community cluster collection treatment and disposal systems can be considered where areas and conditions are poor and a subsurface system readily or where water-pipe developments are anticipated. Cluster systems can be as simple as a conventional system shared between two lots, or as complex as

Management of Decentralized Waste Water Systems in Maine



SEPTIC SYSTEM TECHNOLOGY is a proven solution for addressing solid waste concerns. Proper management of septic systems allows the wastewater to take more difficult environmental conditions, to provide information that supports growth, or to meet water table.

Management of a variety of septic systems can be established in existing communities and in areas of new development. These systems can be of any size, be installed on commercial waste water systems and disposal, and can be located either on an existing property.

Small communities across the United States are engineering programs designed to better manage their decentralized water and waste water resources. In Maine, such of the legal authority needed to begin decentralized management programs is already in place.

What is a "Decentralized" System?
A decentralized system for waste water management may include one or several types of waste water treatment systems. Not the less, it that all the systems have a centralized administration and management program.

Decentralized systems can include traditional septic systems that serve individual homes or businesses (shown in yellow).

They can also include larger septic systems that serve clusters of homes, subdivisions, apartment buildings, or businesses. These "cluster" systems may serve multiple buildings in a single property (shown in orange) or may serve several adjacent properties (shown in red).

Finally, centralized systems with collector pipes, treatment, and collection disposal may also be a part of a decentralized waste water system (shown in blue). These systems are especially useful in villages with very steep hill slopes or where there are valuable natural resources that need to be protected.

A management program in the plan that includes these different types of decentralized systems together. Ideally, a management program for decentralized systems includes three major types of activities: planning and administration, construction, operation, and maintenance of the treatment systems, and compliance with local, state, and federal regulations and permits.

Each paper provides a concise look at a specific issue in simple language and with a friendly look. The intent is to give a person interested in one particular aspect of this broader issue a place to start. For instance, a person who is frustrated with not being able to place a traditional septic system on a particular property may pick up the Technology Choices paper. In so doing, other questions relating to smart growth, management of systems or adding units to their property may occur to him or her. At this point, the individual may seek some of the other short papers or may seek the "brochure".

Partners in Building Maine's Future



What Subdividers and Planners Need to Know about Septic System Options in Local "Growth" Areas

This "brochure", titled "Partners in Maine's Future", is a twelve-page document that includes the information covered in the four shorter papers, adds to them, and offers this to the reader in one document. A town planner or developer with existing background knowledge may be interested in starting with this document, or may arrive at this document after viewing one of the shorter papers first. Both the shorter papers and the brochure will be available on the Maine State Planning Office (2003) web site in addition to paper copy.

Should a reader still seek more information, they will be referred to the Technical Assistance Bulletins, creating the link back to the scientific basis of the work.

Ultimately, for the discussions and debates to occur that will result in Maine's growth areas being developed with decentralized infrastructure, more than materials will be necessary. Training, speeches, and informative talks will be necessary to bend the trend of relying on centralized infrastructure or on huge lot sizes. To assist in this process, a PowerPoint presentation, "Building a Future in Rural Maine", was developed to provide basic information necessary for all of these uses. The presentation has ample slides in it for each purpose with the intent of allowing the user to cut and paste their way to a presentation that will be appropriate for the intended audience with very little work.

Lastly, the steering committee spent time developing an outreach plan. This plan includes various activities centered on creating a debate, and providing training and education. Ultimately the plan intends to answer the following question:

How should the result of this project be disseminated to the people of Maine?

The steering committee identified twelve key audiences for the results of this project. For clarification, a key audience is a group that either is an important stakeholder in the outcome of this project or a group that may be an influencer for either the status quo or for change related to this project's subject matter.

The steering committee identified Planning Boards/Commissions and developers/contractors as the key audiences. Thus, early outreach efforts will be directed at informing, educating and swaying these two groups on the use of decentralized wastewater and water supply to safely support denser growth centers in Maine. While state government was not identified during the discussion of key stakeholders, it was identified many times during discussion of action items. As a result it has been added to the Planning Boards/Commissions and developers/contractors as a key audience for the first round of outreach due to its high level of opportunity to influence funding and policy.

Three Key Audiences

-  *Planners & Planning Boards*
-  *Developers & Contractors*
-  *Other State Departments*

The committee identified the following seven broad areas of outreach that are necessary for denser growth areas relying on decentralized infrastructure to occur.

- Training
- Material distribution
- Public outreach
- State policy
- Training for licensing certification
- Funding for implementation
- Research & documentation

The committee identified thirty-two possible action items within these areas as ways to reach the key audiences for this work. Following the identification phase, the group prioritized the items and selected six items that represent the best place to start an outreach program. These are:

- Document success stories, use for media education
- Develop a general training session for Selectboard members, Town Managers, and Municipal Department Heads
- Put outreach materials on the Maine State Planning Office web site and link with appropriate sites
- Work to get buy-in from other state departments, site evaluators, and system installers
- Develop training session for planners to base suitability for development on more than meeting plumbing code minimum standards
- Provide PowerPoint speech to the Maine State Planning Office, Nonpoint Education for Municipal Officials, GrowSmart, and similar groups for their use in speaking to towns, groups, etc.

This combination of materials, tools and outreach ideas provides a sound basis for the State to move the discussion regarding the use of decentralized infrastructure to assist in the build out of priority growth areas in Maine.

Summary and Conclusions

Towns in Maine have created priority growth areas as required by law; however, lack of funds for centralized infrastructure, coupled with fear and/or lack of knowledge about the potential use of decentralized systems as a solution have resulted in lack of dense development. It has also been historically believed that the State laws and rules are a barrier to these types of solutions. As a result, lower density development is the most common form of development in Maine currently.

Towns without sewers have more options than they may realize. The science, practice, and rules of subsurface wastewater treatment and dispersal have advanced so much that some of the concerns that stymie good “growth” areas are no longer valid. For instance, above the 20,000-square-foot requirement in state law, there is no strong correlation between soils and the lot sizes required for septic systems. It is possible, while following state subsurface wastewater treatment and dispersal rules and good management practices, to have effective “growth” areas that depend on subsurface wastewater systems and wells.



Accomplishing higher density growth using on-lot septic systems requires the merging of good planning, new technologies and a strong commitment to maintenance and management. Through

proper understanding of each, Maine's suburban and rural growth areas may safely rely on onsite technology. Subdividers and municipal officials willing to seek new methods and tools to facilitate this growth through decentralized infrastructure will also be necessary for this type of growth to occur. With appropriate materials and tools developed, successful implementation now requires the dialogue to occur, the skills necessary to navigate the politics, and continued interest from key audiences and stakeholders.

Ultimately, this project provided information that shows that, for most situations, denser development could occur in Maine while safely relying on decentralized infrastructure. With new technologies, better science, and sound management integrated with planning goals, Maine may indeed see its traditional settlement pattern re-emerge.

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