To the Graduate Council:

I am submitting herewith a dissertation written by Kendrick J. Curtis entitled “Influences on Growth: Development Beyond Conventional Wastewater Infrastructure.” I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Geography.

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(Original signatures are on file with official student records)
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ABSTRACT

Wastewater treatment has long had a powerful restraining influence on land use patterns in the United States. The limited availability of central sewers confined intense property development to the sewered areas of cities and towns. The drawbacks associated with septic systems restrained even moderate-density development in areas with inappropriate soils. The advent of decentralized wastewater systems abolished these restraints, however. This technology made it possible to develop land at even high densities with no regard for the proximity of sewers and little for soil quality. This presented an opportunity for developers to pursue projects wherever attractive conditions prevailed. It also offered communities a tool for creating a more appealing pattern of development. These two possibilities were recognized shortly after the technology emerged but limited early use prevented empirical inquiry into which would prevail. Now, with numerous systems installed in Tennessee, we have the opportunity to study the development patterns to which they have given rise. The study employed GIS to identify where systems have been used and what kind of development they have supported. This pattern of system use was compared to the state’s “smart growth” planning initiative. Results revealed that their use undermined orderly growth and accelerated sprawl. Once the local patterns of use were identified, the decision processes behind them were explored through in-depth interviews and examination of policy documents and regulations. Research focused on state regulatory agencies and three case-study counties. Inquiry revealed that developers and landowners were quick to grasp the opportunities presented by the technology while planning authorities failed to either see or act on the opportunities these systems presented for promoting orderly development. The late and weak response of planning was ultimately traceable to how the public’s interest in orderly development was only imperfectly articulated through state or local government channels. It thus was unable to counter the technology’s opportunistic use. This suggests that if decentralized systems and other new infrastructure technologies are to promote orderly growth, the public's expressed desire for such growth must be articulated through public channels and embedded in policies to manage these technologies with community goals in mind.
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CHAPTER I
INTRODUCTION, STATEMENT OF THE PROBLEM
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INTRODUCTION

The ideal of an orderly landscape is embedded in the principles of planning and is central to many growth management initiatives supported by the public. In this ideal, the landscape is composed of compact concentrations of people in cities, towns, and villages. New development occurs in a compact and contiguous manner at the edge of these communities as their populations expand. Beyond the area of contiguous development is a lightly populated countryside. Most of this countryside is dedicated to extractive activities, such as farming, ranching, mining, and the growing of timber. This preferred landscape is juxtaposed with a concern that actual development patterns of the last half century are not sustainable or desirable. Both this concern and the ideal for an ordered landscape have been repeated in plans and policies across the nation and are manifested in concepts such as new urbanism, smart growth, green infrastructure, cluster development, and farmland preservation. Fundamental to many of these concepts is an interest in creating walkable communities while preserving natural and cultural resources. Emphasis is placed on creating communities at a human and more sustainable scale, possessing a strong sense of place. Homes are close to work, shopping, and other activities. While they take differing approaches and focuses, at the heart of these concepts is a desire for an orderly landscape of intense development surrounded by relatively undeveloped areas.
These initiatives have arisen because people—in a collective sense—dislike the sprawling development around American cities. They dislike the traffic, the long commutes, and the lack of a sense of place characteristic of this landscape (Benedict and McMahon 2006). But because people do like their own little piece of the life that low-density development affords, they do not always act consistently with their expressed preferences for the landscape as a whole. Setting aside a minority who favor urban living in downtown environments, there is a preference among most homebuyers for single-family homes in rural and semi-rural environments. This ideal of owning a home requires low-density development. Thus, many people have a love-hate relationship with sprawl (Kelly 2004). While most do not like to see farms converted to shopping centers, parking lots, and residential developments, they do like the personal advantages this development pattern offers: A home in a quiet, private setting from which they can easily commute by private automobile to their jobs as well as to shopping, entertainment, and other services.

We see these two antithetical impulses at work in the periphery of American cities. On the one side, we have a collective interest in an orderly and efficient landscape. On the other, we see individuals making personal consumption choices that have fed the growth machine creating the developing periphery of America cities. In a democracy, we might expect the conflict between these impulses to be articulated in public policies, and indeed, we have seen this in many areas through the adoption of growth management programs. Of the different types of growth management programs that have been implemented, none echo the desires of the ideal landscape as strongly as those that use growth boundaries to demarcate the future extent of cities from rural areas.
In 1998, the Tennessee General Assembly passed a state growth policy that was based on such boundaries. This law—Public Chapter 1101, Acts of 1998—required the establishment of countywide growth plans to delineate urban growth boundaries (UGB), planned growth areas (PGA), and rural areas (RA). Resounding of the principles of the ideal landscape, a goal of the growth plans was to encourage a pattern of compact and contiguous high-density development in urban areas and unincorporated areas planned for growth (Public Chapter 1101, Section 8). The desire to preserve the rural, pastoral countryside was provided for through the designation of rural areas, which were intended to be used for agriculture, forests, recreation, or wildlife management or for uses other than high-density development. In this statewide growth policy, each component of the ideal landscape can be observed.

The desire for an ordered landscape can also be found in local land-use policies. One such example is the Gateway Land Use Master Plan developed by the citizens of Wilson County, Tennessee (Lose and Associates, Inc. 2006). Adopted in 2006 after public input was gathered from the community and county representatives, the plan reported that the overriding concern of the county’s residents was a desire for planned growth rather than arbitrary growth. This plan reported that measures should be taken to reduce the impact of development to farmland while still encouraging new development. A popularly supported means of achieving this goal was to centralize development in small-scale village centers flanked by higher density residential areas. The desire to focus future growth in this way resonates with the public’s desire for an ordered landscape.

However, the residential landscape of America is very different from this ideal because it has been created by a development process designed to meet the needs and
desires of individual landowners, developers, and homebuyers rather than those of the public in general. The landowner—the first actor—is critical to this process, for it is he or she who determines the local supply of available land. Motivated to realize an immediate or future return on an investment, landowners are resistant to restrictions placed on their property by land-use controls, thus inhibiting coordination of development. Furthermore, landowners are influenced to sell their land by their own unique circumstances and desires. Individual reasons, such as the death or retirement of a landowner from farming, determine when certain land is available for development. When sold, land is bought by possibly the most critical actor in the development process, the land developer. This individual is essential to the process, for it is he or she who determines which of the available properties to convert to a developed use. Seeking the most opportune deal to satisfy the demands of the market while minimizing expenses, developers are motivated to produce a product that will sell and provide a profit. This product must meet the needs and desires of the final actor in the development chain, the homebuyer. Desiring to find the home that meets his or her unique situation, a homebuyer is motivated by personal goals. Thus, the homebuyer often assumes a different objective when purchasing a home than when considering a desire for an ordered landscape.

In the public’s desire for an ideal landscape and in the individual’s motivations in purchasing a home, people play these two roles. While the public may recognize the benefits of logical and orderly growth, people purchase homes that satisfy their unique goals rather than foster the development of the ideal landscape. This contradiction in actions and ideals was observed in the case studies conducted for this research.
Informants related that it was typically the new residents to the county who possessed the strongest desire to manage the growth of their new community. These people were described as wanting to “shut the door” on development, but only once they got in. These two interests—a desire for an ideal and ordered landscape and the desire to serve one’s individual interests—are in many ways at odds. However, they have been held in something of a rough natural order by limits imposed by conventional infrastructure.

*Technology’s “Natural” Order*

The history of American urban expansion has been largely one of technology allowing centripetal tendencies for growth to overcome physical restraints. Since their earliest days, American cities have felt the centripetal pull of population dispersal. However, this tendency was inhibited until advancements in transportation reduced the constraints of time and distance, increasing the accessibility of wider peripheral areas. However, the intensification of land use outside cities requires access not only to a transportation system but also to a potable water supply and a means of wastewater disposal (Berke, Godschalk, and Kaiser 2006; Kelley 1984). As greater peripheral areas received improved transportation access from the construction of interstate highways in the latter half of the twentieth century, access to water and sewer systems often became critical influences of local growth patterns (Berke, Godschalk, and Kaiser 2006; Kelley 1984, 2004; Tassie 1998; Urban Systems Research and Engineering, Inc. 1976).

In Tennessee, it has often proven more expensive to extend sewers than water lines into developing areas. In the absence of sewers, such areas have become dependent on the expedient, yet often faulty, septic system (Greene, Grubbs, and Hobday 1982). However, septic systems are often inhibited by soil and bedrock conditions, steep slopes,
and shallow depths of groundwater. Even on suitable sites, septic systems constrain a development’s density and configuration. These constraints offered by conventional means of wastewater disposal often became a limiting factor and so were codified in local land-use regulations. In many communities, the availability of sewers or the suitability of land for septic systems was used to determine the densities permitted by both zoning ordinances and subdivision regulations. However, these “zoning-by-septic” policies reflect concerns for the public health and environment rather than a community’s vision for its future. Additionally, they relieve local governments of difficult and politically charged growth-management decisions. Due to both practical and regulatory constraints, intense development has often been pulled toward the central sewers available in cities and small towns.

*Power to Plan in the Urban Periphery*

Development at the urban fringe must overcome legal, physical, and financial impediments. However, once development becomes physically possible and is perceived as economically beneficial, developers will seek to remove legal barriers (Tassie 1998). As the location of infrastructure influences both physical and financial viability, it often becomes very difficult to control the impact of infrastructure on land-use because it is often easier and less costly to alter zoning requirements than it is to construct new infrastructure. As such, great pressure is brought to bear on changing land-use regulations. However, zoning is a tool implemented by society to express social will; in rural areas social will is in large part determined by the local landowners for they constitute a large segment of the society. Thus, zoning has often proven to be a weak land-use control on the urban fringe. In such areas, the pressures to rezone properties are
not balanced as in older, developed urban areas where zoning proves a more stable tool. In established areas, zoning ordinances are strengthened by residents seeking to protect their quality of life and property values. In such a setting, zoning is better able to resist developments that are counter to the plan for the area. However, such is often not the case in developing areas where—due to the political situation—zoning has largely proven ineffective. This situation is not surprising considering zoning originated as a tool to maintain established neighborhoods and not as an instrument to manage land development (Kelly 1988). An additional limitation of zoning stems from the resistance of landowners to what is seen as an infringement of their right to develop the property they own. In settings where strong economic incentives for development become linked to the emotional issue of government regulation of private property, zoning is often ineffective. Thus, zoning in itself is unlikely to be effective in developing areas unless complemented by other measures of control (Clawson 1971).

As infrastructure enables heightened densities and influences the profitability of developing certain properties, the decisions regarding how and where infrastructure is extended influence the shape of local growth and development patterns. For this reason, by possessing the power to determine the location and nature of infrastructure, sewer builders, transportation agencies, and other units of government often usurp the role assigned to planning agencies and become the de facto planners who shape the development patterns of a community (Coughlin 1963; Clawson 1971; Melosi 2000; Kelly 2004). However, as Wehrwein observed long ago, mere power does not necessarily carry with it the desire, the courage, or the wisdom needed to create well-planned transitional areas between cities and the surrounding countryside (1942).
A Liberating Technology

Conventional wastewater infrastructure’s influence over growth is being altered by the introduction of decentralized wastewater systems, which use alternative technologies such as the recirculating sand filter to provide wastewater service to areas not served by sewers. These systems are liberating growth from the conventional sewer line and constraints of septic systems. Prior to 1996, the Tennessee Department of Environment and Conservation (TDEC) had received eleven permit applications for decentralized wastewater systems. As of January 2008, the department had received 327 applications (Figure 1.1). Decentralized wastewater systems have experienced widespread use because they are less sensitive than septic systems to soil and bedrock conditions, steep slopes, and shallow depths of groundwater. Capable of serving entire residential developments, commercial buildings, and other facilities, decentralized systems are weakening the influence of conventional wastewater infrastructure on growth patterns and hence weakening the influence of natural constraints.

Decentralized wastewater systems use various means to collect, treat, and disperse wastewater near its source (Crites and Tchnobanolous 1998). Through a collection system of small-diameter pipes, pretreated wastewater is conveyed—often under pressure—from an interceptor tank at each home or business to a treatment unit. Of the various treatment technologies available, media filters are commonly used in Tennessee. Of media filters, the recirculating sand filter is most prevalent. After treatment, wastewater is conveyed to a dispersal system located on a suitable site. This dispersal system releases the wastewater onto or under the land surface through spray or drip irrigation. A system with these elements can be installed for a single home, although
Figure 1.1  Decentralized wastewater system applications.
in Tennessee such systems most often service entire residential developments.

Decentralized wastewater systems have been used throughout most of the state of Tennessee (Figure 1.2). However, their most intense use has occurred in a few areas; 53 percent of systems are located in five counties. This uneven distribution is not entirely surprising. Because these systems have primarily been used to serve new development, their distribution corresponds closely to the general patterns of population growth in the state, a pattern that, between 1990 and 2006, has been uneven. During this period, the top ten counties for nominal population growth accounted for 52 percent of the state’s absolute growth. In large part, the most rapid growth occurred in the exurban counties of the metropolitan areas (University of Tennessee Center for Business and Economic Research 2003; U.S. Census Bureau 2006). The highest growth rates occurred in the Nashville-Davidson Metropolitan Area, where Williamson and Rutherford counties experienced growth rates of 90 and 84 percent respectively (University of Tennessee Center for Business and Economic Research 2003; U.S. Census Bureau 2006).

Corresponding to this pattern, 68 percent of decentralized systems were located in metropolitan areas. However, population growth and development demand were not the only enabling conditions that fostered the rapid adoption of these technologies or influenced their use. Other factors, such as rocky and shallow soils that impeded the viable extension of sewer lines or the use of septic systems, favored the use of decentralized systems. Additionally, decentralized systems were favored in locations with high land costs. In these areas, decentralized systems were often needed to enable the densities of homes necessary for a development to be economically viable. Driven by demand, areas with high land costs often corresponded with the locations experiencing
Figure 1.2 Decentralized wastewater systems, 2006.

the most rapid population growth, thus doubling the need for decentralized systems.

Decentralized wastewater systems hold the potential to loosen the bounds imposed by conventional wastewater infrastructure. These technologies could alter the rough accommodation that has been reached between the individual’s interests and the public’s interest in an ideal landscape. For this to occur, the development process would simply need to adopt and use this technology within its existing modus operandi. Alternatively, decentralized wastewater systems could be used to further the creation of an ordered landscape by removing the constraints long imposed by conventional wastewater, constraints such as requiring the development of low density residential areas on lots large enough to accommodate septic systems or intense linear development along sewer lines. Decentralized wastewater systems are uniquely suited to support the clustering of development in villages as outlined in the Wilson County plan. Whether alternative wastewater technologies will unshape development from the ideal or become a tool to create an ordered landscape is not yet known.

RESEARCH PROBLEM

Popper, writing in 1981, recognized the potential that alternative wastewater technologies hold for reshaping development patterns. However, the cost, technical complexity, and novelty limited the technologies’ use at that time. Unable to study their impact because they were too new, Popper did foresee three possible futures for the technologies. The first possibility is that they would have no effect, the anticipated result if the technologies were never widely used due to their high costs, novelty, or inapplicability. The second possible effect was an accelerated dispersion of growth
resulting from the technologies’ overcoming conventional limitations to wastewater disposal. Popper stated that this effect would result in dispersed growth that would become, “at least in some places, indiscriminate and shapeless” (Popper 1981, 11). In this scenario, the technology would produce major land-use and environmental difficulties as they undermined local land-use controls, strained local public services, and diminished local amenities. Third, he opined that the technologies could create more opportunity for rational planning for optimal land-development patterns. For example, as soils amenable to wastewater disposal by septic systems often coincide with prime agriculture or environmentally sensitive areas, decentralized systems could channel development away from such sites (Popper 1981). Additionally, decentralized systems, in comparison to septic systems, could diminish urban sprawl through the reduction of per-unit land consumption. In Popper’s estimation, the determining factor would be the degree of engagement in land-use planning and regulation by state and local governments.

The earliest empirical work considering the impact of alternative wastewater technologies was conducted by Hanson and Jacobs (1989). A similar study was later undertaken by LaGro (1998). In these works, the authors considered the impacts of three types of private sewage systems in Wisconsin: conventional septic systems, mound systems, and holding tanks. While the systems considered have neither the scale nor siting advantages of the decentralized systems currently used in Tennessee, the authors’ general conclusions are relevant and informative. All systems considered in Wisconsin were found to contribute to increased dispersion of development. However, the authors recognized that traditional land-use regulations were being rendered ineffective by
advancement in wastewater technology. Each of these studies recognized the importance and potential weakness of local land-use controls to guide the growth enabled by alternative wastewater technologies.

Recently, Hoover (2001) and Schiffman, Johns, and Banathy (2003) have assumed a more positive perspective regarding the relationship between decentralized wastewater systems and land-use. Asserting that alternative technologies offer a flexible tool for integrating wastewater treatment with land-use planning, Hoover promotes decentralized systems as a means of aiding communities in achieving their desired growth patterns by removing undesirable influences long exerted by conventional wastewater infrastructure. While the integration of technology and land-use regulation to achieve a community’s goals is an ideal, it is unknown whether such integration is occurring. In Wisconsin, Hanson and Jacobs concluded that land-use planning policy would not likely be the primary mechanism influencing such development (1989). Rather, they expected the guiding influence to be the interplay between demand forces, environmental regulations pertaining to private sewage systems, and the emergent costs of nonurban development. However, they concluded that it is unclear whether these forces would produce a development pattern in the best interest of the larger public.

Empirical analysis has not yet demonstrated which, if any, of Popper’s outcomes have come to pass. However, if we consider the relationship between land use, conventional infrastructure, and those holding power in peripheral areas, it is likely that the development community will be able to adopt these liberating technologies successfully. Thus, the development community—due to its strength and articulated interest—is more likely to determine the shape of development enabled by these
technologies. While it is a logical hypothesis, whether this outcome will result is unclear from the literature. Works by Hanson and Jacobs (1989) and LaGro (1998) support this premise while others such as Hoover (2001) have indicated another outcome is possible. However, for decentralized systems to be used by planners and public policy to promote orderly growth, the power structure in developing areas would need to be altered. Thus, the more likely impact of decentralized wastewater systems will be even less disciplined growth. Given the nature of development, the power behind it, and all those who stand to gain from the liberation from the sewer pipe, the development community can be expected to resist any new discipline imposed through public policy.

While the adoption of the Tennessee Growth Policy Act (Public Chapter 1101, Acts of 1998) was unconnected to the expanding use of decentralized systems, the use of these systems has largely coincided with the period of development, adoption, and implementation of the growth plans. Because these systems offer a solution to the constraint of wastewater disposal in unsewered areas, they are a factor influencing growth under Public Chapter 1101. Due to the importance of this legislation, the relationship between systems and the growth plans is an important element of this study.

RESEARCH OBJECTIVE AND DESIGN

Research Objective

This research examines the use of decentralized wastewater treatment systems in Tennessee. It aims to uncover empirical evidence concerning which of Popper’s predictions are occurring and the factors that caused this occurrence. To accomplish this goal, I first identify the development patterns supported by decentralized wastewater
systems. Once this pattern is established, I examine it to identify the cause(s). The research has the following objectives:

1. Identify where and how decentralized systems have been used in Tennessee.
2. Discern the land uses and settlement patterns that decentralized systems support.
3. Identify local forces determining the location and use of decentralized systems.
4. Discover how regulation by state agencies has an impact on the use of decentralized systems.
5. Use these findings to further understanding of how public policy, the development community, and technology interact to shape growth in nonurban areas.

Such analysis is of particular benefit to those concerned with growth in the state as it seeks to contribute to an understanding of how public policy, development dynamics, community, and technology interact to shape nonurban growth in Tennessee. However, this study also provides the empirical basis upon which generalization and theory are developed, and its findings offer insight into general forces operating in and contributing to the development of nonurban areas.

Tennessee: Statewide Patterns of Use and Regulation

The state of Tennessee was selected as the setting for this research for practical reasons. Tennessee presents an ideal confluence of physical environment, population growth, and public planning policy in which to analyze the introduction and use of decentralized wastewater systems. Second, having worked for a time as a planner in Tennessee, I was familiar with Tennessee’s planning laws, policies, and jurisdictions as well as its development pressures. Thus, research in this setting offered unique personal advantages. Perhaps the most important reasons for setting this study in Tennessee is
simply the fact that the systems have been used here, so patterns and processes have shown themselves and can be examined. Further, because the use of decentralized systems has closely coincided with the implementation of the state’s comprehensive growth policy, such a study offers insight into the power of the growth plans to create an orderly landscape.

The role of the state is also assessed through evaluating the policies and actions of two state agencies—the Tennessee Department of Environment and Conservation and the Tennessee Regulatory Authority. While there is no longer a statewide planning department responsible for larger planning-policy initiatives, state government has played a role in shaping the introduction and use of decentralized wastewater systems. The Department of Environment and Conservation issues operating permits for every decentralized wastewater system in the state while the Tennessee Regulatory Authority’s role is limited to granting service areas and regulating privately owned public wastewater utilities. To understand the influence of these agencies, I examine their role and purview. This statewide policy and agency analysis provides the larger framework within which the local factors and processes are examined.

County Case Studies: Local Patterns and Processes

County case studies identify local forces directing and regulating the use of these technologies. While operating within state laws and policies, local actors wield significant influence over the actual timing, shape, and location of development. A realistic understanding of this local development process is essential to creating effective public growth policies (Kaiser and Weiss 1970). The three counties—Wilson, Rutherford, and Sevier—that have experienced the most pronounced use of these
technologies were selected for analysis. As of December 2006, 44 systems were in use or under review by the Department of Environment and Conservation in Rutherford County; Sevier County had 34 systems, and Wilson County had 29. Together, these counties hold 107 systems or 41 percent of the systems operating or being proposed through 2006. In addition to the counties’ experiencing the most pronounced use of decentralized systems, each of these case studies offers unique insights through their differences.

METHODOLOGY AND DATA

A methodology was developed to examine patterns and processes operating at local and statewide scales. This research was designed to follow two avenues. First, through pattern analysis, I identified where and how decentralized systems have been used in Tennessee. Second, through in-depth interviews; field inspection of decentralized developments; inspection of public policy documents and regulations; and secondary data sources, such as census data and newspaper articles, processes underlying this pattern were explored to learn about the factors influencing the technologies’ use.

This research—like any research considering contemporary issues—can only offer a static portrayal of a changing condition. Thus, this is not intended to be a census or up-to-date report of the use of decentralized systems in the state of Tennessee. While new developments are continually considered, proposed, and implemented and the use and regulation of decentralized systems is fluid and evolving, two points make the present study salient. First, this research offers an assessment after the first ten years of

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1 When interviewing staff with the Tennessee Department of Environment and Conservation (TDEC) in May 2007, I learned that the 1997 Memorandum of Agreement delineating which TDEC division regulates decentralized systems was currently being reevaluated (O’Dette 2007; Qualls 2007). Modification to this
widespread use of the technology. Understanding this period of inception is important because it offers insight into how this technology was initially used, embraced, and/or resisted. Second, this research looks at the larger forces and factors influencing these systems. While new developments will continue to occur, the underlying forces are not anticipated to change fundamentally in the short term. Nevertheless, limitations to maintaining up-to-date information must be acknowledged and understood in light of the goals of this research. The data gathered for this research were principally collected between December of 2006 and September of 2007. Thus, the findings of this research reflect only the first decade of the widespread use of decentralized wastewater systems in Tennessee.

**Building the Database and Analyzing the Patterns**

Statewide. To determine where and how decentralized systems have been used, I first had to identify the decentralized systems. The only comprehensive source for this information was the Tennessee Department of Environment and Conservation. This agency of state government possessed this information due to its regulatory purview over wastewater systems. Decentralized wastewater systems are regulated under state operating permits (SOP) issued by the department’s Division of Water Pollution Control. A state operating permit is required for sewage-treatment systems that do not directly discharge to surface or subsurface waters. While decentralized systems can be designed

Memorandum of Agreement will have implications for the influence of environmental regulations of decentralized systems. Likewise, the cities and county government in Sevier County undertook a “Ridge Top Development” study during the spring and summer of 2007. This study undoubtedly grew out of the considerable development on ridge tops and hillsides in recent years. The use of decentralized systems is one factor that has enabled ridge top development in the county. However, changes to land-use regulations that might develop from the “Ridge Top Development” study or changes to TDÉC’s operating procedures may not be manifest for a number of years.
to discharge directly to surface waters, this set-up is rare in Tennessee. Rather, decentralized systems generally discharge through drip or spray irrigation. However, not all of the systems with a state operating permit were of interest. For instance, some cities operate a conventional sewer-collection system under a state operating permit and contract with another entity to treat and discharge their wastewater. Therefore, I needed an accurate yet workable definition to select only those systems of interest. This definition had to use—and was thus limited to—the information the database contained. Due to the fields available, it was most reliable to define decentralized wastewater systems as those with septic tanks and/or grinder pumps at each source and that discharged through drip or spray irrigation. A digital copy of the division’s permit application database was obtained in December of 2006 and again in January of 2008. Decentralized systems were located based on the latitude and longitude coordinates contained in the SOP database. As their location and service areas were critical to further analysis, the location of each system was verified with supplemental materials.² Through individual inspection, location errors were corrected.³

At state and local scales, decentralized systems were evaluated in relation to Public Chapter 1101 Growth Plans. Evaluation was accomplished through the use of a Geographic Information System (GIS) and the data on each county’s original adopted

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² Supplemental materials included location maps, engineering designs/reports, facility/site design layouts, and subdivision plats contained in state operating permit and certificate of convenience and necessity application files; parcel data from the Base Mapping Program (BMP); the Computer Aided Assessment System (CAAS) database and website; real-estate agency websites; websites for specific developments; and online planning documents.

³ The coordinates for 144 systems (55%) were confirmed to be accurate, 51 system coordinates (19%) were inaccurate, 65 system coordinates (25%) were slightly inaccurate, and three records were added to reflect the expansion of a system. A system was considered “Inaccurate” if its placement was far removed from where supplemental materials indicated the system to be located. A system is considered “Slightly Inaccurate” if it was adjacent or in close proximity to but did not coincide with the spatial extent of a development. Inaccurate and slightly inaccurate records were relocated based on supplemental materials.
growth plan. These data were obtained from the State of Tennessee Department of Economic and Community Development’s Local Planning Assistance Office.\textsuperscript{4} The area served by decentralized systems was compared to growth plans as originally adopted and as amended through August 2006. Each record was assigned its corresponding growth plan designation(s). The land use supported by each system was also recorded in the GIS database. Land-use types were determined from descriptive information in the state operating permit (SOP) database or obtained from supplemental materials used to confirm a development’s location. The number of dwelling units and the residential population projected for each decentralized system were estimated because the number of units was not directly contained in the SOP database. Consequently, approximate unit counts were derived either from a system’s flow rate or, when possible, retrieved from the SOP permit file record (see Appendix I). Several data sets were collected and integrated into a collection of files for use in a geographic information system (GIS) for statewide analysis. Appendix II contains a detailed description of data sources.

\textbf{County case studies.} Having established the use and distribution of decentralized systems in Tennessee, I was ready to examine the underlying processes that created these outcomes. Sources for this portion of the research included in-depth interviews with key informants, primary and secondary data sources, field inspection of developments, and public-policy documents and regulations. This research was iterative; insights from each source served to both inform and refine the questions I asked of different sources.

Incrementally, I was able to integrate facts and observations into a theoretical framework

\textsuperscript{4} As of August 2006, seven counties (Anderson, Carroll, Coffee, Decatur, Hamblen, Lake, and Marion) have amended their growth plans. Updated growth plan shapefiles were created for these seven counties through inspection of the amended growth plans.
that explained local influences and outcomes.

Process Analysis

The process analysis aspect of this research explored the forces influencing how decentralized wastewater systems are used at the state and county level. It was accomplished through interviews, examination of primary and secondary data sources, and field research. A degree of overlap exists with the pattern analysis because some of these data are incorporated into and/or derived from the GIS database, yet other data stand independently.

The process analysis began in the case-study counties by identifying the actors likely to be involved in and knowledgeable of planning and regulatory policies, utilities, development pressures, or infrastructure issues and decisions. While some of these individuals and groups were readily apparent, many people making these decisions operate behind the scenes. Most visible and accessible were the public officials and staff of cities, planning commissions, county commissions, and the state’s Department of Environment and Conservation and the Tennessee Regulatory Authority. Somewhat less visible and less accessible were private individuals involved in land development. A third group were informants associated with the utilities operating the systems and the civil engineers designing the systems and the developments served. Once these sources were identified, I initiated contact in accordance with the University of Tennessee’s policies regarding research involving human subjects.5

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5 Once identified, key informants were contacted and presented the Study Information Sheet that is included in Appendix III. This sheet outlined the study’s purpose, the participant’s role in the research and associated rights, and various means of contacting the researcher. The key informants were later contacted to determine their willingness to participate in the study. When we sat down to conduct the interview, I presented each key informant with two copies of an Informed Consent Statement. A copy of this statement
In-depth interviews are a particularly useful form of data collection, for they access information that may not be available otherwise (Carson, Gilmore, Perry, and Gronhaug 2001; Patton 2002). Patton defined key informants as “people who are particularly knowledgeable about the inquiry setting and articulate about their knowledge – people whose insights can prove particularly useful in helping an observer understand what is happening and why” (Patton 2002, 321). Further, key informants offer insight into subgroups to which the researcher has limited access. In this study, key informants in the fields of civil engineering, land surveying, and land-use planning provided essential insight into the subgroup of land developers, who were difficult to identify and reluctant to participate.

In-depth interviews follow a relatively unstructured format to achieve maximum depth and opportunities for insights and unexpected information to emerge. Key informants were asked general, open-ended questions pertaining to their roles in the land development process, particularly in relation to decentralized wastewater systems. Such an approach provides the necessary open, flexible, experiential, and illuminating means to study the complex and dynamic experiences and perceptions of each key informant. This approach allows for the identification and examination of key issues as they are revealed through the interviews. Such research evolves with the emergence of key issues and topics.

Prior to my first interviews in a county, I gathered local policy and regulatory is included in Appendix III. The participant was asked to sign both copies prior to the interview. I retained one for the official record as required by the university and offered the second to the participant. In addition to containing the information provided on the Study Information Sheet, the Informed Consent Statement contained two signature blocks. By signing the first signature block, the participant indicated he or she was a willing and informed participant in the study. By signing one of the two lines in the second signature block, the key informant indicated whether he or she wanted his or her identity to remain confidential or granted his or her permission to be identified in the study.
documents. I combined maps of the counties’ growth plans, zoning districts, and soil and topographic features with the locations of decentralized systems to create local maps of the technologies’ use. These maps served as springboards for interview questions. I quickly found that while many individuals possessed mental maps of where decentralized system developments were located virtually no informant had ever seen—or considered—where these developments were located in relation to the county’s growth plan, zoning districts, cities, or transportation infrastructure.

One of the challenges of this research was realizing that there was no one perfect place to start. I had simply to identify—as best I could—an initial group of individuals, initiate contact, and hope they would agree to an interview. This set of informants served as local gatekeepers because it was through my interaction with them that I was able to identify others. Furthermore, having worked as a planner in Tennessee I was familiar with the type actors—planning commissioners and planners, land surveyors and engineers, and developers—involved in land development. While not knowing particular people in many of these communities, I was familiar with the role different actors played in this process. This aided my ability to ask informed questions. Having never been contacted for a request for such an interview, some informants were initially hesitant, but their concerns were often relieved because they knew the people—those whose identities I could reveal—with whom I had already spoken. As I spoke with more and more people, I was better able to understand the local situation. This growing understanding allowed me to be a more informed interviewer. Upon realizing that I had worked to cultivate an understanding of their community, interviewees were more often willing to spend time with me to explain their understanding of various situations.
Members of the land development community were often the most difficult to identify and obtain access to. In particular, important members of this community were often reluctant to participate openly. This reluctance, however, was not universal, and some developers—speaking in strict confidence—were very open and forthcoming. An unanticipated avenue into this community was discovered through civil engineers, a group not initially considered. When the planning staff in one county refused to identify local developers, I was forced to seek out other informants. Fortunately, I found several knowledgeable engineers who were willing to participate. These individuals—although careful to remain confidential—were more easily identified and less reluctant to explain the actions, motives, and rationales of their developer clients. Due to their unique role in the land-development process, interviewees in this group were knowledgeable of the desires of their clients and the regulatory constraints—or lack thereof—within which they were operating. These interviewees provided insight into many of the basic factors underlying the use of decentralized systems and the resulting outcomes.

In-depth interviews with key informants were a particularly useful form of data collection. However, understanding the local situation required both insights gained from the interviews and knowledge of other factors cultivated from non-interview sources. Informants provided insights that put flesh on the bones of bare public policies, regulatory documents, census statistics, and other primary data sources. However, without the framework these documents and statistics provided, the insights gained from interviews would have been baseless. Because people’s perspectives are inherently limited, selective, and biased, I had to ground their statements in observed facts and patterns as well as balance them against the statements of others. I quickly realized that
the statements of informants represented their particular positions, perceptions, and inherent biases. However, the effect of this subjectivity was mitigated by interviewing a wide selection of informed individuals who were speaking without knowing what others had said. Being aware that many interviews were being conducted caused interviewees to stay close to the facts and speak more honestly. As the perspectives of these informants converged and formed observed patterns, a clearer picture of the processes driving the implementation of decentralized systems emerged.

STRUCTURE AND CONTENT OF THE DISSERTATION

In Chapter Two, this study examines the role of infrastructure—both that of transportation and of central sewers—in shaping development patterns. Chapter Three considers the issues related to the decentralized approach to wastewater infrastructure and examines both the historical role of constraints to onsite wastewater disposal and the literature considering the possible impacts and opportunities of alternative wastewater technologies. The next three chapters consider the use and influence of decentralized systems from a statewide perspective. Chapter Four begins by examining the introduction, use, and distribution of decentralized wastewater systems in the state and concludes with a comparison of this use to the county growth plans. Chapters five and six evaluate the role and influence of two state regulatory agencies: the Tennessee Regulatory Authority in Chapter Five and the Department of Environment and Conservation in Chapter Six. Chapters seven through nine present the county case study analyses. The Middle Tennessee case-study counties of Wilson and Rutherford are presented in Chapter Seven and Chapter Eight respectively while Chapter Nine considers
the unique tourism driven growth in Sevier County in East Tennessee. The conclusions and observations of this research are provided in Chapter Ten.

Although the practice is somewhat unusual, I have purposefully left certain long block quotes in the text. While this is not an ethnographic study, this approach was taken because, often, what the informants said was nuanced. Because I did not want to lose these nuances, I have allowed the informants to speak for themselves in the text. Often, I compelled informants to evaluate critically causes that they had not previously considered. In doing so, their explanations were not refined or packaged but, in many ways, have insightful revelations that would be lost if the quotes had been paraphrased. Also, in some cases, verification was not possible while, in other cases, there is corroboration between sources, thus the block quotes were often necessary to illustrate the point.
CHAPTER II
GROWTH AND THE INFLUENCE OF INFRASTRUCTURE

GROWTH BEYOND THE URBAN BOUNDARY

The proportion of the American population residing in urban areas has risen steadily since the first decennial census of the United States in 1790. The decennial census of 1920—an important milestone in America’s transition from a rural to an urban nation—marks the first time the majority of Americans resided in urban areas (Table 2.1). Since the nation’s earliest days, American cities have absorbed population growth by expanding outward (Clawson 1971). This has resulted in an extensive suburban and exurban settlement patterns around cities.

The dispersion of people into the urban periphery is of importance to the present study. In their review of the geography of North American cities and suburbs between 1900 and 1950, Harris and Lewis (2001) contend that decentralization gained momentum in the third quarter of the nineteenth century and in the early decades of the twentieth century when factories and their laborers increasingly located at the periphery of many cities. Harris and Lewis hold that the more widely recognized decentralization of the post World War II era had truly begun earlier in the century. While the out migration of people from central cities to surrounding areas may have begun around the turn of the last century, the tendency toward decentralization remained constrained by limits to transportation. Not until the automobile became widely available in the 1920s were commuting patterns permitted to extend in many directions and over a more extensive area. Improvements in transportation loosened the urban fabric and contributed to even
<table>
<thead>
<tr>
<th>Year</th>
<th>United States Percentage</th>
<th>Tennessee Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban</td>
<td>Rural</td>
</tr>
<tr>
<td>1790</td>
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<td>94.90%</td>
</tr>
<tr>
<td>1860</td>
<td>19.8</td>
<td>80.2</td>
</tr>
<tr>
<td>1900</td>
<td>39.6</td>
<td>60.4</td>
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<td>51.2</td>
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<td>24.8</td>
</tr>
<tr>
<td>2000</td>
<td>79.0</td>
<td>21.0</td>
</tr>
</tbody>
</table>

* First census more people lived in urban rather than rural areas nationwide.

# First census more people lived in urban rather than rural areas in Tennessee.

** Previous urban definition

*** New urban definition

greater decentralization in following decades. A 1942 article in *Economic Geography* by Wehrwein offers insight into the growing trend of decentralization. Wehrwein observed that:

… residences are spreading into the fringe, industries are “decentralizing,” and commercial establishments in the form of traffic-attracted industries are locating themselves along major highways, reaching many miles beyond the residential or the industrial invasion. (Wehrwein 1942, 217)

Such decentralization continued and reached unprecedented heights in the years following the Second World War. Fueling this decentralization were higher family incomes which provided the means to purchase homes in suburban areas and the automobiles necessary to commute from these homes; wider access to peripheral areas through improved transportation facilities; an extensive population boom in the post-war years; public policy initiatives such as the home mortgage interest deduction; and the steady increase in the availability of suburban employment opportunities (Foresta 2004; Nelson and Dueker 1990; Williamson, Imbroscio, and Alperovitz 2005). Additionally, people sought suburban residences to escape the crime, congestion, and pollution associated with cities. The number of Americans living in suburban areas expanded from 30 million in 1950 to 76 million by 1970 (Phillips 1996). During this period, decentralization produced drastic changes in the land-use patterns of suburban areas. A rising standard of living created a nation of homeowners who required a land-use pattern that met the desires of the modern family. Their desires were largely achieved through detached single-family residences on individually owned lots. Of the 14.5 million new single-family homes built in the United States between 1947 and 1962, at least 10 million were located in the suburbs (Hoyt 1963).
The accelerated dispersal of the American population into suburban and exurban areas has continued unabated into the present. In evaluating those counties which experienced the most rampant growth in the last half of the twentieth century, Lang and Gough observed that “the decentralization of economic and residential life, not the revival of core cities and central downtowns, remained the dominant growth pattern in the United States” (2006, 61). America’s metropolitan areas are still growing fastest at their peripheries. The Brookings Institution reported in 2006 that nationwide outer suburban and exurban counties grew at rates of nine percent and twelve percent respectively while urban and inner suburban counties grew at considerably slower rates of three percent and four percent (Berube, Singer, Wilson, and Frey 2006). Admittedly, only a small proportion—six percent in 2000—of the nation’s population resides in exurban areas; however, the tremendous growth occurring in outer suburban and exurban areas demands our attention. The shape of the coming American city will be determined in these areas.

INFRASTRUCTURE’S SHAPING INFLUENCE

A vast and diverse literature has developed over the last half century concerning the development of land beyond the boundaries of American cities. This literature seeks to understand the reasons underlying such growth and its implications (Berube, Singer, Wilson, and Frey 2006; Dueker, Strathman, Levin, and Phipps 1983; LaGro 1993; Ingram 1998; Nelson and Dueker 1990; Ottensmann 1977; Theobald 2005). Topics covered range from the economic processes influencing peripheral growth (Clawson 1962; Gordon, Richardson, and Yu 1998) to political fragmentation within metropolitan
areas (Carruthers 2003). Still others examine the decision-making process of builders and developers constructing these new areas (Robinson and Robinson 1986; Mohamed 2003). An overarching conclusion can be drawn from the vast array of topics and findings: peripheral growth is complex, its causes are many, and its influences are far reaching.

The growth of any area is influenced by a complex set of interconnected factors. Such factors include the historical, physical, economic, social, and political character of a local area. The manner in which an area develops is influenced by these various local factors, one of which is the nature and availability of infrastructure. These factors exert influence in one of two general ways. Certain factors broadly affect the overall demand for development in a local area. Examples include a region’s rate of population growth, rate of job creation and wage growth, the demographics of the growing population, and government policies. Such general forces promote or retard growth overall. For example, federal tax policy which allows homeowners to deduct interest payments from their taxable income may unintentionally provide incentives for low density, single-family homes (Green 1999). This is a general influence, as it offers no specific locational preference as to where single-family homes should be constructed. Likewise, high interest rates on loans can disqualify many potential home buyers. This can discourage construction of single-family homes, and possibly encourage the construction of multi-family dwelling units for renters. However, this in itself offers no spatial influence over where they are likely to be constructed.

Other factors influence the location and configuration of development within a local area. In 1974 The Fifth Annual Report of the Council on Environmental Quality
observed that “While tax and regulatory policies may have significant effects on broad development patterns, the funding of new public facilities probably has the most direct and immediate impact on specific land areas” (U.S. General Accounting Office [GAO] 1974, 36). This research finds its focus within this second set of factors, those which influence development to occur in a particular location, in a particular pattern, or at a particular time.

People moving to both the urban fringe and rural areas expect the modern conveniences to which they were accustomed in cities: water, electricity, roads, television, and wastewater disposal. More flexible and less expensive than water or sewer lines, power lines have been or generally can be extended to most suburban or exurban areas. Similarly, telephone and television service are also generally available or relatively inexpensive to provide. Cellular telephones and satellite television service in particular further remove the need for physical lines and linear networks. Other elements of physical infrastructure, originally made possible by dense urban concentrations, are more costly to provide to suburban and exurban areas and, thus, have a greater impact on development patterns. Highways, water mains, and central sewers are all spatially constrained and capital intensive. Extension is often uneconomical where consumers are either few or far between (Kelley 1984, 2004; Berke, Godsalk, Kaiser 2006). The limited availability of these elements of physical infrastructure has resulted in their longstanding influence over the rate, pattern, location, and density at which development occurs. Recognized for some time, Coughlin relates this reality in a 1963 article, where he states that:
Once built, public facilities exert a long-lasting influence on communities, an influence often felt after the facilities themselves have disappeared. . . . The public development of transportation systems and the provision of sewage and water utilities have been key factors in determining the extent and types of private building in all communities. (Coughlin 1963, 460)

The authors of *The Growth Shapers* assert that infrastructure influences local land-use patterns by altering the demand for development, the supply of developable land, or both (Urban Systems Research and Engineering, Inc. 1976). Transportation infrastructure principally influences demand for development by altering the accessibility for a particular site. If properties are inaccessible, demand for development is likely to be low unless an additional attraction exists, such as mountainous settings or views which indirectly are related to lower levels of access. Expansions or extensions to transportation infrastructure are the primary means by which demand is altered.

As land is an essential raw material in the development process, the supply of developable land at any time is an important influence over where development can occur. Certain lands may be permanently removed from the market by laws establishing federal and state parks, wildlife refuges, or environmentally sensitive areas. Other sites may be protected by legal arrangements such as conservation easements or by legal restrictions such as zoning. Still other land, while not prohibited legally from development, may not be available at a reasonable price. The size of landholdings may prevent a developer from obtaining enough area to accommodate a development. All these factors act to remove land from the development market (Urban Systems Research and Engineering, Inc. 1976).

In some instances, it may be too expensive—due to location or site conditions—to
provide certain properties with the necessary roads, sewers, and water lines and economically justify developing the property. Although available for sale, other sites may be more attractive as they are already provided these services. Thus, inadequately served properties are effectively removed from consideration by developers until situations change. Variation in the availability of physical infrastructure influences the relative developability of one parcel over another and removes some land from the supply of developable land (Berke, Godschalk, Kaiser 2006; Fischel 1990; Kelly 2004; Tassie1998). Physical limitations such as steep slopes, rock outcroppings, and high water tables raise the costs for extending infrastructure to a site. High costs cause sites to be passed over until less costly land is developed or infrastructure becomes available. Although infrastructure internal to a site is a considerable expense, the cost of external connections often influences a developer’s decision to develop one parcel versus another. When a city, county, or utility extends or expands elements of an infrastructure network—such as a trunk sewer line—through or near vacant land, the developer’s cost to provide that service is reduced. *The Growth Shapers* cite sewers as the prime example of how infrastructure makes development viable in certain areas by lowering development costs (Urban Systems Research and Engineering, Inc. 1976).

TRANSPORTATION’S ROLE IN URBAN MORPHOLOGY

A dynamic relationship exists between transportation and growth patterns. Accessibility, or the ease of getting from one place to another, is at the core of this relationship. This relationship has been the subject of much study and serves as the foundation of the basic models of urban form. A brief review of transportation’s
influence is necessary.

Over time, advancements in transportation technology have altered the nature of the transportation systems in American cities (Adams 1970). With each advancement, accessibility improved for sites both within and beyond the city. Prior to the introduction of the streetcar, American cities were compact due to the practical need for activities to locate in close proximity to serve a primarily pedestrian population. Introduced in the early 1850s, the horse-drawn streetcar was an important early mode of transportation in cities. While a modest advance, this mode permitted the development of land beyond the reach of a primarily pedestrian population. The advent of electrified transportation in the early 1890s permitted the replacement of the horse-draw streetcar by the electric streetcar or trolley. This advance tripled the average speed of interurban transportation and permitted transportation lines to be extended into undeveloped areas. This increased the accessibility of land lying along the major transportation routes leading to the city center. However, as people remained limited to walking once off the streetcar, the levels of accessibility rapidly diminished only a short distance away from the streetcar line. City growth during this period was characterized by a radial pattern of growth along streetcar lines—and later other rail-based modes of mass transit—while less accessible areas between transportation routes remained relatively undeveloped (Hartshorn 1992; Taaffe, Gauthier, and O’Kelly 1996).

The introduction and general adoption of the automobile during the first decades of the twentieth century once again revolutionized the form of the American city. While having been originally developed in the 1880s in Germany, the automobile soon became identified as an “American” product. The mass manufacturing pioneered by Henry Ford
reduced the price of automobiles in America such that they became affordable for the
middle class by the early 1920s. Increasingly available, automobiles afforded people
certain advantages: flexibility, convenience, and personal comfort. Furthermore, people
were no longer constrained to locations within walking distance of a rail line. As radial
highways developed in the 1930s, they opened previously inaccessible locations to
suburban development. Suburban homes began to fill in those poorly accessible
interstices between rail lines and early radial highways. To a degree, this filling-in
process restored the city’s earlier tendency toward a circular form (Hartshorn 1992;
Taaffe, Gauthier, and O’Kelly 1996).

In the years following the end of the Second World War, the urban form of
American cities was once again revolutionized. Owing to an innovation in transportation
infrastructure design rather than technology, the period from 1950 to 1975 has been
identified as the Expressway Era (Taaffe, Gauthier, and O’Kelly 1996). Expressways
were modeled after the German autobahn, which had been constructed in the 1930s.
Although viewed as the solution to urban traffic problems as early as the 1930s, limited-
access expressways were implemented in only a few instances—New York City, Los
Angeles, and Pennsylvania—prior to the Second World War.

Awareness of the need for a national network of limited-access highways
intensified following the war. In 1956 Congress passed the Interstate Highway Act
making available federal funds for the construction of an interstate highway system
(Figure 2.1). This was to be the largest public works program in United States history.
The increase in public funding and improvements in construction technology for the
creation of high-capacity and high-speed highways gave rise to a significant component
of the urban transportation pattern.

The construction of expressways greatly enhanced accessibility for outlying suburbs and rural areas. The decentralization of commercial and industrial activities that had begun earlier accelerated. As improvements in transportation altered accessibility, a complicated pattern of land-uses and land values developed. Land values began to decline in central cities due to common negative externalities such as pollution and congestion associated with these areas, while land values increased for the most accessible suburban sites due to accelerated suburban growth. These most accessible sites often coincided with freeway interchanges, particularly those accessing interstate beltways or federal or state highways (Lewis 1995; Taaffe, Gauthier, and O’Kelly 1996). Beltways had been conceived to serve as metropolitan bypass highways, allowing traffic

![Figure 2.1](image.png)

**Figure 2.1** Historical progression of the United States interstate highway system. 
Source: Knox 1994, 49.
to avoid urban downtowns. However, highly accessible intersections where circumferential beltway or radial interstate highways intersected noncontrolled access highways became the focus of commercial, industrial, or professional office complexes. Such areas often developed into new suburban centers or “Edge Cities” (Garreau 1991). Interstate expressways and beltways made suburban and rural areas increasingly accessible and facilitated the development of adjacent land. As commercial activities and sources of employment increasingly located in peripheral areas, intersuburban commuting and shopping patterns increased.

Transportation may be the most liberating of the technologies and infrastructure shaping urban form. It is certainly the most widely recognized because when we think of suburbanization we think about roads. We think about interstates and limited access highways, and their impacts are perfectly obvious. However, as greater and greater areas were bestowed improved access, the locational influence of transportation infrastructure diminished in importance.

SERVICE DISCREPANCIES

The Diminishing Influence of Highways

Writing in the late 1950s, Coulter (1958) predicted that the population growth occurring on the fringe of the nation’s cities during the immediate postwar period would continue and even expand for the remainder of the century. Coulter speculated that the “highway-building program may have more impact on housing location than any other factor in history” because time and not distance is the commuter’s major consideration
He foresaw the effect which the interstate highways would have on cities. However, he also recognized the potential for wastewater infrastructure to influence the growth that would occur beyond the city’s traditional boundary. In the late 1950s, Coulter observed that sites served by a central sewerage system were both scarce and priced out of the speculative house-building market. This he concluded would result in the “vast majority” of new housing being built in the suburbs and at an ever-increasing distance from urban centers (1958). Coulter’s observations are important, for they provide insight into the dual dynamics of highways and sewers as shapers of urban form.

With the highways will come restaurants, motels, shopping centers, and other service installations. Industries will also locate along the highways, creating still further pressure for fringe area housing. All of these buildings, requiring sewerage and other community facilities, will intensify sanitation needs . . . . We are entirely unprepared to provide adequate sanitary facilities of all types in a dispersed community of the proportions visualized. (Coulter 1958, 489)

The federally financed interstate highways built during the 1950s, 1960s, and 1970s opened many areas around cities to development. However, it proved impossible to extend central sewers to the entire area to which greater transportation access was provided. This discrepancy in service was increasingly recognized during the 1970s. Two years after the Clean Water Act of 1972, and at a time of increasing concern over environmental issues, the Fifth Annual Report of the Council on Environmental Quality recognized that sewers and sewage treatment plants were replacing highways as prime determinants of the location of development (U.S. GAO 1974). As such, sewers were recognized as exerting a considerable influence over where and how fast new

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6 It should be noted that the rising cost of fuel for private automobiles may also diminish the influence of highways in the future as modes of mass transit become increasingly attractive to commuters weighing the financial expense of transportation in relation to time and convenience costs.
development occurred in many of the nation’s metropolitan areas.

The growing influence of sewers was not due to the fact that sewers are more important than transportation facilities, but rather that more land had simply been provided better transportation access than had been serviced by sewers. Sewers became a limiting variable. The influence of a new—or expanded—highway is strongly related to the amount of vacant land that highway makes accessible relative to what was already accessible (Kelley 2004; Urban Systems Research & Engineering, Inc. 1976). The initial Interstate highways yielded substantial impacts to metropolitan areas because they greatly improved the accessibility of areas previously only marginally accessible. However, by the early 1970s most of the major Interstate highways segments in urban fringe areas had been built (Figure 2.1). Consequently, each subsequent highway exerted a diminished impact on local accessibility. This diminishing influence was recognized as giving way to the more limited availability of wastewater facilities. Therefore, sewers came to exert an important influence over development (U.S. GAO 1974).

**Economic Densities: Water vs. Sewer**

While both a potable water supply and a means of wastewater disposal are necessary for land development, the population densities required to make each viable differ. Population densities justifying public water infrastructure are typically lower than that needed to justify central sewerage (Berke, Godschalk, Kaiser 2006; Kenney 1964; U.S. EPA 1987). Consequently, the greater economic viability of extending public water into less densely populated areas has created a discrepancy in utility service. Central sewer collection systems are far more localized in Tennessee while public water infrastructure, although far from ubiquitous, is available in many rural areas. In 1990, the
last decennial census for which information on a household’s source of water and means of sewage disposal was collected, 60 percent of Tennessee households depended on a central sewer system, while 86 percent relied on a public water supply (Table 2.2). While more current statistics are unavailable for wastewater disposal, the Tennessee Department of Environment and Conservation reported in 2005 that over 94 percent of Tennesseans are served by a public water supply (Tennessee Department of Environment and Conservation, Division of Water Supply [TDEC DWS] 2005). Further indicating the limited availability of central wastewater infrastructure, a reported 78 Tennessee municipalities—largely rural or remote in nature—are not served by a central sewer system (Tennessee Advisory Commission on Intergovernmental Relations [TACIR] 2004). A Tennessee example of the variation in cost to service an area with water versus sewer can be taken from the urban growth boundary (UGB) report prepared by the City of Pigeon Forge. In this report, the cost to extend public sewer to the city’s urban growth boundary was estimated to be $34.9 million while the estimated expense to provide water service was only $20.9 million (Tennessee Department of Economic and Community Development, Local Planning Assistance Office 2000). It should be acknowledged that some of the area inside the city’s growth boundary was served with water mains at that time, while very little, if any, of this area was provided sewer service. Regardless, the discrepancy in the cost to extend utilities in this area illustrates the general discrepancy in

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7 U.S. Census Bureau did not collect data for a household’s source of water or means of wastewater disposal in the 2000 Decennial Census. The Bureau’s justification was that “prior to the 2000 Census, data needs were classified according to a narrow legalistic typology. Subjects for which there were federal laws that explicitly stated that decennial data were needed were classified as "M" for mandatory. Those for which there were federal laws that explicitly required data (although not specifically decennial census data), were classified as "R" for required. Items that were ultimately included in Census 2000 were either mandated or required by federal legislative purposes. Source of water and method of sewage disposal were neither required nor mandated items in Census 2000” (U.S. Census Bureau 2007).
### Table 2.2 Water and Wastewater Utility Provision, 1990

#### Means of Sewage Disposal

<table>
<thead>
<tr>
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<th>Public Sewer Housing Units</th>
<th>Septic Tank or Cesspool Housing Units</th>
<th>Other Means Housing Units</th>
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<tbody>
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<td></td>
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<td>United States</td>
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#### Source of Water

<table>
<thead>
<tr>
<th></th>
<th>Public System or Private Company Housing Units</th>
<th>Individual Well Housing Units</th>
<th>Some Other Source Housing Units</th>
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<tbody>
<tr>
<td></td>
<td>Number</td>
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<td>Number</td>
</tr>
<tr>
<td></td>
<td>Percentage</td>
<td>Percentage</td>
<td>Percentage</td>
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<tr>
<td>United States</td>
<td>86,068,766</td>
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<td>Tennessee</td>
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<td>85.7</td>
<td>12.1</td>
<td>2.2</td>
</tr>
</tbody>
</table>

Source: U.S. Census Bureau, 1990.
the availability of water and sewer lines in many areas of the state.

While comparable statistics for water and sewer service are unavailable for more recent censuses, estimates of the current provision of these services are available from the Tennessee Department of Economic and Community Development’s Local Planning Office. Estimates are available for the 89 counties for which CAAS data is maintained. Of these counties, the percentage of residential parcels served by public water ranged from highs of 99 percent and 98 percent in Montgomery and Sumner counties to lows of 17 and 20 percent in Hancock and Grainger counties. On average 69 percent of residential parcels in the 89 counties are served by a public water supply. However, much lower percentages of residential parcels are provided with central sewer service. On average, only 30 percent of residential parcels were served by a sewer. Tennessee counties have consistently lower percentages of residents served by sewer than water. The lowest percentages of residential parcels with sewer service were 1 and 3 percent in Van Buren and Grainger counties respectively. Variation in public water and sewer service levels in Tennessee are reflected in the maps in Figure 2.2.

_A Difference: Utilities and Transportation._

Kelley (2004) stressed that, in most cases, highways simply improve access to a location and so improve the convenience of that location. In turn, this makes development at that location more attractive. Kelley contrasts this heightened attraction to the often limiting—even prohibiting—effect imposed by a lack of access to a potable

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8 These estimates are based on the Tennessee Office of the Comptroller of the Treasury’s Computer-Aided Assessment System’s 2007 property assessment database (CAAS) and reflect the percentage of residential parcels which were coded as being served by public water or public sewer. This database excludes counties which maintain property records in a different property assessment system. With the exception of Unicoi County, these are generally the counties with the highest populations such as Davidson, Shelby, and Knox.
Figure 2.2  Public water and sewer service to residential parcels, 2006.
water supply or means of wastewater disposal. In many locations and for many types of development, the provision of these utility services is an essential requirement for development. Acknowledging that under varying circumstances a developer may be able to provide water through use of a well or dispose of wastewater onsite, Kelley asserts it is rare to be able to accommodate both of these services onsite at densities that make development viable. Thus, Kelley asserts that while transportation infrastructure alters the access and attraction of certain sites it is the nature of utility services that often make development possible or not.

SEWERS AS A DEVELOPMENT SHAPER

Sewers: A Growing Importance

The importance of “interceptor” or “trunk” sewers in the development process stems from the fact that an acceptable means of wastewater disposal is required. Arising from the need to separate wastewater from a population’s drinking water, sewers were first used in dense urban areas (Cohn 1966). The very urban densities that made sewers necessary also made them economically viable. While peripheral areas had been earlier served by privies, cesspools, and septic tanks, changes in water consumption heightened the demand for disposing of wastewater onsite. As electricity and indoor plumbing became increasingly available in nonurban areas from the 1930s onward, the wastewater flows generated by residents in these areas, as well as those who would arrive in the post-war period, expanded. As baths, showers, clothes washing machines, and flush toilets became increasingly common, levels of water consumption increased and so placed greater demands on septic systems.
Not only was the pattern of water consumption changing but so too was the settlement pattern around cities. As the nation’s population dispersed into the urban periphery in the years following the Second World War, it became difficult to provide sewers to this dispersing population. As such, sewage collection, rather than sewage treatment, proved the principal challenge in peripheral areas. Expanding ever outward in a leap-frog manner, the periphery of American cities often developed into pockets of low to medium-density housing separated by gaps in development. Such development often used septic systems as an alternative to sewers. This further complicated the ability to extend sewers to this fragmented population (Downing 1969). Furthermore, this suburban development often occurred at densities that were higher than septic systems could safely dispose of the wastewater. At these higher densities, septic systems often failed; this was particularly true where soils were unsuitable or where systems were improperly installed or maintained (Cohn 1966; Melosi 2000; Otis and Anderson 1994).

At the same time as the nation’s population was dispersing into the urban periphery, the nation’s awareness and concern over water pollution and environmental issues was growing. By the end of the 1960s, public concern for the environment was leading to more comprehensive environmental regulation. Earlier concerns for assuring a pure water supply broadened to encompass biological and chemical aspects of water quality, the nature of waste, and various effects of pollution (Melosi 2000). These mounting environmental concerns culminated in the 1972 Clean Water Act. This act, along with later environmental legislation, placed increasingly stringent requirements on the means of wastewater disposal. Such traditional disposal techniques as cesspools ceased to be an acceptable option, and physical limitations to the use of septic systems
were increasingly recognized. As such, sites with physical constraints to onsite disposal became increasingly costly and sometimes impossible to develop. In 1975, Brinkley, Collins, Kanter, Alford, Shapiro and Tabors observed that “as a result of these environmental standards, the lack of sewerage has become a real bottleneck to development and, in some localities, has halted residential construction” (1975, 1). Increased recognition of the importance of sewers is reflected in the fact that multiple studies such as *Influences on wastewater management on land use: Tahoe Basin* (1974), *Interceptor Sewers and Urban Sprawl* (1975), *The Growth Shapers: The Land Use Impacts of Infrastructure Investments* (1975), and *Land Use and the Pipe* (1976) were funded at this time to consider this issue (Brinkley, Collins, Kanter, Alford, Shapiro and Tabors 1975; Pepper 1974; Tabors, Shapiro, and Rogers 1976; Urban Systems Research and Engineering, Inc. 1976). Heightened levels of water consumption and an expanding nonurban population, coupled with concerns for public health and the environment in the 1960s and 1970s, required that acceptable onsite disposal be provided. In its own way, each of these factors presented challenges to conventional means of wastewater disposal and so elevated the importance of wastewater infrastructure in the development process.

*The Influence of Conventional Wastewater Disposal*

Wastewater from homes and businesses has largely been disposed of through either access to a sewer or septic system. In place for a long time, both of these means of disposal possess certain inherent opportunities and constraints and as such are more

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9 Another option, the activated sludge package plant was of more limited use. Issues related to these systems are considered in Chapter 3 and Chapter 6.
suited to certain uses. As an alternative to central sewers, septic systems offer certain advantages. They provide wastewater disposal for sites removed from sewers, and they offer—for certain sites—the least costly means of wastewater disposal. Mohamed (2003) found evidence that larger lots and septic systems were favored by small developers because they offer a solution to the expense of connecting to public sewers, reducing a developer’s capital exposure for a project. Yet, the use of septic systems can be limited by physical site constraints. An estimated two-thirds of the land area in the United States have soils considered unsuited for dispersal of wastewater through a conventional septic tank drainfield (U.S. EPA 2002). Even when used on suitable sites, septic systems require enough area to ensure that the flow of wastewater does not exceed the absorptive and treatment capacity of the soil. As such, septic systems can not support the density of development possible on sewers. Nevertheless, if a site that a developer is considering is suited to septic systems and is capable of supporting a density of development with which the developer is satisfied, then septic systems may be the favored option. It is important to recognize that where developers are satisfied with the densities supported on septic systems, sewer lines exert less influence over development. It is in areas where septic systems are limited that sewers exert their most potent influence over growth patterns.

Nugent recognized this, stating that for sewer service to have

an impact on the development of a particular parcel of property, its existence must be a prerequisite for that development to occur or at least be a highly desirable precondition. . . . In locations where soil conditions, ground water, density of development, and/or other physical features prohibit on-site water acquisition and/or

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10 Some of these opportunities and influences are examined later in this chapter or are presented in Chapter 3.
wastewater disposal, the significance of the availability of municipal utilities is enhanced. (Nugent 1975, 5)

In such cases, sewers make development possible, and so they are important shapers of development patterns. For this reason, people have made statements such as “Sewer is the ultimate no-growth weapon; without sewer, nothing can be built” (Hirst and Hirst 1975).

Not only is sewerage often a necessity and a reducer of development expense, but sewers also alter the possible uses for which a parcel can be developed, for they allow parcels to be used to greater intensities. Able to support greater densities than septic systems, sewers alter the extent to which a site can be developed. Sewers also often alter the legal densities possible for a site. In many Tennessee communities, for example, land-use regulations governing densities allow sewered properties to be developed to higher densities. Therefore, for both physical and legal reasons sewers are often critical in determining the possible uses for land and designs for a development.

As developers typically increase their profits through more intensive use of land, the availability of sewer service is therefore a stimulus to build where sewer connections are possible (Bascom, Cooper, Howell, Makrides, and Rabe 1975; Burby, Kaiser, and Moreau 1988). This economic rationale was recognized by Coughlin.

Because the housebuilder will realize a higher return on his investment in land when he builds at higher densities, one can expect residential construction to occur in places where trunk sewers are available rather than in areas where the builder must install individual septic tanks or package sewage systems. (1963, 463)

Additionally, sewers offer the opportunity to more fully utilize a site as they enable development on areas of the site which would not accommodate conventional
septic systems. By allowing use of the entire property, sewers liberate development designs from site constraints imposed by septic systems. This greater flexibility offers additional incentive for development of sewered sites. Greater site utilization, coupled with enabling more intense use, can be the difference in the economic viability of a development. Properties without access to a sewer and where septic systems would not permit developing a site to its full potential would likely be skipped over.

An additional reason for the influence of sewers relates to the possibility of local promotion of development along sewers. Requiring a significant capital investment, sewers are designed to be in service for a long period of time and possess high fixed costs. Therefore, sewers are installed initially with substantial excess capacity (Tabors, Shapiro, and Rogers 1976; Urban Systems Research and Engineering, Inc. 1976). This excess capacity makes development within the sewered region possible and attractive. Having committed considerable funds to the creation of a sewer, a utility may deliberately attract new development to new sewer service areas in order to pay for construction expenses through user charges and connection fees.

**Sewer’s Resulting Effect**

A sewer’s capacity and its location influence the location, configuration, and timing of development. These two factors are paramount in determining the amount and pattern of development resulting from the construction of an interceptor or trunk sewer line. By being accessible to extensive areas of vacant land, particularly when held in large tracts, a sewer is more likely to induce low-density residential development. Sewers typically have their greatest impact on the construction of single-family home developments; projects likely to be built where large tracts of undeveloped land have
access to sewers (Bascom et al. 1975). The construction of a sewer will make such sites suitable for medium (two dwelling units per gross acre) and higher density development, where it otherwise would only be suitable for lower density development on septic systems (Urban Systems Research and Engineering, Inc. 1976).

Where sewers make large amounts of vacant land available for development, discontiguous development will often occur as developers search for the lowest priced sewered parcels available. Such development will leapfrog out along sewer lines. The rate of development will principally depend on demand for development and the availability of other vacant, sewered land in the area (Urban Systems Research and Engineering, Inc. 1976). However, where land prices are high, development of sewered parcels will likely occur at somewhat greater densities. This is necessary to achieve the number of units per acre necessary to justify an economic return.

However, if relatively large areas of vacant land are already provided access to sewers, the effects of a new sewer are diminished. Conversely, if the supply of land with easy access to sewers is limited then the construction of a new sewer can have a significant impact. In areas where sewers serve only limited amounts of vacant land then infilling and contiguous development is likely. However, if sewer extensions are not made or if they only serve limited amounts of developable land then leapfrogging of development may also result. As the price for sites serviceable by sewers increases it may become more profitable for the developer to go beyond sewered areas in search of cheaper land, even if he has to sacrifice densities and full utilization of his property because he has to use septic systems (Bascom et al. 1975). The developer willing to do this is unaffected by the location of the sewer lines and so will look for the cheapest land
available. Such land is likely to be distant from the existing urban boundary (Urban Systems Research and Engineering, Inc. 1976).

*The Nature of Public Regard for Sewers*

Provision of certain public facilities such as schools and highways benefit from a heightened degree of public attention; however, sewer policy is often unconsidered by the general public (Hirst and Hirst 1975; Kenney 1964). Wastewater treatment and disposal is generally “out of sight, out of mind” for much of the public. To the uninformed consumer, wastewater disposal is typically not directly considered, for “in seeking a suburban home, the previous city resident, conditioned by the absence of sewer problems in the city, may not even inquire about drainage, and the colors used in interior decoration may be a stronger selling point that a connection with a community sewer system” (Kenney 1964, 150). While the homebuyer who has owned or lived in a house served by a septic system may consider the nature of wastewater disposal for his potential home, this occurs—for those cases where it does occur—at the level of the individual homebuyer. However, such concerns over wastewater are not likely to be considered by the general public in making public policy decisions regarding the planning of infrastructure as it relates to land-use decisions. As such, public policy directing wastewater infrastructure is “particularly vulnerable to lapses of broad-based public attention, and during these lapses sewer policy can be utilized to achieve goals that only a small group may understand or desire” (Hirst and Hirst 1975). Due to the inherent relationship between wastewater infrastructure and land-use, the general public may pay a severe penalty for this neglect.
CONCLUSIONS

Decisions regarding the extension and construction of elements of physical infrastructure have been intricately involved in shaping development patterns in the later half of the twentieth century. As homebuyers and developers continually push development into previously nonurban areas, growth of cities is increasingly occurring beyond the conventional urban boundary. The requisite transportation facilities for such growth came about with the federal Interstate Highway System and expansions to state and federal highways. However, until recently the limited extent of sewers and the siting constraints to conventional septic systems exerted an influence over how and which areas could be developed. With the advent of alternative wastewater technologies used in decentralized wastewater systems, these constraints of wastewater disposal are diminishing. While the impacts of wastewater infrastructure on land development and urban expansion have received a measure of attention in the planning and geography literature, the focus of these studies has chiefly been concerned with central sewage systems. A comprehensive range of studies is largely unavailable regarding the impact of decentralized wastewater systems. Chapter Three continues with a review of the need for alternative means of wastewater disposal, a general review of the types of systems used in Tennessee, and the impacts or potential of these systems as described in the literature.
CHAPTER III

BEYOND CONVENTIONAL WASTEWATER INFRASTRUCTURE:

THE DECENTRALIZED APPROACH

The urban governments of Tennessee have long provided sewer systems that collected liquid waste from some of the urbanizing area. But those systems never kept up with urban growth in the fringe areas, where the septic tank or the privy was the rule, whether adequate or not. . . . Sanitation is expensive; opposition to good planning is understandable, but short-sighted. (Greene, Grubbs, and Hobday 1982, 317)

CONVENTIONAL WASTEWATER INFRASTRUCTURE

In 1959, Coulter, Bendixen, and Thomas asserted that, in the 1940’s, there was reason to believe that the major challenges of safely disposing of domestic wastewater had been solved. Reasoning that Americans primarily resided in distinctly urban or rural areas, Coulter, Bendixen, and Thomas maintained that one of the two common techniques for disposing of wastewater—either central sewers or individual household systems—was well suited for each setting. Their reasoning held that the urban densities permitting the use of sewers were well served by this infrastructure, while individual septic tanks and cesspools were suitable for the sparsely settled rural areas. Cohn made a similar observation, stating that septic tanks and cesspools were the “answer to the sewage disposal problem of detached homes and other structures during a period when the detached property was, indeed, detached . . . and gave promise of being neighborless for some time to come” (1966, 22). The general point both Coulter, Bendixen, and
Thomas (1959) and Cohn (1966) go on to make is that, while the two conventional means of disposal were generally suitable for the pre-World War II settlement pattern, they were less suited to service the dispersed development which emerged after the war.

Despite challenges to their use in nonurban areas, sewers and septic systems were the principal means of wastewater disposal in the latter half of the century. In 1970, 71 percent of American homes were served by a central sewer system while 24 percent were served by a septic tank or cesspool (Table 3.1). The remaining 4.3 percent of homes either were provided no wastewater service or were served by some other means. This “other means” category included homes using facilities such as a privy or a chemical toilet or homes where wastewater facilities were accessed in another building (U.S. Census 2004). While the number of American homes on septic tanks steadily increased between 1970 and 1990, the relative share of homes they served remained constant, at around 25 percent.

The share of sewered homes in the nation increased between 1970 and 1990, as fewer homes were served by “other means” of disposal, a category that declined from 4.3 percent to 1.1 percent. In 2005, the share of American homes served by sewers had increased to 79 percent while 21 percent were served by a septic tank, cesspool, or chemical toilet—as reported in the American Housing Survey. This survey, however, does not report data for each state.

While not quite three in four American homes (71%) were served by sewers in 1970, only slightly more than half (51%) of Tennessee homes were, reflecting the limited

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11 Statistics for means of wastewater disposal were not collected in the nation’s decennial census before 1970 or after 1990 (U.S. Census 2004). However, for those years when such information was collected, we can gain important insight into how the nation’s homes have been provided wastewater infrastructure.
### Table 3.1 Means of Sewage Disposal, 1970 – 1990

<table>
<thead>
<tr>
<th></th>
<th>United States</th>
<th></th>
<th>Tennessee</th>
<th></th>
<th></th>
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</thead>
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<tr>
<td></td>
<td>Public Sewer Housing Units</td>
<td>Septic Tank or Cesspool Housing Units</td>
<td>Other Means Housing Units</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number Percentage</td>
<td>Number Percentage</td>
<td>Number Percentage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1970</td>
<td>48,187,675 71.2</td>
<td>16,601,792 24.5</td>
<td>2,904,375 4.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1980</td>
<td>64,240,532 74.0</td>
<td>20,926,961 24.1</td>
<td>1,591,224 1.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1990</td>
<td>76,455,211 74.8</td>
<td>24,670,877 24.1</td>
<td>1,137,590 1.1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

extent of sewers in the state. As the state lagged behind the national average in sewer service, greater numbers of Tennessee homes used septic tanks and cesspools (35%) to dispose of wastewater. However, by 1990 the percentage of Tennessee homes served by sewers or septic tanks had increased as ever fewer homes were served by some other means. Homes included in this “other means” category dropped from 13 to 1.5 percent in the state over these three decades. Although the number of Tennesseans served by sewers increased over these decades, a considerable share of the state’s population remained in unsewered areas in 1990. At that time, nearly 39 percent of Tennessee homes were served by a septic tank, compared to only 24 percent nationally. This, along with the statistics presented in Chapter Two contrasting the availability of public water systems to sewers, indicates the limited extent of central sewer systems in Tennessee (Figure 2.2.)

Central Sewers

Central sewers are economical in large cities and densely developed areas where the costs of the collection system can be shared by numerous households and businesses. Thus, many local governments in Tennessee provide central sewer systems to collect liquid waste from their densely populated areas. Central sewers (often referred to as public, municipal, or “city” sewers—even if operated by a utility district or other entity of local government) collect water-borne waste through a collection network of large-

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12 While onsite disposal of wastewater has principally been through the use of a septic system, a number of onsite alternatives became available, including incinerators, lagoons, aerobic units, and small package plants. However, it is unclear from the description contained in the decennial censuses which category included these other systems. However, it may be reasonable to assume that systems using a septic tank and some alternative means of discharge, such as a low-pressure pipe system or a mound system, were included in the septic tank category. Regardless, the principal means of onsite disposal during the latter half of the twentieth century was the septic system. In a 1978 report, the U.S. EPA indicated that 85 percent of all onsite systems were septic systems.
diameter pipes. Central sewers have typically used gravity to move wastewater from its source to a treatment plant where wastewater is renovated and discharged. Force mains and lift (or pump) stations are employed where the slope of the land requires pressure to overcome the force of gravity. The installation expense associated with conventional gravity sewers along with operating and maintaining lift stations make the use of conventional sewers uneconomical in areas of low densities, for their financial return in relation to their cost becomes diluted. For many systems conventional gravity sewers can account for as much as 70 to 90 percent of the construction costs (U.S. GAO 1994). This has been a considerable limitation to the extension of sewered areas.

Conventional Onsite Disposal: Septic Systems

In use for over a century, septic systems have been the preferred means for onsite disposal in areas beyond the reach of sewers. The evolution of the modern septic tank can be traced to work conducted in France between 1860 and 1880 (Dunbar 1908). Early septic tanks proved a valuable preliminary step in treating sewage because they offered an economical means of disposing of sludge. For unlike sedimentation tanks, septic tanks better enabled the decomposition of solids contained in the wastewater, allowing their operation for extended periods without the removal of sludge (Melosi 2000). However, their use did not receive wider popularity until after 1895 when Donald Cameron applied the term “septic tank” to this tank design. One contemporary observed, “Since the septic tank idea gained favor, every designer of sewage tanks . . . has used the name septic for his tank, and apparently with good reason, for originally the word septic simply meant bacterial, just as the word anti-septic means anti-bacterial” (Melosi 2000). A United States patent was first issued for a septic tank design in 1899 (Crites and
Septic tanks experienced increased use during the post-World War II housing boom when home construction outpaced the extension of central sewers. At this time, septic systems were increasingly called upon to meet the wastewater needs of a rapidly decentralizing population (Coulter, Bendixen, and Thomas 1959; Lustig 1962; Melosi 2000; Otis and Anderson 1994). Coulter, Bendixen, and Thomas indicated that it seemed reasonable at the time to believe that the rampant expansion of suburban areas immediately following the war was merely the result of pent-up demand and that construction would eventually catch up and leave relatively stable communities, only with expanded outer boundaries (Coulter, Bendixen, and Thomas 1959). In most locations, this did not occur. However, this perspective may have contributed to the use of septic systems in these expanding areas because these systems were generally viewed as an impermanent solution. Coulter, Bendixen, and Thomas found that, in many rapidly expanding post-war communities, septic systems were used under improper site conditions with the assumption that central sewerage service would be extended into these areas when densities made such an investment practical (Coulter, Bendixen, and Thomas 1959). Cohn relates this mentality in the following statement: “They [septic tanks and cesspools] are, at best, a temporary expedient, pending the time when growing areas must be sewered and home disposal units will have to be scrapped in favor of public sewer connections” (1966, 24).

Whether officials truly intending to replace them or not, the septic system was used as an alternative to the challenge of extending sewers to the vast areas being developed after the war. In 1962, Lustig observed that “while it is conceivable that
postwar builders would have preferred to install sewers, neither they nor the municipal officials would face the high costs involved” (1962, 144). Extending trunk sewers to connect widely separated developments was generally too expensive for individual developers. Similarly, the rural or semi-rural municipalities inundated by the post-war suburban housing boom lacked the urban tradition or the tax base for the construction of sewage facilities. Thus, suburban developers “adopted those venerable servants of farm and estate: the cesspool and the septic tank” (Lustig 1962, 145).

Heightened use of septic systems placed unprecedented demands on these systems. In their review of the regulation of septic systems, Otis and Anderson observed, “Programs to regulate the installation and use of onsite wastewater systems were not adequate for the increased demand. Little was known about the relationship between design and performance, and system siting and design guidelines were vague” (1994). Inadequate rules and regulatory controls resulted in the installation of many systems where conditions were not suitable or where the design was inappropriate. Additionally, operation and maintenance was often left to the homeowner, endangering the function of even properly sited and installed systems. As a result, failures were common in the early years following the war (Otis and Anderson 1994).

Modern septic systems are comprised of three primary components: a septic tank, a subsurface wastewater infiltration system (SWIS), and the soil (Figure 3.1). When this system is sited, designed, installed, and maintained properly, it can successfully dispose of wastewater while protecting the public health and environment. Septic tanks, the first step in this treatment train, are typically concrete or fiberglass tanks positioned to receive wastewater directly from a home or other source. Septic tanks are important because they
remove “most of the settleable solids, greases, oils, and other floatable matter and anaerobic liquefaction of the retained organic solids” (U.S. EPA 2002, 3-25). The second component of the system is the subsurface wastewater infiltration system (SWIS). More common names are often applied, such as soil absorption system, leach field, drainfield, drainline, field lines, disposal field, or infiltration trench. The terms drainfield or field lines are generally used in this study. While septic systems had originally been used independently, improved system designs by the middle of the twentieth century began to incorporate field lines (U.S. EPA 2002, 1-2 to 1-3). The use of field lines is important because they distribute the effluent into the soil for further treatment and discharge.

While often not considered, the soil is the final element of the system.

The soil provides additional treatment as the effluent infiltrates and percolates through the soil where bacteria break down the remaining organic matter. So essential is infiltration through the soil that the U.S. Environmental Protection Agency (U.S. EPA) has stated that the “performance of conventional systems relies primarily on treatment of the wastewater effluent in the soil horizon(s) below the dispersal and infiltration

![Figure 3.1](image)

**Figure 3.1** Primary components of a conventional septic system.
components of the SWIS” (U.S. EPA 2002). The soil possibly is the least commonly considered and yet most important component of a septic system. Additionally, it is the element over which engineers have the least control. As the other two components are manufactured, their design can be improved to maximize their function. However, short of constructing a mound or similarly engineered fill system—both of which would increase the system’s cost—the physical nature of a site often determines a septic system’s viability. Due to physical constraints, septic systems can function successfully only on suitable sites. Septic systems perform best on relatively level, well-drained lots with deep, moderately permeable soil. As much as two-thirds of the land area in the United States has soil considered unsuited for dispersal of wastewater through a conventional SWIS. Even when installed in suitable soils, septic systems require enough area to ensure the flow of wastewater does not exceed the absorptive and treatment capacity of the soil (U.S. EPA 2002). Consequently, development reliant on a septic system is often limited by physical site constraints or health and land-use regulations designed to ensure acceptable densities are maintained. Physical, legal, and economic constraints have made wastewater disposal an impediment to development in many areas.

Although there are numerous variations to the design of technologies available for individual onsite disposal, septic systems have been favored for their simplicity, relative ease of use, and lower costs. Alternative or modified designs—such as a mound system, an individual aerobic treatment unit, or an activated-sludge package plant—are less attractive to a developer due to complexities associated with their use. One developer no longer directly involved as a homebuilder related this point, stating, “When I built houses, if I saw a lot with something like a French Drain I stayed away from it. . . . I
wanted 350 foot of drainline, a tank, and I am out of there. I wanted what was safest for me as a builder” (Source B25a 2007).

*Pre-engineered (Package) Wastewater Treatment Plants*

While many of the alternative designs previously mentioned would commonly serve a single house, one alternative system requires mention as it, similar to the decentralized wastewater systems, could serve a cluster of homes. This alternative is the pre-engineered package wastewater treatment plants which have been—and still are—used to treat wastewater from individual facilities, such as schools and small residential communities. Package plants typically employ an extended aeration activated-sludge process to treat wastewater, which is then typically discharged to a surface water body. Package plants are susceptible to variations in both the volume and composition of wastewater flows and, therefore, are generally less favored than sewers or septic systems (Crites and Tchobanoglous 1998; Lemasters 2007; Source D13b 2007; Source D20a 2007). Their limited use in Tennessee became evident from the few interviewees who mentioned package plants as a means of treating and disposing of wastewater. Indeed, planners and planning commissioners considered technologies that were available before decentralized systems as limited to central sewers and septic systems. Issues related to the operation and permitting of package plants are examined in Chapter Six as they relate to the regulatory influence of the Tennessee Department of Environment and Conservation.
DECENTRALIZED WASTEWATER SYSTEMS

The Need for Alternatives

In 1958, Coulter recognized decentralization as the major population trend likely to alter the urban form in the second half of the twentieth century (Coulter 1958). He further realized this decentralization would depend in many areas on septic systems for onsite wastewater disposal. Such dependence was foreseen as a factor likely to influence the shape and nature of future development patterns. This influence is due to the siting requirements for onsite systems to ensure the protection of the public health and environment. As more land is required to accommodate onsite disposal, land-use regulations—particularly in Tennessee—often restricted densities allowed in developments served by septic systems.

Coulter, Bendixen, and Thomas (1959) further recognized that the usefulness of septic systems was ultimately limited by the absorption characteristics of a site’s soil, which were seen as a considerable constraint because “at least half of the major soil groups in the county are relatively impervious” (905). In light of the physical constraints to septic systems and mounting demand for dispersed housing, they identified the need for what they called “workable schemes for individual houses built on impervious soil” (905). Coulter, Bendixen, and Thomas further recognized that a different type of pretreatment could render sewage suitable for disposal in soils that were unsuitable for septic tank effluent and foresaw the need for “radically different sewage disposal appliances” (905). Hoyt recognized the potential impact for such an alternative, stating that it “may cause a much wider dispersal of home areas” (1963, 301).

Indeed, both the development of an alternative and its potential to allow the wider
dispersal of home areas were being realized, largely as a result of both the pressure for growth in unsewered areas and the heightened environmental standards implemented around this same time. These changes encouraged the development of innovative wastewater technologies beginning in the 1960s and expanding during the 1970s and 1980s through to the present (Downing 1969; U.S. EPA 1997, 2005). A significant advancement in alternative technologies was the development in 1968 of the recirculating sand filter in Illinois by two sanitary engineers: R. E. Favreau and Michael Hines. Recognizing that the limiting characteristics of soil conditions in many areas prevented the proper functioning of drainfield systems and/or could require lots to be larger than desirable to accommodate onsite disposal, the authors recognized that “private developers and experts in the field of waste treatment have for years attempted to develop a system that would replace the septic tank-seepage field installation. Until recently, all such efforts have resulted in failure” (Hines and Favreau 1974, 130). In the early 1990s, Michael Hines introduced his recirculating sand filter technology into Tennessee. This was one of the factors that increased the use of decentralized systems in the state.

During these past few decades, research has expanded the technology’s ability to accommodate diverse site conditions although a key to the success of these systems remains their proper operation and maintenance (U.S. EPA 1997). In Tennessee decentralized wastewater systems are principally operated by either an investor-owned public utility or a governmental entity.

Indeed, the technologies and methods for alternative treatment, collection, and disposal are still being researched, refined, and improved and, thus, have produced a range of available technologies. Used together, these technologies comprise a
“decentralized wastewater system.” The U.S. EPA reported to Congress that decentralized systems offer a “cost-effective and long-term option for meeting public health and water quality goals, particularly” for small, suburban and rural areas (1997, i).

Decentralized Systems Defined

Conventionally, wastewater systems could be described as either central or onsite (septic). However, technological advancements have improved the ability to renovate wastewater near its source, and as such, wastewater systems no longer conform to this simple dichotomy. Systems for wastewater can today be broadly categorized as either centralized or decentralized. Centralized systems remain as they have been: a collection system, a central treatment plant, and the disposal/reuse of treated effluent removed from its source. Crites and Tchobanoglous have distinguished decentralized systems as systems that “collect, treat, and reuse or dispose of wastewater at or near its point of generation” (1998). According to this general definition, decentralized systems include both onsite systems, systems for individual homes and businesses, and cluster systems, systems collectively serving a group of two or more homes or businesses. In the 1997 report to Congress, the U.S. EPA defined terms related to decentralized systems as follows:

A decentralized system is an onsite or cluster wastewater system that is used to treat and dispose of relatively small volumes of wastewater, generally from individual or groups of dwellings and businesses that are located relatively close together. Onsite and cluster systems are also commonly used in combination.

An onsite system is a natural system or mechanical device used to collect, treat, and discharge or reclaim wastewater from an individual dwelling without the use of community-wide sewers or a centralized treatment facility. A conventional onsite
system includes a septic tank and a leach field. Other alternative types of onsite systems include at-grade systems, mound systems, sand filters and small aerobic units.

A **cluster system** is a wastewater collection and treatment system where two or more dwellings, but less than an entire community, are served. The wastewater from several homes may be pretreated onsite by individual septic tanks or package plants before being transported through low cost, alternative technology sewers to a treatment unit that is relatively small compared to centralized systems. (U.S. EPA 1997, 2)

As in the Crites and Tchobanoglous definition, the 1997 U.S. EPA definition of **decentralized system** includes both individual onsite systems and cluster systems. However, with the evolved use of decentralized systems, a third type can be identified. In its 2003 *Draft Handbook for Management of Onsite and Cluster (Decentralized) Wastewater Treatment Systems*, the U.S. EPA expanded the description of decentralized systems to distinguish flows from commercial, multifamily residential, institutional, and recreational facilities (Table 3.2). While this report did not name this third category, it was described as “systems designed to treat larger and sometimes more complex wastewater sources from commercial buildings (e.g., restaurants), apartments, or institutional or recreational facilities” (U.S. EPA 2003, 12). This research uses the term **Complex Onsite** to designate these facilities.

Centralized and decentralized wastewater systems occupy different positions on a size scale. Individual onsite systems are the smallest while a regional wastewater treatment plant serving central sewer systems for multiple municipalities are the largest (Figures 3.2 and 3.3). A cluster system is similar to a centralized system in that both collect and transport wastewater to a treatment facility. However, cluster systems
<table>
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<th>Type of system</th>
<th>Description</th>
<th>Considered in this research</th>
</tr>
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<tbody>
<tr>
<td>Individual onsite system</td>
<td>Systems that serve an individual residence and can range from conventional septic tank/drainfield systems to systems composed of complex mechanical treatment trains.</td>
<td>No</td>
</tr>
<tr>
<td>Complex onsite system</td>
<td>Systems designed to treat larger and sometimes more complex wastewater sources from commercial buildings (e.g., restaurants), apartments, or institutional or recreational facilities.</td>
<td>Yes</td>
</tr>
<tr>
<td>Cluster system</td>
<td>Wastewater collection and treatment systems that serve two or more dwellings or buildings, but less than an entire community, on a suitable site near the served structures.</td>
<td>Yes</td>
</tr>
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</table>

Source: Modified from Table 1-1. U.S. EPA 2003.
Figure 3.2  Comparison of centralized and decentralized approaches to wastewater service.

Note: STP indicates the treatment facility for either a central or cluster system.

Figure 3.3  The wastewater treatment system continuum.
are smaller as they handle wastewater from a “neighborhood or a few homes rather than a whole town or community” (U.S. GAO 1994, 15). Consequently, the “line” distinguishing cluster systems from centralized systems becomes vague at some point.

Distinction from a centralized system may be made in three ways:

**Onsite pretreatment:** Central systems connect directly with sources without pretreating wastewater prior to its entering the collection network. Decentralized systems place a septic tank (interceptor tank) or grinder pump at each source to remove or macerate settleable solids prior to the wastewater entering the collection system.

**Collection system:** Central systems generally use conventional gravity sewers while decentralized systems use alternative collection systems such as small-diameter pressurized pipes or small-diameter gravity pipes.

**Discharge method:** Central systems typically discharge refined wastewater to a surface water body. While decentralized systems can be designed to discharge treated effluent directly to surface waters, they generally discharge treated wastewater through a land application system (drip or spray irrigation).

With these distinctions, clarification of the 1997 U.S. EPA definitions is necessary to define accurately the decentralized systems considered in this research.

First, as this research does not involve onsite systems serving an individual home—regardless of technology employed—decentralized systems are defined to exclude individual residential systems. Decentralized systems are therefore either cluster systems or complex onsite systems. Second, they collect wastewater from septic tanks (interceptor tanks) and/or grinder pumps through an alternative collection system. Third, decentralized systems discharge refined wastewater through land application rather than directly to surface waters. Land application offers lower operating and monitoring costs.
and greater siting flexibility. A system that discharges refined wastewater directly to surface waters has monitoring demands and siting constraints akin to a central sewer treatment facility.

Components of a Decentralized Wastewater System

Decentralized systems are composed of four basic components: a means of pretreatment, a collection system, an advanced treatment unit, and a dispersal system (Figure 3.4). Septic tanks or interceptor tanks are the most common means of providing pretreatment. Septic tanks are attractive because they passively remove suspended solids, store and digest solids, and offer some attenuation of peak flows (U.S. EPA 2002). Grinder pumps may be used in place of a septic tank to macerate the influent sewage. Four decentralized systems in Tennessee were identified as using grinder pumps while 259 use septic tanks.

Following pretreatment, a nonconventional collection system conveys pretreated wastewater from its source to an advanced treatment unit. Depending on topography and the desired location of the advanced treatment unit, one of three types of collection systems may be used: a septic tank effluent gravity sewer (STEG), a septic tank effluent pump sewer (STEP), or a pressure sewer with grinder pumps (Crites and Tchobanoglous 1998). In a STEG system, septic tank effluent moves through small-diameter (1 to 2 inches) plastic pipes under the force of gravity while a STEP system uses pumps to move the screened septic tank effluent through the collection system. A pressure sewer with grinder pumps, likewise, moves pretreated wastewater under pressure.

These collection systems offer advantages over conventional gravity sewers. As solids have been removed or macerated, there is no threat of their settling out within the
Figure 3.4  Examples of decentralized wastewater system designs.

Schematics A, B, and C are examples of a decentralized wastewater system design for a residential development. Schematic D is an example of a design for system serving a school.

Source: Tennessee Department of Environment and Conservation permit file records 05074, 99037, 97013, and 00021.
collection system, thereby enabling installation at shallow depths. The use of lightweight plastic pipe buried at shallow depths permits installation where shallow soils, rolling terrain, and/or shallow depth to groundwater would be prohibitively expensive for conventional gravity collection. Thus, these systems can not only serve sites prohibitive to conventional collection but can also extend wastewater collection through areas with much lower densities (state operating permit [SOP] file 01006). As the collection system is watertight, alternative collection systems prohibit infiltration from groundwater, a common problem with conventional systems. Pressurized systems offer the flexibility to pump septic tank effluent uphill—offering flexibility in the location of the advanced treatment unit. This flexibility enables a more marketable design. Attractive lots on a lakeshore or with mountain views can be serviced by an advanced treatment unit located in a remote area. Depending on topography, a system may use both STEG and STEP collection lines.

Various technologies may be used to provide advanced treatment to pretreated wastewater. While numerous treatment technologies exist, two general types are predominant in Tennessee: aquatic systems and media filters (also known as packed bed filters) (Table 3.3). Media filters, of which there are many variations, are the most numerous; 81 percent (215 of 264) of decentralized systems in Tennessee use a media filter for advanced treatment. Media filters are distinguished by the type of media used (natural/mineral products versus manufactured/synthetic products) and whether the wastewater passes through the media once (known as single pass or intermittent) or is recirculated for multiple passes. Natural media filters consist of a lined, watertight
Table 3.3 Advanced Treatment Types in Tennessee: Decentralized Wastewater Systems, 2006

<table>
<thead>
<tr>
<th>Type</th>
<th>Intermittent / Recirculating</th>
<th>Systems Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aquatic Systems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constructed Wetlands</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lagoons</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lagoon ~ Aerated</td>
<td>2</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>Lagoon ~ Facultative</td>
<td>14</td>
<td>5.3%</td>
<td></td>
</tr>
<tr>
<td>Lagoon ~ Sheaffer System</td>
<td>3</td>
<td>1.1%</td>
<td></td>
</tr>
<tr>
<td><strong>Media Filter</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Sand Filter</td>
<td>Recirculating 140</td>
<td>53.0%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Sand Filter</td>
<td>Intermittent 3</td>
<td>1.1%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Sand Filter</td>
<td>Unspecified 17</td>
<td>6.4%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Gravel Filter</td>
<td>Recirculating 1</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Gravel Filter</td>
<td>Unspecified 1</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Unspecified Media Filter</td>
<td>Recirculating 10</td>
<td>3.8%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Synthetic filter</td>
<td>Recirculating 1</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Synthetic filter</td>
<td>Unspecified 2</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Packed bed filter</td>
<td>Recirculating 8</td>
<td>3.0%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ AdvanTex-Filter</td>
<td>Recirculating 20</td>
<td>7.6%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Advantex-Textile Filter</td>
<td>Recirculating 3</td>
<td>1.1%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Orenco geotextile fixed film</td>
<td>Unspecified 1</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>Media Filter ~ Biofilter</td>
<td>Recirculating 8</td>
<td>3.0%</td>
<td></td>
</tr>
<tr>
<td><strong>Other</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- ~ BioClere</td>
<td>Recirculating 7</td>
<td>2.7%</td>
<td></td>
</tr>
<tr>
<td>- ~ Fixed-Film Reactor</td>
<td>Unspecified 8</td>
<td>3.0%</td>
<td></td>
</tr>
<tr>
<td>- ~ Packed-bed trickling filter</td>
<td>Unspecified 2</td>
<td>0.8%</td>
<td></td>
</tr>
<tr>
<td>- ~ Trickling filter</td>
<td>Recirculating 7</td>
<td>2.7%</td>
<td></td>
</tr>
<tr>
<td>Unspecified ~ Unspecified Filter</td>
<td>Unspecified 1</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td>Dual System ~ Lagoon and Sand Filter</td>
<td>Recirculating 1</td>
<td>0.4%</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>264</td>
<td>100%</td>
</tr>
</tbody>
</table>

structure, which is filled with a uniformly sized medium. Used in 61 percent of systems, sand is the most commonly used medium (Figure 3.5). Wastewater is dosed onto the surface of the medium and is refined as it percolates downward to an underdrain system, where it is collected for further processing or discharged to a distribution system (U.S. EPA 2002).

Aquatic-based systems are also used to refine pretreated wastewater further. Aquatic systems have been defined as “large basins filled with wastewater undergoing some combination of physical, chemical, and/or biological treatment processes that render the wastewater more acceptable for discharge to the environment” (U.S. EPA 2002). Aquatic systems in Tennessee are of two general types: lagoons (sometimes referred to as waste stabilization ponds) and constructed wetlands. Lagoons are most common: 19 systems (7%) use lagoons (Table 3.3). Constructed wetlands are used in four decentralized systems.

Lagoons are generally classified as facultative or aerated. Aerated lagoons use mechanical aerators to introduce oxygen artificially into the lagoon, enhancing and intensifying the rate of biodegradation. Aerated lagoons generally have aerobic conditions throughout their depth and have smaller area requirements than facultative lagoons. Because facultative lagoons obtain oxygen by surface aeration from the atmosphere, they have an aerobic zone near the surface, a transitional aerobic and anaerobic middle zone, and anaerobic conditions in the deepest portion. Facultative

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13 The medium is designed to have a large amount of surface area, while allowing water and oxygen to pass easily. Microbial growth establishes itself on the medium surface. The BOD of the wastewater is reduced through exposure to these microorganisms (Loudon, et. al 2003). The medium also removes suspended solids and enables chemical adsorption to media surfaces.

14 Other lagoon systems exist in Tennessee. However, as they do not discharge through land application (drip or spray irrigation), they were neither contained in the SOP database nor considered as “decentralized systems” here.
lagoons combine sedimentation of particulates with biological degradation (U.S. EPA 1979; U.S. EPA 2002). Various engineering reports contained in the state operating permit (SOP) application files offered insight into advantages of one system over another. These sources indicated that facultative deep cell lagoons were often selected due to their very low operating costs. Additionally, these lagoons provide significant capacity and can be upgraded to allow for additional capacity rather inexpensively (SOP file 01028; SOP file 05057).

While lagoons have generally been distinguished as aerated or facultative, a hybrid lagoon system, the Sheaffer System, which uses mechanical aerators in a controlled manner to maximize the aerobic and anaerobic conditions, has recently been used in Tennessee. The Sheaffer System was identified as being used in three decentralized systems. An SOP application was made for a fourth Sheaffer System to service the Burrus Ridge Development in Robertson County (SOP file 05063); however, arrangements were later made with the City of White House to provide wastewater

Figure 3.5  Recirculating sand filter under construction, Rutherford County, Tennessee. Photograph by Kendrick J. Curtis, 2005.
service (Tennessee Regulatory Authority [TRA] Docket 06-00005).

Following advanced treatment, wastewater is conveyed to a dispersal system located on a suitable site, typically in close proximity to the advanced treatment unit. This dispersal system receives the pretreated wastewater, which it releases onto or under the land surface. Drip irrigation is the most common means of dispersal: 91 percent of systems use drip irrigation while twenty-two systems (8%) use spray irrigation. The dispersal means for three of the systems could not be determined. In the drip irrigation design, treated wastewater is dosed into the first few inches of the soil in an area reserved for the network of underground piping. This dedicated area is “sized to allow a dosing rate for the design flow that does not hydraulically overload the soil” (SOP file 04047).

The U.S. EPA asserts that, with proper management, alternative technologies can be installed in areas where the soil, bedrock, ground water levels, or lot sizes limit the use of conventional onsite systems (U.S. EPA 2002). Where shallow soils do not provide complete aerobic treatment, the additional treatment that the alternative system affords can substitute for lost soil treatment opportunities. Also, wastewater can be treated to a higher standard before being released in environmentally sensitive areas.

Conventionally, wastewater systems could be described as falling along a continuum from individual onsite systems to large regional treatment facilities. This is no longer the case as myriad technologies now exist—and will continue to be developed—to collectively treat wastewater near its source. However, to the current research the most important characteristic held in common by all the decentralized wastewater systems is that they offer “a means of substantially breaking the constraints on the conventional septic tank drainfield system” (Popper 1981, 9). This *de facto*
development constraint has often been an important shaper of land-use and development patterns. Because this influence rather than the technologies of these systems is the concern of this research, the technical side of these systems receives little attention or distinction in the remainder of this study.

RELATION TO PLANNING AND DEVELOPMENT

Within the planning and geography literature, little research has considered the specific influence that decentralized wastewater systems have on development. Only a few articles were identified which considered, or speculated on, this influence (Hanson and Jacobs 1989; Jacobs and Hanson 1989; LaGro 1996, 1998; Nelson and Dueker 1989; Popper 1981). However, a number of government reports, principally by the U.S. EPA, have evaluated these technologies and issues related to their use (U.S. EPA 1987, 1997, 2002; U.S. GAO 1994; U.S. Department of Agriculture 1998). Similarly, considerable research has been conducted with regard to the engineering of these systems (Crites and Tchobanoglous 1998). As decentralized wastewater systems have become more common in many parts of the country—a fact no doubt related to improved technologies and promotion—they have prompted articles in newspapers and magazines for the general public. Likewise, a growing number of articles and publications for professionals interested in wastewater issues are also available from entities such as the National Small Flows Clearinghouse whose publications Small Flows and Pipeline feature news, technical, and educational articles. While material from these sources served to inform this and later chapters, the following review is limited to the few studies most relevant to the present research, studies considering the influence of decentralized systems on
patterns of land development.

*Early Articles: Theoretical and Empirical*

An article by Frank Popper in 1981 was the earliest attempt to predict the influence of decentralized wastewater systems on land development. ¹⁵ Popper’s article presented a layman’s review of the technology existing at that time, a summary of the policies influencing their use, and a prediction of their possible impact. However, due to the technology’s then limited use, Popper was prevented from empirically studying this impact. He did, nonetheless, identify three possible outcomes for the technology mentioned earlier. The first possibility—no effect—would result if the technologies were never widely used due to their high costs, novelty, or inapplicability. The second possible effect was an accelerated dispersion of growth. Finally, Popper foresaw an outcome where regulations would guide the technology to produce desirable outcomes. In Popper’s estimation, the determining factor would be the degree of engagement in land-use planning and regulation by state and local governments.

In a 1989 article, Nelson and Dueker considered the potential that advances in onsite water and wastewater technologies could have on exurbanization. However, like Popper, they faced data limitations. Thus, their article was largely theoretical and speculative. Believing that innovation was likely to further reduce barriers to use due to cost, they predicted that onsite technologies would increasingly enable households to

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¹⁵ It should be noted that, while the term *decentralized wastewater system* is not found in the early literature, the land use issues identified in these studies are the same as those resulting from decentralized wastewater systems considered in this research. Casting a wide net, Popper (1981) refers to them as “alternative” small-scale wastewater treatment systems. Hanson and Jacobs (1989), Jacobs and Hanson (1989), and Nelson and Dueker (1989) refer to wastewater systems as “onsite” or “private sewage systems” and include both conventional and alternative designs. Nevertheless, the present study uses the term *decentralized* wherever appropriate in order to be consistent. However, to be true to the earlier studies, this use is not always possible, so the terms they use are, therefore, used where appropriate.
further sever the “urban umbilical cord” (Nelson and Dueker 1989). They further
recognized that these technologies serve a prevalent urban-development philosophy
which prefers new construction to rehabilitation or reuse of buildings, highways to public
transit, conversion of undeveloped land to urban uses, construction of single-family
owner occupied homes to multi-family rental housing, up-and-coming areas to depressed
ones, and new locations over old ones (Nelson and Dueker 1989).

Despite the importance of advanced onsite wastewater technologies, Nelson and
Dueker cited only two studies considering land-use implications for these technologies.¹⁶
These articles, also published in 1989, reflect work by Hanson and Jacobs in Wisconsin
and represent the earliest identified analysis of the land-use impacts of various private
sewage systems. The authors state that a “similar range of studies is not available on the
impacts of private sewage systems, rural infrastructure, and rural land use” (Hanson and
Jacobs 1989, 170). The authors considered the impact of three types of individual
systems: conventional septic systems, mound systems, and holding tanks. While these
systems have neither the scale nor the siting advantages of the decentralized systems
currently used in Tennessee, their general findings are relevant and informative.

Hanson and Jacobs’ research was conducted in response to an interim program by
the State of Wisconsin to permit the use of onsite mound-sewage systems. This program
became controversial because opponents asserted mound systems would lead to an
increase in rural development, particularly for sites previously undevelopable due to
constraints to septic systems. Opponents feared the systems would accelerate the
conversion of agricultural land and facilitate outmigration from urban areas. Opponents

¹⁶ While Nelson and Dueker (1989) does not reference Popper’s 1981 article, Hanson and Jacobs did.
also suggested that development enabled by mound systems would result in greater
demand for public services in rural areas while depleting urban areas of citizens to pay
for existing urban infrastructure. Such claims were countered by advocates asserting that
mound systems would lead to more compact land-use patterns by permitting development
of sites previously skipped. Additionally, mound systems were claimed to alleviate
development pressure on prime agricultural lands because they would enable
development of more marginal land. Proponents further countered that mound systems
would reduce public investment in infrastructure as they would eliminate the need for
more expensive, urban-based sewage systems (Hanson and Jacobs 1989; Jacobs and
Hanson 1989).

To evaluate the outcome produced by allowing the use of mound systems, Hanson
and Jacobs compared the use of mound systems to both conventional septic systems and
watertight holding tanks. Each system served a single residence. They also faced
data limitations as only two percent of the systems they considered were mound systems
and three percent were pump-and-haul holding tanks. The remaining 95 percent were
conventional septic systems (Jacobs and Hanson 1989). Nevertheless, their analysis
revealed that very few private sewage systems—of any type—were being used for sites
adjacent to or within one-quarter mile of contiguous development in urbanized areas.
Rather, all systems were used principally to enable scattered development in rural areas.
While all systems were found to facilitate dispersed development, mound systems were
found to play an important role because they enabled development of previously
constrained sites. Because holding tanks were prohibited at that time in rural subdivision

17 The watertight holding tanks hold sewage until it is pumped and hauled to a treatment facility
developments and not all sites would accommodate septic systems, mound systems were—for certain sites—the only alternative available. Thus, without mound systems, development of these rural subdivisions would probably not have occurred at that time.

Hanson and Jacob asserted that public policy regarding private sewage systems was not concerned with broader land-use issues. As such, these policies were seen to be ill suited to mitigating the technology’s impact on settlement patterns. The authors concluded that “[a]s long as a particular site, in its soil, slope, and water-table conditions, can safely accommodate a private sewage system when it is working properly, the policy structure . . . the United States in general will allow system installation” (Hanson and Jacobs 1989, 178).

Hanson and Jacobs (1989) maintained that land-use policies are best suited to guide development enabled by these technologies. However, they observed little concern among local or state officials for the impact of these systems to land use. Consequently, there was no movement in Wisconsin at that time to institute a coordinated planning response. However, they did recognize an emerging consensus among these officials to protect groundwater. The authors speculated that this concern would result in stricter environmental regulation, stating that “[i]f rural development continues to be accepted and popular, public policy makers will increasingly turn to site design to protect the groundwater resource” (Hanson and Jacobs 1989, 178). This observation reflects compartmentalized thinking by policy makers. Nevertheless, the authors concluded that the likely determinant of development enabled by advanced wastewater technologies will not be land-use and environmental-planning policies but rather the interplay between demand forces, infrastructure provision, regulations related to private sewerage systems,
and the growing costs associated with rural and suburban development—to both individuals and the general public. They felt it was unclear whether these drivers will produce development patterns in the best interest of the community (Hanson and Jacobs 1989).

Wisconsin was also the site of similar work by LaGro in the 1990s (1996, 1998). LaGro’s 1996 article reiterated the theoretical implications of such systems for growth management. His 1998 article presented an empirical evaluation of the relationship between private sewerage systems and four landscape attributes: pre-development land use, site suitability for farming, density of surrounding housing development, and distance to the nearest city or village. The types of systems considered were conventional septic systems, mound systems, and holding tanks. The goal of this research was to determine differences in the development pattern supported by each system and provide insight into whether or not land “skipped over” due to site constraints to septic systems was being developed on mounds systems, systems that LaGro referred to as “alternative systems.” The article’s second objective was to describe the morphology and landscape context of supported developments. LaGro’s analysis revealed that the different types of private sewage systems were located in different physiographic settings. Septic systems and two-thirds of mound systems were found in the areas with better drained soils. Nearly all of the holding tanks and a third of the mound systems were located in poorly drained areas where the use of septic systems was more difficult. However, each type system was found to facilitate dispersed residential development, and holding tanks and mound systems were not found to promote in-fill development. LaGro (1998) concluded that newer generations of alternative wastewater
technologies were likely to allow development to occur on the most limited sites for onsite disposal of wastewater.

Each of the previous articles varies slightly from the others in its scope and findings. However, they all recognized the potential for advancements in wastewater technology to render land-use planning regulations ineffective. Both sets of empirical work found evidence that advanced wastewater systems were allowing dispersed development to occur on sites unsuitable to septic systems. Thus, while recognizing the importance of local land-use controls these authors foresaw the potential weakness of these controls to ensure the technologies were used in the best interest of the public.

A Different Perspective

A number of more recent studies have presented a different perspective. In these articles, the authors assert that through technological advancement, decentralized wastewater systems offer a more flexible tool for integrating wastewater treatment with land-use planning (Hoover 2001; Shiffman, Johns, Banathy 2003; Pinkham, Magliaro, and Kinsley 2004). Decentralized systems are promoted as aiding communities in achieving their desired development patterns because they remove undesirable influences that conventional wastewater can have on growth, such as promoting growth to occur in a linear and leapfrog manner along trunk sewers or requiring low densities to site septic systems.

A case for linking management of decentralized wastewater systems and land-use planning was made by Hoover at the American Planning Association’s 2001 national conference. Hoover begins with two generally held premises. First, although wastewater treatment is a critical factor in land development, planners have historically had very little
to do with determining the timing or location of this infrastructure. Second, in unsewered areas, planners have often relied on the “ability of land to support septic systems as a de facto method of development regulation” (Hoover 2001, 1). However, she recognizes that improvements to wastewater technologies are making it increasingly difficult for local governments to allow constraints to wastewater disposal to regulate development. Hoover advocates the development of a decentralized wastewater management plan to manage all wastewater systems centrally, regardless of type, location, ownership, or configuration. This management plan would be linked to conventional planning tools. Such regulation and management would allow decentralized systems to support development in desirable locations. She contrasts the decentralized management plan, which she contends are growth neutral, to conventional sewers and urges integrating decentralized wastewater systems with smart growth-planning solutions (Hoover 2001).

In 2003, a report was published by the California Wastewater Training and Research Center to familiarize planners, environmental health specialists, and others with “enhanced on-site wastewater systems.” The study sought to explain how these systems could play a role in preserving agricultural land in California’s Central Valley. Toward this goal, the authors reported on a survey they conducted of planning directors and environmental health directors in 58 counties. The results of the survey indicate that septic systems were believed to exert an influence over local land-use planning in these counties. Further, the survey indicated that only limited consideration had been given to enhanced onsite wastewater technology in the planning process. The findings further indicated that these systems were not used in new development but to replace failed conventional systems. Like Popper (1981), the authors contended that such systems
could enable communities to direct growth away from prime habitat and farmland.

Framing this argument in the context of “smart growth” planning objectives, Shiffman, Johns, Banathy propose the integration of enhanced wastewater technologies with “smart growth” principles to allow communities to direct growth away from prime habitat and farmland and toward areas with less natural resource value which might not be conducive to septic systems (2003). Like Hoover, the authors asserted that decentralized systems present a tool to allow development in more locations, thereby enhancing the effectiveness of smart-growth planning initiatives. They contrasted this approach to the artificial constraints imposed by septic systems that “not only caused subdivisions to be placed on working farmland, but [have] caused them to range over a larger area than would be the case if the code allowed technology suited to the site” (Shiffman, Johns, Banathy 2003, 28). Cluster residential developments are cited as a planning design that is not possible in certain areas on septic systems but is enabled through the use of alternative wastewater technologies. The authors contended that cluster designs could provide some measure of economic relief to farmers because they allow economic gain from the development of a limited portion—particularly the more marginal areas—of their farms while preserving most of the land for agriculture.

In 2004, the Rocky Mountain Institute published two studies concerning decentralized systems. The first presented a “catalog” of the economic advantages and disadvantages of decentralized systems relative to conventional systems (Hamilton, Pinkham, Hurley, and Watkins 2004). It is important to note that, as recently as 2004, the authors of this report found that in many cases empirical data were lacking. Thus, they relied on “articulating the apparent logic” as applied to the various topics. This report
considers a wide variety of topics ranging from financial planning and financial risk associated with these systems to their management and integration with other infrastructure. Of particular importance to the present study is the consideration given to community impacts, in which the authors reviewed the growth-related advantages and disadvantages of both central sewer systems and decentralized systems. Their review drew largely from sources already discussed, such as Hoover (2001), Hanson and Jacobs (1989), and Jacobs and Hanson (1989), as well as sources referenced in Chapter Two.

The second study published in 2004 by the Rocky Mountain Institute considered seven topics that the authors assert had received little attention in the literature. One topic was the impact of wastewater system choices on community growth, development, and autonomy.18 The authors asserted that, while wastewater systems direct growth, it is not well understood how public concern over these matters influence infrastructure decisions. This study presented case studies to illustrate how certain communities grappled with wastewater infrastructure decisions. It recommended that a community develop a widely supported vision of its future and implement this vision through local land-use regulations—such as zoning and subdivision regulations. Its recommendation recognized that decentralized wastewater systems are an increasingly important aspect of realizing this vision (Pinkham, Magliaro, and Kinsley 2004).

In response to the growing interest in and importance of advancements in onsite wastewater technologies, the American Planning Association published a Planning Advisory Service Report in 2006, which addressed issues related to decentralized systems (Feiden and Winkler 2006). This report was largely concerned with explaining the

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18 Others topics included the hydrologic impact of wastewater systems and how communities evaluate the performance and reliability of wastewater systems.
adverse health effects of water contamination that can result from an improperly functioning decentralized system. Additionally, the report looked at the planners’ regulatory and management role concerning the siting and evaluation of decentralized systems. While the purpose of this report was not to evaluate the impacts of decentralized systems on land-use and settlement patterns, it signifies the growing importance of these technologies.

Articles in both groups recognize the importance of local land-use regulation in guiding development enabled by decentralized wastewater systems. However, the two groups differ somewhat in their perspectives on whether or not land-use regulations will produce a development pattern in the best interest of the community. The possible outcomes are repeated throughout this literature, yet it remains ill understood how decisions regarding wastewater systems are made and how these decisions, in turn, impact a community experiencing growth using decentralized systems.
CHAPTER IV

GROWTH OF DECENTRALIZED WASTEWATER SYSTEMS IN TENNESSEE

As Tennessee has experienced a considerable increase in the use of decentralized wastewater systems during the last decade, the state offers an ideal setting to answer the questions posed by this research. Through December 2006, 316 state operating permit applications had been made to the Tennessee Department of Environment and Conservation’s Division of Water Pollution Control for the operation of a decentralized system. Of the 316 applications, 264 had been permitted or were under review. All but eleven of the 264 applications had been submitted since 1996. The 264 systems permitted or under review had the potential to support an estimated 75,186 residents in 25,062 residential units. While this is still a rather small number of people and residential units, it is large enough to observe patterns and outcomes. Furthermore, this pattern points toward a larger and still developing trend. Now is the time to evaluate the outcomes resulting from the use of these systems because there is still great potential to set policies and regulations to govern their use.

This chapter begins with a review of how decentralized wastewater systems first came to be used in the state. It then examines the statewide distribution of systems and offers a description of the land uses and populations they serve. This chapter concludes with an appraisal of how development supported by decentralized systems conforms to the growth plans.

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19 Two applications had been denied, and 53 applications were classified as inactive.
20 See Appendix II for detail on the calculation of residential units and residents.
INTRODUCTION OF DECENTRALIZED SYSTEMS IN TENNESSEE

While wastewater technology made great strides in the 1970s and 1980s, it was not until the late 1990s that decentralized systems experienced a true surge of use in Tennessee (Table 4.1). Per the Department of Environment and Conservation’s permit application database, the earliest permit for a decentralized system—as defined in this research—was applied for in 1989.21 This permit was for a constructed wetland and spray irrigation system designed to service a convenience store at a rural interstate interchange in Jefferson County. The first application proposing the use of a recirculating sand filter discharging through spray irrigation was in 1990. A permit for a recirculating sand filter discharging through drip irrigation was not officially applied for until 1991. Correspondence between Steve Fishel in the Department of Environment and Conservation’s Division of Water Pollution Control and the applicant for this system reflects the unfamiliarity and novelty of media filters in Tennessee at that time:

The rock filter/sand filter recycle system is a new concept to this state. After discussing this concept with personnel from other demonstration sites . . . , it seems appropriate. Thus it can be approved based on “design by analogy” (Fishel 1990).

The early 1990s saw only minimal use of decentralized systems in the state. In 1996, six applications were made (Figure 1.1 and Table 4.1). Ten systems were applied for in 1998, and the number of systems grew steadily thereafter, with a dip in 2001. In

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21 A U.S. EPA report to the U.S. Congress from 1989 offers insight into the use of nonconventional systems in Tennessee until that time. This report offered a summary of technologies funded through the U.S. EPA’s Innovative and Alternative Technology Program (I/A), a program terminated after 1990 (U.S. EPA 1989, 1). Innovative technologies were considered to be cutting edge and not fully proven, while alternative technologies were seen as relatively more verified (U.S. EPA 1994). While the Innovative and Alternative Technology Program did fund 23 alternative collection systems, it funded no systems using sand filters in Tennessee. That so few systems received I/A funds reflects the limited use of nonconventional technology in Tennessee through 1989. This limited use of nonconventional technologies corresponds to dates of the earliest state operating permit (SOP) applications for decentralized systems in Tennessee.
<table>
<thead>
<tr>
<th>Year</th>
<th>Systems*</th>
<th>Residential Unit Capacity#</th>
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</tr>
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<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percentage</td>
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<tr>
<td>1989</td>
<td>1</td>
<td>0.4%</td>
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</tr>
<tr>
<td>1990</td>
<td>2</td>
<td>0.8%</td>
<td>14</td>
</tr>
<tr>
<td>1991</td>
<td>2</td>
<td>0.8%</td>
<td>67</td>
</tr>
<tr>
<td>1992</td>
<td>1</td>
<td>0.4%</td>
<td>143</td>
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<td>1994</td>
<td>3</td>
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<td>457</td>
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<td>1995</td>
<td>2</td>
<td>0.8%</td>
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<td>6</td>
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<td>9</td>
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<td>1998</td>
<td>11</td>
<td>4.2%</td>
<td>339</td>
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<td>10</td>
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<td>29</td>
<td>10.9%</td>
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<tr>
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<td>25</td>
<td>9.5%</td>
<td>2,508</td>
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<tr>
<td>2004†</td>
<td>33</td>
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<tr>
<td>2005</td>
<td>40</td>
<td>15.2%</td>
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<tr>
<td>2006†</td>
<td>44</td>
<td>16.7%</td>
<td>6,896</td>
</tr>
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</table>

Total: 264 systems, 100% of systems, 25,062 residential units, 75,186 possible residential population.

* Systems which are permitted or under review by the Department of Environment and Conservation.
# Permits for which no dwelling unit count was obtainable: Dwelling units were calculated by dividing the approved (or applied for) flow rate by 300.
~ Possible residential population is based on an assumed occupancy rate of three persons per unit.
† A permit was modified to enable an expansion to an existing system. Since a new permit was not applied for, a record was created to reflect this expansion.

December of 2006, there were 264 decentralized systems permitted or under review by Water Pollution Control (Tennessee Department of Environment and Conservation. 2006).

**Period of Expanded Use: 1996 - 2006**

The confluence of several factors brought about the use of decentralized systems in Tennessee. Each factor encouraged the use of these systems in its own way. The most basic factor driving their use was the mounting pressure for development in areas where central sewers were not economically available and where septic systems were unsuitable or of limited use. In many parts of Tennessee, the initial subdivisions developed in nonurban areas were commonly located on farmland where soils were well suited to septic systems (Source D13b 2007). By the late 1980s and into the 1990s, the supply of available farmland suited to septic systems started to dwindle in certain parts of the state. This situation was particularly true for those areas where growth pressures were most pronounced. Additionally, environmental regulations were tightened in the 1980s to restrict the use of blasting to install septic systems. A longtime planning commissioner and developer in Rutherford County related this change:

> When I was building homes, the state said, “Anywhere you can physically get a septic tank, you put it in.” Well, you can take dynamite and physically get one anywhere you want to. . . . A lot a people put them in like that. They blasted the rock. And the reason they work [is] because that rock split, when they blasted it, and the [water] did seep down. It went somewhere. . . . But it may have come up into somebody else’s water supply or something. . . . With that, you know, you just got you a jackhammer and some dynamite and you put a septic tank in.

*[Curtis: So when [the Department of Environment and Conservation] changed that, this sort of put the clamps on what you could do with a septic system?]*
You bet it did. That is when everybody started to having to find property that had good soil. (Source B26b 2007)

A developer in Wilson County explained:

I guess the first thing was [the Department of Environment and Conservation] put kind of a moratorium on the blastings. You couldn't blast the rock for [septic] tank holes, field lines, and so forth. And so, that limited to a great extent the land that could be used [for development]. So, the only land that was useable [was] the best soils, the tillable land, you know around there, and that [land] became kind of a premium. (Source B25c 2007)

As many of the properties readily suited to the use of septic systems were already developed and as environmental restrictions limited the ability to remove rock in order to install septic systems, developers and engineers were forced to consider properties more marginal in their innate ability to accommodate conventional means of onsite disposal. This had two consequences. For one, developers began to propose developments of odd configurations where lots were oriented according to what the soils allowed. These lots affected the overall design of subdivisions—how roads were laid out, the size of the lots, and the positioning of houses. This reality was increasingly commonplace in much of Middle Tennessee. Rutherford County’s 1995 Strategic Plan reported reviewing an increasing number of subdivision plats that had unusually shaped lots designed to coincide with the location of soils suitable to septic systems (Rutherford County 1995).

A second outcome of the diminishing supply of land suitable to septic systems was the prompting of developers and engineers to find alternative means of wastewater disposal.
The Pickney Brothers and Michael Hines

A group of brothers working in the onsite wastewater construction business in Middle Tennessee in the late 1980s recognized this growing need for alternative means of disposing of wastewater. Through their engineering background and work with wastewater systems, they knew a combination of alternative technologies that made wastewater service possible for individual subdivisions, small communities, and individual sites. The increased use of decentralized wastewater systems in the state is largely attributable to the actions of these brothers. The Pickneys became involved with Michael Hines, who was also instrumental in the introduction of the systems to Tennessee.\(^{22}\)

Three of the Pickney brothers had been involved in the 1980s and into the 1990s with individual home wastewater systems that used low pressure pipe systems. Such systems possess advantages over dispersal through a conventional drain field but offer no additional treatment, as do decentralized systems. Recognizing the shortcomings of conventional onsite technologies, the Pickneys approached the Department of Environment and Conservation in the early 1990s about the opportunity to use alternative wastewater systems. By this time, Michael Hines had been living in the Alabama and Tennessee area for several years and had raised certain people’s awareness of alternative

\(^{22}\) Hines was mentioned in Chapter Three as a pioneer in the development of recirculating sand filter. Hines had since moved to Alabama and then Tennessee, where he was employed by the Tennessee Valley Authority. When Hines retired from TVA, he founded Southeast Environmental Engineering, a firm providing engineering services related to onsite wastewater systems. The nature of the agreement between Hines and the Pickneys is not relevant to the current study other than to relate that they function in a partnership whereby Tennessee Wastewater Systems is the entity to which service territories are granted. However, functionally, Hines is largely responsible for Tennessee Wastewater Systems’ operations in East Tennessee. In testimony before the TRA, Pickney explained that day-to-day operations for Tennessee Wastewater Systems are carried out by subcontractors such as Southeast Environmental Engineering.
technologies, particularly the recirculating sand filter. Hines related that

I came to the [Tennessee] Valley in 1980, to TVA. I was down in Muscle Shoals. I brought with me this [recirculating sand filter technology] because we had been doing this since the 60’s in Illinois. It was the salvation for rural areas that did not have dirt. And it got used everywhere in the world ultimately. But I brought that technology to Alabama and Tennessee when I came to TVA. I met with state engineers in both states. And there were two guys [Steve Fishel and Sam Weiland] in particular in Tennessee that jumped all over it. (Hines 2007)

In the late 1980s, Steve Fishel in the Department of Environment and Conservation’s Division of Water Pollution Control became interested in alternative wastewater technologies and traveled to Oregon to inspect sites where they had been used (Weiland 2007). When the Pickneys approached the Department of Environment and Conservation in the early 1990s, Fishel and Weiland encouraged them to examine what was being done with watertight effluent collection systems, drip and gravel filter treatment, and sub-surface dispersal in other parts of the country, particularly Oregon. The Pickneys became convinced of the opportunity to use alternative technologies in Tennessee (Pickney 2007; Stiles 2004). However, the people experienced with these systems in Oregon had cautioned the Pickneys that, while the alternative technologies were sound, their successful operation depended on the availability of an entity to operate, maintain, and monitor the systems. The brothers returned to Tennessee recognizing the need to establish a public utility that could assume these responsibilities (Pickney 2007). Under Tennessee state law, investor-owned public utilities—such as the Pickneys desired to operate—are regulated by the Tennessee Regulatory Authority.23

23 At the time Tennessee On-Site was created the corporation fell under the purview of the Tennessee Public Service Commission. The TRA’s regulation and influence is examined in detail in Chapter Five.
Although the Pickneys could have operated under contract to various entities that were the actual owners and permittees of the systems (and in some cases they still have) this was not the model they desired. Charles Pickney noted:

> Yes [the brothers] certainly could have [operated the systems under a contract with the owner of the system].

> [Curtis: But that wasn’t the model?]

> We had a very strong, I guess, opinion about how we wanted to run this business. We wanted to have total control over all the specs, all the maintenance. We did not want homeowners associations or anybody telling us how to build the system, how to operate it, whatever. We wanted to do it in a first class manner with no restraints, politically, or any other way. That way we had the freedom to go out and run it right. (Pickney 2007)

In the early 1990’s the Pickneys started the effort to become a public sewer utility, and in March of 1993, three of the Pickney brothers formed On-Site Systems, Inc. In April of 1994, On-Site Systems petitioned the Tennessee Regulatory Authority for their original Certificate of Convenience and Necessity to provide service to Oakwood Subdivision in Maury County (TRA Docket 99-00393). Since that time, the company has been awarded additional service territories across the state. In 2003, On-Site Systems became Tennessee Wastewater Systems, Inc.

**Overcoming Obstacles to Introduction**

Although more than twenty years had passed since Hines and others had first used the recirculating sand filter in Illinois, similar technology had not been widely used in

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24 Charles Pickney, the fourth brother, became a stockholder in 1994 and was elected president of the corporation at that time.

25 This is the name that is generally used throughout this dissertation.
Tennessee. It took the overt effort of the Pickneys and Hines to demonstrate the successful operation of these systems locally. In the early 1990s, there was simply no acceptance of anything like these systems in the state and the lack of local experience presented an obstacle. It became necessary to “get somebody to try it, get the authorities to approve it, get one built, [and] get customers. It was a lot of effort” (Pickney 2007). Through persistence, the Pickneys in time overcame obstacles to the use of these systems.

Almost in tandem with establishing the company and convincing the Tennessee Regulatory Authority and the Department of Environment and Conservation, the Pickneys had to find a developer willing to try the technology. As the systems had yet to be truly tested in Tennessee, land developers were among those in need of convincing. Charles Pickney explained that many developers were unwilling to talk to the brothers, fearful this was a scam (2007). Ultimately, they found a developer in Maury County willing to try the system. Next, the Pickneys had to assuage the concerns of the local planning commission. Charles Pickney’s recounting of this effort offers insight into the concerns held by this local body:

[The County Planning Commission] said, “If this thing does not work where is that going to leave us? . . . It’s not just going to be one house with a problem, it is going to be 50 you know, and our county does not want that.” And so they were concerned. . . . And we really had a major selling job to do with each one of the planning commission members. And we spent the better part of a year and a half educating them. (Pickney 2007)

Pickney recounted that one of the members of the commission, who took the time to examine what they were proposing, ultimately became convinced of the technology’s viability. His belief in the Pickneys and the technology proved instrumental in the
Planning commission in Maury County approving the development (Pickney 2007).

The Pickney’s persistence and a few fortunate breaks—having Weiland and Fishel within the Division of Water Pollution Control supportive of this concept, the ability to secure service territories from the TRA, the willingness of a developer and a planning commissioner to believe in the technology enough to try the system—resulted in the proving of this new technology. Underlying all of it was the basic setting of rising market demand in nonurban areas and an environmental condition restrictive to the use of other disposal means. The establishment of a few systems allowed for local evidence of their success, but building this evidence took time. Pickney stated:

Well, we [created the corporation] in 1993, and you do not really see the chart [Figure 1.1] starting to take off here until really after ’98, ’99. It was really ’98 when we got our first systems up and running; then it started to take off. The market acceptability is what started driving this (Pickney 2007).

SPATIAL DISTRIBUTION AND INFLUENCING FACTORS

During the period of introduction and expanding use of decentralized systems, Tennessee experienced considerable population growth. In the 1990s, Tennessee grew a robust 17 percent, outpacing the nation’s growth rate of 13 percent (U.S. Census 1990, 2000). This population growth was principally the result of in-migration. Of the 812,098 residents added during the 1990s, 86 percent migrated to Tennessee (English 2003). Between 2000 and 2005, Tennessee’s population has continued to grow, although at a rate slightly slower than the national average. Tennessee’s population grew by 4.8 percent between 2000 and 2005, while the nation grew by 5.3 percent (U.S. Census 2006).

The population growth that occurred between 1990 and 2006 was unevenly
distributed within the state. Most counties experienced more modest absolute increases: 31 counties added fewer than 3,000 people each. The top ten counties for nominal population growth accounted for 52 percent of the state’s absolute growth; all were located in metropolitan areas. Growth principally occurred in the outermost counties of metropolitan areas, where 70 percent of the 1.086 million new residents located. The highest growth rates occurred in the Nashville-Davidson Metropolitan Area (MA), where Williamson and Rutherford counties experienced growth rates of 90 and 84 percent respectively. Wilson (49%), Robertson (46%), and Chetham (42%) counties also experienced considerable gains between 1990 and 2005. Periphery counties in other metropolitan areas also experienced considerable growth, including Sevier (55%) and Blount (34%) in the Knoxville MA and Tipton (49%) and Fayette (35%) in the Memphis MA (Tennessee Advisory Commission on Intergovernmental Relations and the University of Tennessee Center for Business and Economic Research 2003). Growth was also uneven between the state’s three regions. Middle Tennessee had the highest rate of growth at 33 percent as well as the highest absolute increase (545,913). East Tennessee followed with a 20 percent growth rate (absolute increase of 373,592) while West Tennessee had the lowest growth rate at 12 percent and the lowest absolute increase (166,269).

**Distribution of Decentralized Systems**

Decentralized wastewater systems are fundamentally used to serve new development rather than to replace existing septic systems. Pickney related that it is not economically feasible for a private company to go into an existing fifty home subdivision where ten homes have failing septic systems and fix their problems. However, for new
development in peripheral areas the use of a decentralized wastewater system is often the developer’s most viable solution.

Because growth between 1990 and 2005 was unevenly distributed across the state, so too was the distribution of decentralized systems (Table 4.2; Figures 4.1 and 4.2). This uneven distribution is evident in that 53 percent of decentralized systems were located in five counties. Four of these five counties ranked in the top five for percentage growth between 1990 and 2005. The majority (56%) of decentralized systems are located in Middle Tennessee. East Tennessee follows with 98 systems (37%) while West Tennessee has the fewest at 18 systems (7%). Two major concentrations of decentralized systems can be identified. One is crescent shaped and extends around the southern and eastern periphery of Nashville. This cluster reaches from Williamson through Rutherford and into Wilson County. The other major concentration is in East Tennessee and extends from Blount through Sevier and Jefferson and into Union County. The remainder of the decentralized systems are scattered throughout the state. Secondary concentrations exist in Roane, Cumberland, Clay, Montgomery, Robertson, and Fayette counties.

The most prominent use of decentralized systems corresponds to growth on the perimeter of metropolitan areas, with 68 percent located in a metropolitan area. However, due to greater availability of central wastewater infrastructure, there is less need for systems in the metropolitan area’s core county. The Nashville-Davidson Metropolitan Area contained 109 systems (41%); six are located in Davidson County. Fifty-seven systems are located in the Knoxville Metropolitan Area; two are located in Knox County. The Memphis Metropolitan Area contained seven systems; two are in Shelby County. The Clarksville-Hopkinsville Metropolitan Area contains only
Table 4.2  Decentralized Systems by County, 2006

<table>
<thead>
<tr>
<th>County</th>
<th>Systems * Number</th>
<th>Percentage</th>
<th>Residential Unit Capacity#</th>
<th>Possible Residential Population ~</th>
<th>Population Growth 1990 to 2005</th>
<th>Percent Growth</th>
<th>Ranked by percent</th>
<th>Nominal Growth</th>
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<tr>
<td><strong>Case Study Counties</strong></td>
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<tr>
<td>Rutherford</td>
<td>44</td>
<td>17%</td>
<td>6,204</td>
<td>18,612</td>
<td>84.1</td>
<td>2</td>
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<td>Sevier</td>
<td>34</td>
<td>13%</td>
<td>2,446</td>
<td>7,338</td>
<td>55.3</td>
<td>3</td>
<td>28,239</td>
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<tr>
<td>Wilson</td>
<td>29</td>
<td>11%</td>
<td>4,325</td>
<td>12,975</td>
<td>48.5</td>
<td>5</td>
<td>32,833</td>
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<tr>
<td>Williamson</td>
<td>15</td>
<td>6%</td>
<td>3,180</td>
<td>9,540</td>
<td>89.6</td>
<td>1</td>
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<td>Blount</td>
<td>15</td>
<td>6%</td>
<td>1,220</td>
<td>3,660</td>
<td>34.4</td>
<td>23</td>
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<tr>
<td>Jefferson</td>
<td>10</td>
<td>4%</td>
<td>126</td>
<td>378</td>
<td>46.6</td>
<td>7</td>
<td>15,378</td>
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</tr>
<tr>
<td>Roberton</td>
<td>9</td>
<td>3%</td>
<td>986</td>
<td>2,958</td>
<td>45.5</td>
<td>9</td>
<td>18,885</td>
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</tr>
<tr>
<td>Cumberland</td>
<td>7</td>
<td>3%</td>
<td>291</td>
<td>873</td>
<td>47.8</td>
<td>6</td>
<td>16,610</td>
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</tr>
<tr>
<td>Davidson</td>
<td>6</td>
<td>2%</td>
<td>66</td>
<td>198</td>
<td>12.6</td>
<td>75</td>
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<td>DeKalb</td>
<td>5</td>
<td>2%</td>
<td>298</td>
<td>894</td>
<td>27.1</td>
<td>34</td>
<td>3,894</td>
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</tr>
<tr>
<td>Fayette</td>
<td>5</td>
<td>2%</td>
<td>564</td>
<td>1692</td>
<td>34.8</td>
<td>22</td>
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<tr>
<td>Montgomery</td>
<td>5</td>
<td>2%</td>
<td>252</td>
<td>756</td>
<td>46.5</td>
<td>8</td>
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<tr>
<td>Roane</td>
<td>5</td>
<td>2%</td>
<td>218</td>
<td>654</td>
<td>12.0</td>
<td>76</td>
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<td>Union</td>
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<td>1,092</td>
<td>3,276</td>
<td>39.3</td>
<td>16</td>
<td>5,382</td>
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</tr>
<tr>
<td>Campbell</td>
<td>4</td>
<td>2%</td>
<td>175</td>
<td>525</td>
<td>16.0</td>
<td>62</td>
<td>5,607</td>
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<tr>
<td>Clay</td>
<td>4</td>
<td>2%</td>
<td>100</td>
<td>300</td>
<td>10.4</td>
<td>79</td>
<td>754</td>
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</tr>
<tr>
<td>Bedford</td>
<td>3</td>
<td>1%</td>
<td>112</td>
<td>336</td>
<td>38.8</td>
<td>19</td>
<td>11,793</td>
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<tr>
<td>Cheatham</td>
<td>3</td>
<td>1%</td>
<td>511</td>
<td>1,533</td>
<td>42.2</td>
<td>12</td>
<td>11,463</td>
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</tr>
<tr>
<td>Coffee</td>
<td>3</td>
<td>1%</td>
<td>59</td>
<td>177</td>
<td>26.1</td>
<td>35</td>
<td>10,530</td>
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<tr>
<td>Fentress</td>
<td>3</td>
<td>1%</td>
<td>207</td>
<td>621</td>
<td>17.0</td>
<td>56</td>
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<tr>
<td>Maury</td>
<td>3</td>
<td>1%</td>
<td>133</td>
<td>399</td>
<td>39.2</td>
<td>17</td>
<td>21,480</td>
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</tr>
<tr>
<td>33 counties have two or fewer</td>
<td>47</td>
<td>18%</td>
<td>2,497</td>
<td>7,491</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td><strong>State Total</strong></td>
<td>264</td>
<td>100%</td>
<td>25,062</td>
<td>75,186</td>
<td>22.3</td>
<td>-</td>
<td>1,085,774</td>
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<tr>
<td>Metropolitan Counties</td>
<td>180</td>
<td>68%</td>
<td>20,975</td>
<td>62,925</td>
<td>22.9</td>
<td>-</td>
<td>754,630</td>
<td></td>
</tr>
<tr>
<td>Non Metropolitan Counties</td>
<td>84</td>
<td>32%</td>
<td>4,087</td>
<td>12,261</td>
<td>20.9</td>
<td>-</td>
<td>331,144</td>
<td></td>
</tr>
</tbody>
</table>

* Systems that are permitted or under review by the Department of Environment and Conservation.
# Permits for which no dwelling unit count was obtainable: Dwelling units were calculated by dividing the approved (or applied for) flow rate by 300.
~ Possible residential population is based on an assumed occupancy rate of three persons per unit.

Figure 4.1  Percent population growth, 1990 to 2005

Figure 4.2  Decentralized wastewater systems, 2006.
Montgomery County in Tennessee. Five decentralized systems are located in Montgomery County; however, all are in urban-fringe areas. Neither the Jackson nor the Johnson City-Kingsport-Bristol metropolitan areas contain decentralized systems. Only one system is located in the Chattanooga Metropolitan Area.

The cost of land contributed to where these systems have been used. Where land is relatively inexpensive, the land savings that the systems afford will not offset their expense. As Pickney explains:

[The fact is] not everything fits this mold. There are certain circumstances where land is so cheap that being able to save an acre does not mean anything. If you are paying $1,500 or $2,000 an acre for land and I come to you and say, “If you put my sewer system in you can get not one house on two acres, you can get a house on every half acre. But you are going to have to pay $7,000 per home for my system.” [In that situation] the numbers still do not work. If land is cheap and lots are cheap [then] saving land for five to seven thousand [dollars] does not do it. So, you have got to find where growth [is going to occur] . . . then [determine if land] in that area is valuable. Are lots priced at $40-50,000 or are they priced at $10,000? Those are all factors in whether this system is economically viable or not. (Pickney 2007)

**Physical Constraints**

The demand for development in many parts of the state has driven the use of decentralized systems. However, many areas where these systems have been used coincide with areas with considerable limitations to the use of septic systems. As such, the physical environment has also played a role in the use of decentralized systems. The shallow soils and steep and rocky terrain common throughout much of East Tennessee, particularly in Sevier County, have encouraged the use of alternative technologies. Additionally, the crescent-shaped concentration in Middle Tennessee corresponds to
areas of shallow soils and prevalent bedrock conditions. Such significant physical constraints have undoubtedly contributed to the extensive use of these systems in areas such as Rutherford, Wilson, Williamson, and Sevier Counties. In areas of the state such as West Tennessee, where soil conditions are more favorable to the use of conventional septic systems or the installation of sewers is less costly due to fewer physical constraints, there is somewhat less of a need for nonconventional technologies.

The Pioneer and Utility Operator Factor: The Pickneys and Hines

An additional factor at work in determining the use of decentralized wastewater systems in the state relates to the efforts of the Pickneys and Hines to promote and operate these systems. We have already examined the role of these individuals in locally proving the use of these systems. These efforts undoubtedly yielded an influence on where the systems were used. However, the willingness and ability of utilities to operate these systems has played a continuing role in their location. This has resulted from the ongoing operation and maintenance required for the systems. Utility operators such as Pickney must consider whether enough systems will be located in an area to make trips by service staff to that location feasible. As Pickney explained:

I have got to have something that is within a reasonable range that I can maintain. Either I have already got something else nearby or it is within reasonable driving range of . . . one of my maintenance providers. . . . If it is someplace out in the middle of nowhere, [then] we struggle trying to provide the service. . . . We are in a lot of places, but we have to think long and hard before we look a guy in the eye and say, “Yeah, we will provide service.” [We must evaluate] can we really . . . do it on an economical basis. (Pickney 2007)

Charles Pickney explained that the lack of systems in West Tennessee had been
influenced by the lack of work by Tennessee Wastewater Systems in that area and by an early problem with a sand filter at a truck stop on Interstate 40, a problem which had placed a damper on the willingness of locals to try alternative technologies.

The pioneering use of decentralized wastewater systems by Tennessee Wastewater Systems and later by other investor-owned utility companies, such as Integrated Resource Management, influenced how these systems were used in the state. The unanticipated confluence of these unrelated factors—a growing interest in developing nonurban areas combined with alternative technologies, a pioneering effort by the Pickneys and Hines, and a resistance by the Division of Water Pollution Control to package plants—culminated in a rampant increase in the use of these systems once the Pickneys showed that they could reliably be used.

LAND USES AND POPULATIONS SERVED BY DECENTRALIZED SYSTEMS

Decentralized systems service a range of land uses in Tennessee. The majority (91%) service a single type of land use, while 9 percent service a combination of land uses.

Single-Use Decentralized Systems

The majority of decentralized systems (134 systems—51%) service residential developments (Figure 4.3 and 4.4 and Table 4.3). Developments of single-family homes are the most commonly serviced land use (123 systems), although six systems service multi-family developments. Single-family homes in these subdivisions are the owner’s primary residence. Four were identified as developments of vacation or second homes. Residential developments of primary homes are found on the urban periphery of cities throughout the state, although they are most prominent in Middle Tennessee. While most
developments contain site-built homes, three manufactured-home communities were identified. Residential developments served by a decentralized system are also principally new developments. However, one system—Wayside Acres Subdivision, in Coffee County—was installed to service existing homes previously served by failing septic systems.

With its mountains and lakes, Tennessee has many natural amenities. Such natural amenities have been the focus of much of the development supported by decentralized systems. Thirty-nine commercial resorts use such systems to dispose of wastewater. These resorts generally consist of cabins and/or chalets that are rented to tourists for short periods of time. Rented nightly, such developments are largely commercial in function, as are hotels or motels. Yet, their layout and the nature of their housing are more akin to single-family homes. Rental units are often owned as investment property and rented to tourists through a property management company. Such units may, therefore, be used as both vacation homes and resort rental property.

Figure 4.3  Land uses served by decentralized wastewater systems, 2006.
Figure 4.4  Decentralized wastewater system development of single-family homes in Rutherford County, Tennessee.

The system’s recirculating sand filter is at lower left.

Table 4.3 Land Uses Supported by Decentralized Systems, 2006

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Systems *</th>
<th>Residential Unit Capacity</th>
<th>Possible Residential Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td>Residential systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-use decentralized systems</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>134</td>
<td>50.8</td>
<td>15,017</td>
</tr>
<tr>
<td>Single-family residence</td>
<td>123</td>
<td>46.6</td>
<td>14,360</td>
</tr>
<tr>
<td>Primary residence</td>
<td>119</td>
<td>45.1</td>
<td>13,898</td>
</tr>
<tr>
<td>Primary or vacation residence</td>
<td>4</td>
<td>1.5</td>
<td>462</td>
</tr>
<tr>
<td>Manufactured home community</td>
<td>3</td>
<td>1.1</td>
<td>216</td>
</tr>
<tr>
<td>Multi-family residence</td>
<td>6</td>
<td>2.3</td>
<td>381</td>
</tr>
<tr>
<td>Single and multi-family residences</td>
<td>1</td>
<td>0.4</td>
<td>83</td>
</tr>
<tr>
<td>Unspecified residential</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Resort</td>
<td>39</td>
<td>14.8</td>
<td>2,931</td>
</tr>
<tr>
<td>Vacation rental / residence</td>
<td>34</td>
<td>12.9</td>
<td>2,639</td>
</tr>
<tr>
<td>Lodge</td>
<td>1</td>
<td>0.4</td>
<td>17</td>
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<tr>
<td>RV Park</td>
<td>4</td>
<td>1.5</td>
<td>275</td>
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<tr>
<td>Commercial</td>
<td>27</td>
<td>10.2</td>
<td>-</td>
</tr>
<tr>
<td>Retail Sales</td>
<td>13</td>
<td>4.9</td>
<td>-</td>
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<tr>
<td>Convenience Store</td>
<td>9</td>
<td>3.4</td>
<td>-</td>
</tr>
<tr>
<td>Grocery Store</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Retail (unspecified)</td>
<td>3</td>
<td>1.1</td>
<td>-</td>
</tr>
<tr>
<td>Office (Real Estate, Industry Utility, Misc.)</td>
<td>5</td>
<td>2.0</td>
<td>-</td>
</tr>
<tr>
<td>Services</td>
<td>7</td>
<td>2.8</td>
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<tr>
<td>Restaurant</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Bank</td>
<td>2</td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>Laundromat</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Mini-Warehouse</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Nursing Home</td>
<td>2</td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>Assorted commercial</td>
<td>2</td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>Rental office; Laundromat</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Retail Sales; Restaurant</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Industry (unspecified)</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Public / Semi-Public</td>
<td>40</td>
<td>15.2</td>
<td>-</td>
</tr>
<tr>
<td>Camping / Retreat Complex</td>
<td>9</td>
<td>3.4</td>
<td>-</td>
</tr>
<tr>
<td>Public Recreation Area</td>
<td>2</td>
<td>0.8</td>
<td>-</td>
</tr>
<tr>
<td>Religious Camp Facility</td>
<td>4</td>
<td>1.5</td>
<td>-</td>
</tr>
<tr>
<td>State Park Campground</td>
<td>3</td>
<td>1.1</td>
<td>-</td>
</tr>
<tr>
<td>Government facilities</td>
<td>7</td>
<td>2.7</td>
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<tr>
<td>Government office</td>
<td>1</td>
<td>0.4</td>
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</tr>
<tr>
<td>Interstate welcome center or rest area</td>
<td>5</td>
<td>1.9</td>
<td>-</td>
</tr>
<tr>
<td>Military Base</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
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</table>

(Continued)
Table 4.3. Land Uses Supported by Decentralized Systems, 2006 (Continued)

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Systems *</th>
<th>Residential Unit Capacity #</th>
<th>Possible Residential Population ~</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td><strong>Public / Semi-Public (Continued)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Religious institution</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church</td>
<td>8</td>
<td>3.1</td>
<td></td>
</tr>
<tr>
<td>Temple/cultural center</td>
<td>1</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td><strong>Schools</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public school</td>
<td>14</td>
<td>5.3</td>
<td></td>
</tr>
<tr>
<td>Private school (K-12)</td>
<td>1</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Independent school / sanitarium</td>
<td>1</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td><strong>Mixed-Use Decentralized Systems</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mixed use</strong></td>
<td>23</td>
<td>8.7</td>
<td>7,091</td>
</tr>
<tr>
<td>Residential and Commercial</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single-family homes and lodge;</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurant</td>
<td>1</td>
<td>0.4</td>
<td>40</td>
</tr>
<tr>
<td>Single-family homes; Retail</td>
<td>3</td>
<td>1.1</td>
<td>573</td>
</tr>
<tr>
<td>Single-family homes; Unspecified</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>commercial</td>
<td>1</td>
<td>0.4</td>
<td>35</td>
</tr>
<tr>
<td>Multi-family homes; Retail</td>
<td>1</td>
<td>0.4</td>
<td>14</td>
</tr>
<tr>
<td>Multi-family homes; Retail and</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restaurant</td>
<td>1</td>
<td>0.4</td>
<td>10</td>
</tr>
<tr>
<td><em>(Extended Cluster Systems)</em></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Residential (unspecified); Elementary school</td>
<td>1</td>
<td>0.4</td>
<td>166</td>
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<tr>
<td>Restaurant; High school</td>
<td>1</td>
<td>0.4</td>
<td>-</td>
</tr>
<tr>
<td>Unspecified Mix</td>
<td>14</td>
<td>5.3</td>
<td>6,253</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>264</td>
<td>100</td>
<td>25,062</td>
</tr>
</tbody>
</table>

* Systems that are permitted or under review by the Department of Environment and Conservation.
# Permits for which no dwelling unit count was obtainable: Dwelling units were calculated by dividing the approved (or applied for) flow rate by 300.
~ Possible residential population is based on an assumed occupancy rate of three persons per unit.

The resort category also includes four recreational vehicle parks. While similar in many ways to a residential development of homes, rental resorts place different demands on local services. While the need for fire, police, emergency healthcare, and transportation services are somewhat similar, resorts do not place burdens on a local school system, as would a development of single-family homes. Twenty-six of the 39 rental resort developments are in Sevier County. Resort developments are also in the following counties: Campbell (1), Claiborne (1), Cocke (1), Cumberland (1), Grainger (1), Jefferson (1), Pickett (1), Polk (2), Roane (1), and Union (3).

Public and semi-public uses, such as schools and churches, are the second most common land use serviced by decentralized systems. Forty public or semi-public single-use developments were identified. Sixteen systems service schools. Camping and retreat complexes are also common. Four religious camp facilities, three state parks, and two public recreation areas use a decentralized system. Other government facilities include the University of Tennessee Extension Office in Montgomery County, the Arnold Village on the Arnold Air Force Base in Coffee County, and five interstate highway welcome centers or rest areas.

Commercial land uses (10%) are also supported by decentralized systems. Retail developments, principally convenience stores, were the leading commercial use. Two industrial offices, one real estate office, a utility office, and one office park use a decentralized system, as do several establishments offering services and two developments containing an assortment of commercial uses. One industry is serviced by a system that meets the definition of a decentralized system.
Mixed-Use Decentralized Systems

Nine percent of decentralized systems (23 systems) treat wastewater from a combination of land uses. These mixed-use systems are one of two types. First, there are seven systems which service a single development that is composed of mixed uses. An example is Trillium Cove Condominiums in Blount County. This mixed commercial/residential development in Townsend was proposed to consist of ten residential condominium units, two restaurants, and 23 commercial units for tourist-related businesses (SOP file 04065). The second type of mixed-use system is an extension of the cluster system design. In such a system, a treatment facility is installed to serve an extended, yet largely undeveloped, area. Because a specific development is not the focus of such a facility and the development of the service area is ongoing, the eventual mix of land uses to be served is unknown upon construction. Such systems are generally designed so that additional volume can be accommodated in the future. There are sixteen extended cluster systems in Tennessee. These systems will likely serve residential and commercial land uses but could service any land use that generates domestic wastewater.

The Paris Landing Wastewater Reclamation Facility is an example of an extended cluster system (Figure 4.5). In this system an alternative collection system conveys wastewater from septic tanks at sources to a deep cell facultative lagoon and drip-irrigation system located at the reclamation facility (SOP file 03022). This facility is available to service both existing and new development in an area of Henry County.

Possible Residential Units and Populations

Residential land uses are served by both the single-use and the mixed-use systems. An estimated 25,062 residential units can be supported by decentralized
Figure 4.5   Paris Landing wastewater reclamation facility.
systems that have been approved or are under review by the Department of Environment and Conservation (Appendix II). At an assumed occupancy rate of three persons per unit, these systems could support an estimated 75,186 Tennesseans. The single-use residential systems have the potential to service an estimated 15,017 residential units and could be inhabited by 45,051 people. Resort systems could support an estimated 2,931 units (8,793 occupants), while the mixed-use systems could support an estimated 7,091 units (21,273 occupants).

RELATION TO THE TENNESSEE GROWTH POLICY ACT

Addressing municipal annexation and incorporation issues, the Tennessee General Assembly adopted the Tennessee Growth Policy Act (Public Chapter 1101, Acts of 1998) in May of 1998. In addition to addressing issues regarding annexation and incorporation, the act recognized the need to match more closely the timing of development with the provision of public services and the need to minimize urban sprawl. This act required the 92 Tennessee counties with a non-metropolitan form of government to develop growth plans to direct their development. Three counties—Davidson, Moore, and Trousdale—have a metropolitan form of government. The act required the creation of a coordinating committee in the remaining 92 counties. This committee was to develop a growth plan for ratification by their county legislative body and each municipality. County growth plans delineated urban growth boundaries (UGB) for each municipality, planned growth areas (PGA), and rural areas (RA). However, the law did leave open the possibility that a county could elect not to designate planned growth or rural areas. Growth plans were to be submitted to the Local Government Planning Advisory Committee by July 1, 2001.
Goals and Objectives

Section 8 of Public Chapter 1101 states that the “purpose of a growth plan is to direct the coordinated, efficient, and orderly development of the local government and its environs that will, based on an analysis of present and future needs, best promote the public health, safety, morals and general welfare.” This section further requires that once a plan is adopted, land-use decisions, whether made by legislative bodies or planning commissions, be consistent with the growth plan. Although Public Chapter 1101 required the submission of growth plans to the Local Government Planning Advisory Committee for approval, if a growth plan was ratified by a county and its associated municipalities then the approval by this committee was automatic. This resulted in considerable variation among county growth plans.

Additionally, the concept of density as used in Public Chapter 1101 deserves notice. Per the statute, density was to serve as a guide in the delineation of growth plan areas. For example, territory within an urban growth boundary was to be the likely site of “high density commercial, industrial and/or residential growth” (Public Chapter 1101, Section 7C). Likewise, the description of rural areas indicated that such areas were to be preserved “for uses other than high density commercial, industrial, or residential development” (Public Chapter 1101, Section 7D). However, density was not defined within the statute. Thus, it allowed counties and the associated municipalities to define density locally in a manner that would best reflect their unique goals and policy objectives. Additionally, as density was left to local interpretation, it remains impossible to quantify what constituted high, moderate, or low density as related to the growth plans.
**Types of Growth Plan Areas**

Urban growth boundaries were to identify territory contiguous to the existing municipality that would, while being sufficiently compact, be large enough to accommodate residential and nonresidential growth projected to occur during the next twenty years. The territory inside the growth boundary was to include the likely sites of high-density commercial, industrial, and/or residential growth. Factors to be considered in making this delineation included historical experience, economic trends, population growth patterns, and topographical characteristics. Growth boundaries were also to reflect the duty of each municipality to facilitate the full development of its current territory while controlling extraterritorial expansion, thereby limiting growth’s impact to agricultural lands, forests, recreational areas, and wildlife management areas.

Provision of public services and physical infrastructure was also to be a determining factor in the delineation of the growth boundaries. The territory inside a municipality’s growth boundary was to be an area where that municipality was better able and prepared to provide urban services than other municipalities. Municipalities were to determine and report the current and projected costs of core infrastructure, urban services, and public facilities that would be necessary to facilitate the full development of the municipality’s current territory and resources, as well as the expansion of infrastructure, services, and facilities necessary for the area considered for inclusion within its growth boundary.

Counties were to designate territory outside of municipalities and the growth boundaries where growth was projected to occur as planned growth areas. These areas were to be compact yet large enough to accommodate residential and nonresidential
growth during the next twenty years. Also based on historical experience, economic
trends, population growth patterns, and topographical characteristics, planned growth
areas were to be the likely sites of high- or moderate-density commercial, industrial,
and/or residential growth. Considering growth’s impact on agricultural areas, forests,
recreational areas, and wildlife management areas, these areas were to reflect the
county’s duty to manage these natural resources while controlling urban growth.

In delineating planned growth areas counties were to consider the projected costs
and feasibility of recouping the costs—by imposition of fees or taxes—of providing an
urban-type core infrastructure, urban services, and public facilities throughout the
territory. Counties were also to consider the additional need for land suitable for high-
density industrial, commercial, and residential development above that which could be
used, reused, or redeveloped within the current municipalities.

Rural areas were to be identified in growth plans as territory not within either an
urban growth boundary or a planned growth area and that was to be, for the next twenty
years, preserved as agricultural lands, forests, recreational areas, or wildlife management
areas. However, some development was still anticipated in these areas.

Comparison of Decentralized Developments to County Growth Plans

With an understanding of how decentralized systems are being used, an
examination of their relation to the growth plans adopted under Public Chapter 1101
follows (Figure 4.6). Developments served by decentralized systems were identified in
each type of area designated in Public Chapter 1101 growth plans (Figure 4.7 and Table
4.4). Additionally, 26 decentralized systems were identified as serving developments
within the corporate limits of sixteen Tennessee cities. Six systems were identified in
Figure 4.6  Public Chapter 1101 Growth Plans.

Source: Tennessee Department of Economic and Community Development 2006.
Table 4.4 Decentralized Systems by Public Chapter 1101 Growth Plan Area, 2006

<table>
<thead>
<tr>
<th></th>
<th>Systems</th>
<th>Residential Unit Capacity</th>
<th>Possible Residential Population</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number</td>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td>Metropolitan County</td>
<td>6</td>
<td>2.3%</td>
<td>66</td>
</tr>
<tr>
<td>Municipal</td>
<td>26</td>
<td>9.8%</td>
<td>3,149</td>
</tr>
<tr>
<td>UGB</td>
<td>63</td>
<td>23.8%</td>
<td>6,847</td>
</tr>
<tr>
<td>PGA</td>
<td>59</td>
<td>22.3%</td>
<td>2,858</td>
</tr>
<tr>
<td>Rural Area</td>
<td>104</td>
<td>39.4%</td>
<td>11,199</td>
</tr>
</tbody>
</table>

System whose service area spans multiple PC 1101 areas

<table>
<thead>
<tr>
<th></th>
<th>Number</th>
<th>Percentage</th>
<th>Residential Unit Capacity</th>
<th>Possible Residential Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipal and UGB</td>
<td>1</td>
<td>0.4%</td>
<td>80</td>
<td>240</td>
</tr>
<tr>
<td>Municipal and PGA</td>
<td>1</td>
<td>0.4%</td>
<td>166</td>
<td>498</td>
</tr>
<tr>
<td>UGB / PGA / RA</td>
<td>1</td>
<td>0.4%</td>
<td>219</td>
<td>657</td>
</tr>
<tr>
<td>PGA and Rural</td>
<td>2</td>
<td>0.8%</td>
<td>417</td>
<td>1,251</td>
</tr>
<tr>
<td>UGB and Rural</td>
<td>1</td>
<td>0.4%</td>
<td>61</td>
<td>183</td>
</tr>
</tbody>
</table>

Total 264 100% 25,062 75,186

* Systems that are permitted or under review by the Department of Environment and Conservation.
# Permits for which no dwelling unit count was obtainable: Dwelling units were calculated by dividing the approved (or applied for) flow rate by 300.
~ Possible residential population is based on an assumed occupancy rate of three persons per unit.

counties with a metropolitan form of government—counties which were exempt from preparing a growth plan.

Public Chapter 1101 empowered local communities to shape their growth plans to reflect their individual goals. This leeway resulted in growth plans that varied greatly by county. Growth plans in certain east Tennessee counties designated a vast expanse for planned growth, while west Tennessee counties generally designated much smaller areas for planned growth. The McMinn County Growth Plan designated 76 percent of that county’s total area as planned growth, while only 0.8 percent of Wayne County was designated as such. Such differences influence statewide statistics for the relation of decentralized systems in each area type. Nevertheless, the growth plans ultimately reflect the plan the county and its municipalities arrived at for future development and, therefore, warrant examination in terms of decentralized systems. The area serviced by most decentralized systems is small and generally confined to the boundaries of a single development. However, four extended cluster systems serve an area that is within multiple growth plan areas and two decentralized systems each serve a development that is within two growth plan areas; one is in part within a city and in part inside an urban growth boundary and one is in part within a city and in part in a planned growth area.

The location of each decentralized development was compared against growth plans as originally adopted and as amended through August 2006. However, no decentralized systems were identified as serving developments located in any area whose growth plan designation was altered by these amendments. Therefore, this assessment applies to only the originally adopted growth plans.

Containing the greatest single share of decentralized systems (39%), rural areas
have been the site of considerable development supported by decentralized systems. These 104 systems could support the equivalent of 11,199 residential units. Residential developments were the predominant land use supported in the rural areas, 62 percent of development (Table 4.5). At 16 percent, the next land use in this area was public and semi-public uses.

Urban growth boundaries, planned growth areas, and municipalities were expected to experience development during the twenty years following the adoption of the growth plan. The majority of decentralized systems (150 systems—57%) service developments in one of these three areas: 24 percent are located inside an urban growth boundary, 22 percent are in a planned growth area, and 10 percent are inside a municipality. At 59 percent, residential developments were the foremost land use supported by decentralized systems inside the growth boundaries. Along with resorts (20%), few other uses were supported inside the growth boundaries. A greater mix of uses was supported in the planned growth areas, including residential (37%), resort (22%), public/semi-public (20%), and commercial (17%). Decentralized systems offer the potential to match the provision of wastewater services with the timing of development in areas designated for growth. In such areas, decentralized systems may provide an alternative means of wastewater disposal that is less of a burden on the local government. Wastewater disposal in sparsely populated areas may be more viable when provided by a decentralized system rather than by conventional central sewers. Decentralized systems offer an alternative to conventional disposal in municipalities that lack population densities necessary to support central sewers. Twenty-six decentralized systems were identified as serving developments inside sixteen municipalities. Twelve
Table 4.5 Decentralized Systems by PC 1101 Area and Land Use, 2006

<table>
<thead>
<tr>
<th>Public Chapter 1101 Area / Land use</th>
<th>Systems *</th>
<th>Residential Unit Capacity#</th>
<th>Possible Residential Population ~</th>
</tr>
</thead>
<tbody>
<tr>
<td>Municipality</td>
<td>Number</td>
<td>Percentage</td>
<td></td>
</tr>
<tr>
<td>Residential</td>
<td>8</td>
<td>31%</td>
<td>864</td>
</tr>
<tr>
<td>Commercial</td>
<td>6</td>
<td>23%</td>
<td>-</td>
</tr>
<tr>
<td>Public / Semi-Public</td>
<td>7</td>
<td>27%</td>
<td>-</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>5</td>
<td>19%</td>
<td>2,285</td>
</tr>
<tr>
<td>Metropolitan County</td>
<td>6</td>
<td>17%</td>
<td>66</td>
</tr>
<tr>
<td>Residential</td>
<td>1</td>
<td>17%</td>
<td>66</td>
</tr>
<tr>
<td>Commercial</td>
<td>4</td>
<td>67%</td>
<td>0</td>
</tr>
<tr>
<td>Public / Semi-Public</td>
<td>1</td>
<td>17%</td>
<td>0</td>
</tr>
<tr>
<td>Planned Growth Area</td>
<td>59</td>
<td>37%</td>
<td>1,625</td>
</tr>
<tr>
<td>Residential</td>
<td>22</td>
<td>37%</td>
<td>1,625</td>
</tr>
<tr>
<td>Resort</td>
<td>13</td>
<td>22%</td>
<td>726</td>
</tr>
<tr>
<td>Commercial</td>
<td>10</td>
<td>17%</td>
<td>-</td>
</tr>
<tr>
<td>Public / Semi-Public</td>
<td>12</td>
<td>20%</td>
<td>-</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>2</td>
<td>3%</td>
<td>507</td>
</tr>
<tr>
<td>Rural Area</td>
<td>104</td>
<td>62%</td>
<td>7,320</td>
</tr>
<tr>
<td>Residential</td>
<td>64</td>
<td>62%</td>
<td>7,320</td>
</tr>
<tr>
<td>Resort</td>
<td>7</td>
<td>7%</td>
<td>417</td>
</tr>
<tr>
<td>Commercial</td>
<td>5</td>
<td>5%</td>
<td>-</td>
</tr>
<tr>
<td>Public / Semi-Public</td>
<td>17</td>
<td>16%</td>
<td>-</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>11</td>
<td>11%</td>
<td>3,462</td>
</tr>
<tr>
<td>Urban Growth Boundary</td>
<td>63</td>
<td>59%</td>
<td>5,024</td>
</tr>
<tr>
<td>Residential</td>
<td>37</td>
<td>50%</td>
<td>5,024</td>
</tr>
<tr>
<td>Resort</td>
<td>19</td>
<td>30%</td>
<td>1,788</td>
</tr>
<tr>
<td>Commercial</td>
<td>2</td>
<td>3%</td>
<td>-</td>
</tr>
<tr>
<td>Industry</td>
<td>1</td>
<td>2%</td>
<td>-</td>
</tr>
<tr>
<td>Public / Semi-Public</td>
<td>3</td>
<td>5%</td>
<td>-</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>1</td>
<td>2%</td>
<td>35</td>
</tr>
<tr>
<td>Multiple PC 1101 areas</td>
<td>6</td>
<td></td>
<td>943</td>
</tr>
<tr>
<td>Residential</td>
<td>2</td>
<td>33%</td>
<td>141</td>
</tr>
<tr>
<td>Mixed Use</td>
<td>4</td>
<td>67%</td>
<td>802</td>
</tr>
<tr>
<td>Total</td>
<td>264</td>
<td>100%</td>
<td>25,062</td>
</tr>
</tbody>
</table>

* Systems that are permitted or under review by the Department of Environment and Conservation.
# Permits for which no dwelling unit count was obtainable: Dwelling units were calculated by dividing the approved (or applied for) flow rate by 300.
~ Possible residential population is based on an assumed occupancy rate of three persons per unit.
of these 26 systems are complex onsite systems that serve individual establishments, such as schools, offices, retail commercial developments, and churches. The remaining 14 are cluster systems that principally serve residential developments. The remaining systems are extended cluster systems for which the combination of ultimate land uses is yet unknown.

While development in any small place is likely to use decentralized systems in the future, these systems are already in use in certain municipalities in Tennessee. In Louisville, Piperton, Cedar Hill, Coopertown, Cross Plains, Orlinda, and Thompson’s Station they serve at least a portion of a municipality. These historically rural and agricultural communities are experiencing exurban growth due to their proximity to Nashville, Knoxville, or Memphis. While not an exurban bedroom community, Townsend is also experiencing resort development pressure due to its setting in the Smoky Mountains. During the 1980s and 1990s, prior to the current growth pressures, three of these eight municipalities experienced population loss. However, all eight are anticipated to experience considerable growth through 2025 (Tennessee Advisory Commission on Intergovernmental Relations and the University of Tennessee Center for Business and Economic Research 2003). Future development in these communities is likely to rely largely on decentralized systems for wastewater disposal. Seven other cities (Vanleer, Allart, New Market, Philadelphia, Whitwell, Columbia, and Lebanon) have a single development—principally public and semi-public uses—supported by a decentralized system. No residential development in these municipalities has been supported to date. Six decentralized systems are in a county with a metropolitan form of government. These systems principally serve commercial uses, although one residential development and one church are served in the county.
CONCLUSIONS

This chapter has revealed the factors and actors which played a part in the introduction of decentralized systems to the state and the nature of the development they support. Fundamental to the use of these systems has been the population growth that has occurred in areas with physical limitations to the use of septic systems or the extension of central sewers. Through use of decentralized wastewater systems, demand has largely been realized in the form of residential development in nonurban portions of the periphery of metropolitan areas. In such areas, these systems also support schools, churches, and commercial establishments. In areas with intense demand for resort development, this has also been accommodated by decentralized systems.

This chapter has also presented an assessment of how the developments supported by decentralized systems relate to the statewide growth policy under Public Chapter 1101. That decentralized systems were identified—in almost equal shares—inside the urban growth boundaries, the planned growth areas, and the rural areas indicates that the county growth plans have had little influence over the use of these technologies to support new development. However, because density was not defined in the law it is difficult to say definitively whether their use in the rural area conforms or is counter to the stated intent of this area. While possibly not violating the letter of the law, their common use in rural areas seems counter to its spirit. The seeming lack of coordination between decentralized wastewater systems across the state with the county growth plans suggests the inability of these plans to create an ordered landscape. This indicates that factors other than the growth plans have determined their use. While we will examine the role and responsibility of state government in the following chapters, we must eventually turn to county-level case studies.
CHAPTER V
THE TENNESSEE REGULATORY AUTHORITY

THE STATE’S ROLE

History of Planning in Tennessee

Public planning for community development has a long history in Tennessee. A few Tennessee cities—first Memphis then Knoxville, Chattanooga, Nashville, and Johnson City—created planning commissions in the 1920s. In the 1930s planning on a statewide scale was undertaken (Green, Grubbs, Hobday 1982). Strongly influenced by the Tennessee Valley Authority and the National Planning Board, the Tennessee General Assembly adopted the State and Regional Planning Act in 1935. This legislation provided for the establishment of the Tennessee State Planning Commission, a nine member body composed of the governor and eight governor-appointed citizens. Following its creation, the Tennessee State Planning Commission hired a staff to prepare projects that were regional or statewide in scope; collect data, conduct research, and prepare reports or publications; and to extend planning assistance to local communities (Tennessee Department of Economic and Community Development [ECD] 2003). Of these efforts, the provision of local planning assistance proved most successful.

During the 1959 reorganization of state government when many of the boards, commissions, and agencies created in the 1930s and 1940 were restructured or abolished, the Tennessee State Planning Commission was placed under the Department of Finance and Administration. Although it survived, the Commission’s power was reduced, and by
the next restructuring of state government thirteen years later its involvement in the operation of the actual planning work was minimal. The Commission did not survive this restructuring, and in 1972 it was abolished (Green, Grubbs, Hobday 1982). As a result, the Commission’s planning staff was moved to the newly formed Tennessee State Planning Office. To replace the citizen advisory committee function of the abolished Commission, the Local Government Planning Advisory Committee (LGPAC) was formed in 1972. In 1983, further restructuring occurred and the State Planning and the Local Planning Divisions of the Tennessee State Planning Office were separated. The Local Planning Division exists today as a component of the Department of Economic and Community Development and provides contract planning services to cities and counties in the state. However, the State Planning Division was abolished in 1995 and statewide planning ceased to exist as a separate function of state government.

Today, land-use planning and the implementation of general plans is the domain of local governments in the state. Nonetheless, various state agencies such as the Tennessee Department of Transportation (TDOT), the Tennessee Department of Environment and Conservation (TDEC), the Tennessee Regulatory Authority (TRA), the Tennessee Advisory Commission on Intergovernmental Relations (TACIR), and the Tennessee Department of Economic and Community Development (ECD) are involved with land-use and the development of communities. Their involvement—except for the local planning assistance function of ECD—is chiefly indirect. The best illustration of this indirect involvement is the Tennessee Department of Transportation (TDOT). Transportation is inherently connected with land-use and thus the actions of the department have far reaching consequences for the development of land. However, the
department is primarily concerned with the provision of transportation infrastructure and service rather than land-use or community planning. The department has a Long-Range Planning Division under the Chief of Environment and Planning; however, this division is responsible for such programs as toll feasibility studies, long range transportation planning, systems planning, and planning for bicycle and pedestrians. While the actions of the Tennessee Department of Transportation influence the use and development of land, this is not its focus but rather a by-product. In another role, the state—through the Tennessee Advisory Commission on Intergovernmental Relations (TACIR)—conducts research relating to public policies on planning, infrastructure, and land-use. Established to serve as a forum to discuss and resolve intergovernmental problems, TACIR serves as something of a state “think tank”. Thus, TACIR was the natural entity to monitor the implementation of the state’s comprehensive growth policy under Public Chapter 1101. However, TACIR only conducts research and reports on its findings. Possessing no authority to require that development coincide with the county growth plans or that infrastructure extensions support these plans, TACIR cannot itself determine growth patterns in the state.

The State and Decentralized Wastewater Systems

While no statewide planning agency remains to oversee the use of decentralized wastewater systems, state government—through the Department of Environment and Conservation and the Tennessee Regulatory Authority—is influencing the use of these technologies. We must examine each agency.

The Tennessee Department of Environment and Conservation is charged with protecting the environment. As such, it influences the use of decentralized systems
through its regulatory purview over wastewater operations. Decentralized wastewater systems are regulated by the department under a state operating permit, required for sewage-treatment systems that do not directly discharge to surface or subsurface waters. The Tennessee Regulatory Authority is responsible for regulating investor-owned public utility companies providing electric, gas, telecommunications, potable water, and wastewater services in the state. Although not all decentralized wastewater systems are operated by an investor-owned utility, at least 36 percent are (Table 5.1). Many of the systems not operated by an authority regulated utility are located in Wilson and Rutherford counties where the utility operator is a governmental entity. However, in much of the remainder of the state, the authority has exerted a direct influence over the provision of wastewater service made possible by decentralized systems. The authority also played a role in the establishment of the utility companies that proved the viability of these systems. Without the authority’s influence, the use of systems would likely have been hindered.

Due to the unique and separate roles of these state agencies, I have divided the review of their responsibilities and influences into these two chapters. In one case, an agency is directly responsible for the environment. In the other, we have an agency responsible for regulating investor-owned utilities; this is the focus of the present chapter. In Chapter Six we examine the influence of the Tennessee Department of Environment and Conservation.
Table 5.1 Number of Decentralized Wastewater Systems by Operator or Applicant for a State Operating Permit

<table>
<thead>
<tr>
<th>Utility Districts / Water &amp; Wastewater Authorities</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consolidated UD of Rutherford County</td>
<td>44</td>
</tr>
<tr>
<td>Water &amp; Wastewater Authority of Wilson County</td>
<td>29</td>
</tr>
<tr>
<td>East Sevier County Utility District</td>
<td>9</td>
</tr>
<tr>
<td>Pleasant View Utility District</td>
<td>3</td>
</tr>
<tr>
<td>Watts Bar Utility District</td>
<td>3</td>
</tr>
<tr>
<td>Crab Orchard Utility District</td>
<td>2</td>
</tr>
<tr>
<td>Hallsdale-Powell Utility District</td>
<td>2</td>
</tr>
<tr>
<td>Second Utility District of Jackson County</td>
<td>1</td>
</tr>
</tbody>
</table>

Investor-owned utilities regulated by the Tennessee Regulatory Authority:

| Tennessee Wastewater Systems, Inc.                                                    | 81     |
| Integrated Resource Management, Inc.                                                   | 9      |
| Aqua Utilities Company, Inc.                                                           | 1      |
| Cartwright Creek Utility Company, Inc.                                                 | 1      |
| Hickory Star Water and Sewer LLC                                                      | 1      |
| Kings Chapel Capacity LLC                                                              | 1      |
| Shiloh Falls Utilities, Inc.                                                           | 1      |

Other

| Independent/Unknown                                                                    | 42     |
| A county board of education                                                            | 11     |
| Municipality                                                                           | 11     |
| State of Tennessee (TDOT or TDEC)                                                      | 8      |
| U. S. Army Corps of Engineers                                                          | 2      |
| Marshall County Board of Public Utilities                                              | 1      |
| Coffee County Water and Wastewater Authority                                           | 1      |

Establishment and Purview

The Tennessee Regulatory Authority was established in 1996 in response to challenges arising in the changing telecommunications and utility environment (TRA 2007b). However, the authority has a much longer history. Established by legislative act in 1883, this body operated under various names before being renamed the Public Service Commission in 1956. By that time, this body had assumed numerous responsibilities, one of which was to evaluate the rates and operations of companies under its jurisdiction. It also had the responsibility to compute rates of return and to fix just and reasonable rates for these companies. The Public Service Commission also made investigations and held hearings to determine the propriety of granting “Certificates of Convenience and Necessity” (CCNs) to public utilities (Tennessee Department of State 2002).

The Tennessee Regulatory Authority maintains many of these same responsibilities today. The authority’s current mission is to “promote the public interest by balancing the interests of utility consumers and providers while facilitating the transition to a more competitive environment” (Tennessee Regulatory Authority [TRA] 2007a, 8). This mission is achieved through its two major operational components. The authority’s consumer assistance component deals with complaints that consumers have with authority regulated utilities. Through its regulatory component, the authority oversees utility operators and market conditions. Items evaluated include requests for rate modifications, applications to provide service, requests for the authority to approve financing transactions and mergers, and requests for rule modifications.
Public Utilities Under the Authority’s Regulatory Purview

As not all utilities are regulated by the Tennessee Regulatory Authority, it is important to examine the state enabling legislation that establishes the TRA’s authority. Tennessee state law prohibits any public utility from beginning construction or operation of a new facility or service before obtaining approval by the authority. This section of the law reads in part:

(a) No public utility shall establish or begin the construction of, or operate any line, plant, or system, or route in or into a municipality or other territory already receiving a like service from another public utility, or establish service therein, without first having obtained from the authority, after written application and hearing, a certificate that the present or future public convenience and necessity require or will require such construction, establishment, and operation, and no person or corporation not at the time a public utility shall commence the construction of any plant, line, system, or route to be operated as a public utility, or the operation of which would constitute the same, or the owner or operator thereof, a public utility as defined by law, without having first obtained, in like manner, a similar certificate. . . . (Tennessee Code Annotated [TCA] 65-4-201(a))

However, it is essential to recognize what this section of the law considers a “public utility” and what it does not. The pertinent section reads:

(6) “Public utility” means every individual, copartnership, association, corporation, or joint stock company, its lessees, trustees, or receivers, appointed by any court whatsoever, that own, operate, manage or control, within the state, any interurban electric railway, traction company, all other common carriers, express, gas, electric light, heat, power, water, telephone, telegraph, telecommunications services, or any other like system, plant or equipment, affected by and dedicated to the public use, under privileges, franchises, licenses, or agreements, granted by the state or by any political subdivision thereof. “Public utility” as defined in this section shall not be construed to include the following nonutilities:
(A) Any corporation owned by or any agency or instrumentality of the United States;
(B) Any county, municipal corporation or other subdivision of the state of Tennessee;
(C) Any corporation owned by or any agency or instrumentality of the state . . . .
(TCA 65-4-101(6))

Thus, utility systems operated by a county, municipality, or other subdivision of the state are not considered a “public utility” under the authority’s enabling legislation and, therefore, are not under the purview of the authority.26 The definition of public utility contained in the rules that the authority adopted in June of 2006 offers additional clarity to the type utilities under the authority’s purview:

(5) Public utility or public wastewater utility—any person, partnership, corporation, company, association, receiver or two or more persons having a joint or common interest that owns, operates, and manages any public wastewater system for compensation within the state subject to the jurisdiction of the Authority. (TRA Chapter 1220-4-13-.02)

Per the 2005-2006 Annual Report, the authority regulated 738 utility companies (TRA 2007a). However, 75 percent of these provide telecommunications services. The authority regulates nine utilities providing wastewater service (Table 5.2). Two of these nine utilities operate wastewater systems that discharge directly to a surface water body. These systems do not meet the definition of a decentralized system used in this research. However, the other seven utilities do operate systems that do. Per the authority’s 2005-2006 Annual Report, the utilities regulated by the authority operate approximately 89 wastewater systems in the state (TRA 2007a). This number approximates the 95 systems

26 With regard to utility districts, Tennessee Code Annotated section 7-82-104 states that “Neither the Tennessee regulatory authority nor any other board or commission of like character hereafter created shall have jurisdiction over the district in the management and control of any system . . . except to the extent provided by this chapter and by the Wastewater Facilities Act of 1987, compiled in title 68, chapter 221, part 10.” TCA Section 65-4-101 (7) specifies that a nonprofit homeowners’ associations providing service for the exclusive use of its subdivision are also not considered a public utility under the purview of the TRA.
### Table 5.2 Number of Authority Regulated Utilities, June 30, 2006

<table>
<thead>
<tr>
<th>Energy and Water</th>
<th>Approximate Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric</td>
<td>3</td>
</tr>
<tr>
<td>Natural gas companies **</td>
<td>6</td>
</tr>
<tr>
<td>Water</td>
<td>8</td>
</tr>
<tr>
<td>Wastewater</td>
<td>9</td>
</tr>
<tr>
<td>Methane gas provider</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Telecommunications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Competing telephone</td>
<td>115</td>
</tr>
<tr>
<td>service providers</td>
<td></td>
</tr>
<tr>
<td>Customer-owned coin</td>
<td>194</td>
</tr>
<tr>
<td>operator telephone providers</td>
<td></td>
</tr>
<tr>
<td>Incumbent telephone</td>
<td>18</td>
</tr>
<tr>
<td>companies</td>
<td></td>
</tr>
<tr>
<td>Resellers and operators</td>
<td>222</td>
</tr>
<tr>
<td>service providers</td>
<td></td>
</tr>
<tr>
<td>Long distance facility</td>
<td>6</td>
</tr>
<tr>
<td>providers</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Gas Pipeline Safety</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Direct sales*</td>
<td>22</td>
</tr>
<tr>
<td>Intrastate pipeline*</td>
<td>8</td>
</tr>
<tr>
<td>Liquefied natural gas (LNG)</td>
<td>2</td>
</tr>
<tr>
<td>operations</td>
<td></td>
</tr>
<tr>
<td>Master meters*</td>
<td>34</td>
</tr>
<tr>
<td>Municipalities*</td>
<td>72</td>
</tr>
<tr>
<td>Utility Districts*</td>
<td>25</td>
</tr>
</tbody>
</table>

| Total                       | 738              |

* These entities are regulated by the authority only to ensure compliance with Minimum Federal Safety Standards for the transmission of natural gas.

** The Tennessee Regulatory Authority also has jurisdiction over these companies’ gas pipeline safety.

identified in the Department of Environment and Conservation’s permit application
database as being operated—or applied for—by a utility regulated by the authority.
(Appendix IV presents a brief history of each of these utilities.)

NEW UTILITIES AND EVOLVING REGULATION

It has been some thirty years since the Public Service Commission granted the
first CCN for wastewater service to the Cartwright Creek utility company. However, the
Tennessee Regulatory Authority had relatively little experience with wastewater utility
companies until the late 1990s and early 2000s. From the mid 1970s until 1990—when
Aqua Utilities Company petitioned the authority for a Certificate of Convenience and
Necessity—no investor-owned utility was issued a certificate to provide wastewater
service. Throughout this time, and even today, the authority has principally been
concerned with utilities providing other services, namely telecommunication services
(Table 5.2). However, the authority did have experience regulating a few companies
providing potable water—most notably Tennessee-American Water Company, which
serves approximately 65 thousand customers in the Chattanooga area.27 In the 1990s,
new investor-owned utility companies, notably Tennessee Wastewater Systems, Inc.,
made numerous requests for wastewater service territories.

Early utilities such as Shiloh Falls Utilities and Aqua Utilities Company as well as
later ones such as Hickory Star Water Company and King’s Chapel Capacity were
created to service individual developments. The practice of granting project-specific
territories is apparent in the record for Aqua Utilities where the Public Service

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27 As of 2006, the Authority regulated eight utilities providing potable water service.
Commission actually granted the certificate to the land developer “doing business as” Aqua Utilities for his project. Most investor-owned utilities operating decentralized systems today service the single development for which they were originally created. However, the vast majority of decentralized systems are operated by Tennessee Wastewater Systems, Inc., which operates in multiple, non-contiguous service territories across the state (Table 5.3). This is a service model pioneered by the Pickneys.28 Charles Pickney described the introduction of their service model:

> It was a very difficult circumstance because the TRA really did not know what to do with us. They had a couple of small sewer providers that they were regulating, and basically, they were running a little package plant for a subdivision that a developer had put it in so he could build a subdivision. They really had never seen a model like we were creating with a decentralized wastewater [utility]. (Pickney 2007)

Decentralized wastewater systems are suited to service both extended areas and isolated developments. Their self-contained, stand alone nature lends well to servicing dispersed service territories. However, the technologies also allow service to extensive areas with population densities too low to make conventional gravity collection systems viable. Thus, the technologies are conducive to both the extensive and site specific service territories granted by the authority (Figures 5.1 and 5.2).

Not only did the number of investor-owned utility companies providing wastewater service increase in the 1990s and 2000s, but the number of requests to the authority for service territories also began to rise, particularly in the years since 2000. The authority received seven requests for new—or expansions to—wastewater service territories in 2000, ten in 2001, three in 2002, eleven in 2003, 16 in 2004, 21 in 2005, and

28 Operating in two non-contiguous service territories in Williamson County, Cartwright Creek is the third of the seven decentralized wastewater utilities operating under this dispersed service model.
<table>
<thead>
<tr>
<th><strong>Cartwright Creek</strong> <em>(First CCN: 1975 – Williamson County)</em></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers*</td>
<td>499</td>
<td>513</td>
<td>520</td>
<td>520</td>
<td>520</td>
</tr>
</tbody>
</table>
| [Not all of these customers are supported by the decentralized system. Some are served by the utility’s conventional sewer system.]

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>140</td>
<td>154</td>
<td>180</td>
<td>187</td>
<td>205</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>266^</td>
<td>446^</td>
<td>652</td>
<td>913</td>
<td>1,367</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Shiloh Falls Utilities</strong> <em>(First CCN: 1996 – Hardin County)</em></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>104</td>
<td>114</td>
<td>124</td>
<td>143</td>
<td>166</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>---</td>
<td>48</td>
<td>112</td>
<td>112</td>
<td>50</td>
</tr>
</tbody>
</table>
| [Due to the unusual variability in these numbers, they are suspected to have been reported in error.]

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>3</td>
<td>18</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>King’s Chapel Capacity</strong> <em>(First CCN: 2006 – Williamson County)</em></th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>0</td>
<td>15</td>
</tr>
</tbody>
</table>

* Figures based upon the “Sewer Customers” table on S-3 in the respective annual report unless otherwise indicated. This table was not always populated with data. Other tables used as indicated.

^ Figures based upon the “Other Sewer System Information” table on S-5 in respective annual report.

^ Figures based upon the “Service Connections” table on S-4 in respective annual report.

Figure 5.1  Site specific wastewater service territories in Sevier County.
Source: Tennessee Regulatory Authority docket records 03-00467 and 05-00042.

Figure 5.2  Expansive wastewater service territories in Fentress and Stewart counties.
Source: Tennessee Regulatory Authority docket records 01-00229 and 05-00162.
eight during the first six months of 2006 (Table 5.4) (TRA 2007a). By 2002, the authority had been granting certificates to investor-owned utilities on a fairly regular basis for several years. However, the authority was still adjusting to the influx of requests for this expanding service. At that point, the authority had not developed specific regulations for wastewater utilities. Director Miller related:

I came in 2002, and they had already started granting [certificates for wastewater service]. And so this had become somewhat routine—the process of granting a CCN for wastewater—at that point. But it was only done on an . . . individual basis. (Miller 2007)  

Director Miller explained that one of the authority’s guiding principles in granting a wastewater service area at that time was whether or not a local government was

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**Table 5.4 Petitions for Wastewater Service Territories**

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>7</td>
</tr>
<tr>
<td>2001</td>
<td>10</td>
</tr>
<tr>
<td>2002</td>
<td>3</td>
</tr>
<tr>
<td>2003</td>
<td>11</td>
</tr>
<tr>
<td>2004</td>
<td>16</td>
</tr>
<tr>
<td>2005</td>
<td>21</td>
</tr>
<tr>
<td>2006 (first six months)</td>
<td>8</td>
</tr>
</tbody>
</table>


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29 Of the Authority’s four directors serving in this capacity during 2007, only Director Miller was reached for an interview. Director Miller was able to offer valuable insight because he served as the Authority’s Chairman during the 2004 wastewater workshop. Additionally, Director Miller was instrumental in the development of the Wastewater Rules adopted in 2006. Of the current directors, Director Kyle has the longest tenure as a Director. However, her office declined my request for an interview. Undoubtedly, her insight would have contributed considerable information to this research. The other two current directors were not contacted for interviews. Director Roberson was not approached for an interview because he had only served as a Director since 2006. Director Jones’s tenure has overlapped that of Director Miller.
planning to serve the area in question. “We felt like it was not good public policy . . . to
grant [a utility] an exclusive right [to] serve that area [if local governments had plans to
serve it]” (Miller 2007). Director Miller explained the background of this decision:

My recollection is [that the requested service territories] were all in kind of rural areas
outside the urban growth areas. And so we checked with both the county government
and city government that had jurisdiction and if they had any plans then we would re-
evaluate. . . . After we asked the question a few times the Pickney Company and
others would come forward with letters from the local governments stating that they
did not have any interest in serving the area. . . . So I do not know that our initial
inquiry was “Would they ever serve an area?” We did not really have in mind any
timeframe. We did not really run into any conflict within the local governments until
we started granting [service areas] in Sevier County. I think that was the first time
where somebody stepped forward, intervened, and said “Wait a minute we plan to
serve an area.” And then I think we were more diligent about how we asked the
question after that. (Miller 2007)

The growing number of requests for service territories prompted the authority to
evaluate its policies and regulations with regard to investor-owned wastewater utilities.

The authority’s mounting concern is reflected in the following statement by Miller:

I was appointed to this commission in 2002, and my first year on the commission, we
had a handful of [petitions for wastewater service territories]. They started trickling
in, and I noticed at every conference it was picking up; mostly Tennessee Wastewater
[Systems] but some others, and it became pretty obvious that it was growing pretty
quickly. . . . And you know, the light bulb went off for me, that this is growing and . . .
we need to get our arms around it. (Miller 2007)

Concerns resulting from the rapid expansion in requests for service territories
prompted the authority to hold a joint workshop with the Department of Environment and
Conservation in December of 2004. This workshop had several outcomes. The first was
a report prepared by Director Miller’s office containing four recommended actions for the authority. Per the report’s first recommendation, the authority and the Department of Environment and Conservation developed and signed a Memorandum of Understanding in April of 2005. This memorandum outlined the responsibilities of each agency (See Appendix V). It was hoped this memorandum would foster inter-agency communication to address the lack of coordination between the two agencies pertaining to decentralized wastewater systems.

The report’s second recommendation was for the authority to prepare legislation that would authorize it to develop a set of rules to ensure the continued operation of wastewater utilities. The Tennessee legislature passed legislation in 2005 that allowed the Tennessee Regulatory Authority to incorporate financing and bonding requirements into the wastewater rules it developed. In response to the report’s third recommendation, the authority developed a set of wastewater rules to better protect wastewater customers. These rules were adopted in June of 2006. The report’s final recommendation was for the authority coordinate the granting of certificates for wastewater service with local governments. In response, the authority sent a letter to all county mayors requesting information on bonding requirements their county enforced for wastewater utilities. No changes in policy or practice were identified with regard to further coordination with local governments.

Although, many of the wastewater service territories granted by the authority were issued prior to the adoption of the wastewater rules in 2006, these rules formalized

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30 In Tennessee, the chief executive officer of a county had originally been known as the “County Judge.” However, this title was changed in 1978 to “County Executive.” In 2003, the title for this position was again changed, this time to “County Mayor.”
the authority’s regulations. As such, they offer insight into what the authority identified as essential to fulfilling its role.\textsuperscript{31} This insight is essential to understanding the nature of the authority’s regulation and its influence. The stated purpose of the wastewater rules is expressed as:

(2) The purpose of these rules is to define acceptable practices for the provision of wastewater service. The rules are intended to ensure continued adequate and reasonable service. (TRA Chapter 1220-4-13)

Further examination of the 2006 wastewater rules reveals three goals of the authority’s regulation: ensuring continuity of service, uniformity of service quality, and avoidance of pollution. These three are explicitly stated in the “Adequacy of Facilities” section of the rules. The first item in this section states:

(1) All public wastewater utilities shall design, construct, maintain, and operate wastewater systems to comply with the rules, laws, ordinances and codes of state, federal, and local government agencies to assure, as far as reasonably possible, continuity of service and uniformity of the quality of service so as not to cause water pollution, wastewater spills, wastewater backup, or other undesirable conditions. (TRA Chapter 1220-4-13-.06)

GUIDELINES FOR GRANTING CERTIFICATES

Investor-owned utilities can only provide wastewater service within the territories granted to them by the authority through a Certificate of Convenience and Necessity.

Thus, it is important to consider the criteria for the authority’s decision when considering

\textsuperscript{31} Although no rules specific to wastewater utilities had been adopted prior to the rules adopted in 2006, the authority did have rules governing its practices and procedures. Chapter 1220-101 established basic definitions, general filing procedures, fees for dockets and filing, hearings and conferences by the authority, among other similar items. Additionally, the authority operated under a set of general rules relating to public utilities in Chapter 1220-4-1. This chapter provided for regulation related to tariffs, petitions for revising rates, provisions for changing the name of a utility, and requirements for reporting financial and accounting statements. The authority also operated under rules regarding utilities providing water service (Chapter 1220-4-3).
whether to grant a request for a certificate. The authority’s enabling legislation establishes the underlying basis for granting certificates. This section (TCA 65-4-201(a)) requires that public convenience and necessity require or will require the proposed service. Additional criteria are provided elsewhere in the authority’s enabling legislation and Wastewater Rules.

**Need With No Alternative**

The first criterion has two parts: demand for the service and the inability to secure this service through a neighboring provider. This comes directly from the authority’s enabling legislation. Section 65-4-203 of the Tennessee Code states:

(a) The authority shall not grant a certificate for a proposed route, plant, line, or system, or extension thereof, which will be in competition with any other route, plant, line, or system, unless it shall first determine that the facilities of the existing route, plant, line, or system are inadequate to meet the reasonable needs of the public, or the public utility operating the same refuses or neglects or is unable to or has refused or neglected, after reasonable opportunity after notice, to make such additions and extensions as may reasonably be required under the provisions of this part. (TCA 65-4-203)

To evaluate this criterion, the authority requires that all applicants for a Certificate of Convenience and Necessity justify existing public need for the service they desire to provide (TRA Chapter 1220-4-13-.04 (1)(b)). This justification is typically provided in the form of a letter from a land developer desiring wastewater service for a site. Applicants are also now expected to include estimates of the number of customers to be served initially and any estimates for growth. Second, the authority requires that this service cannot be obtained from other utility providers in the general area. To verify this
condition, the authority requires letters from neighboring utility providers—utility districts, the county, or neighboring municipalities—indicating their unwillingness to provide the proposed service. Typically, these entities either have no desire to serve the site or are unable to provide wastewater service at the time. If the neighboring service providers decline to offer service—in a timeframe, typically 12 months, that the authority feels is reasonable—the authority recognizes it as evidence that the service can be provided in no other way. This decline coupled with the desire for this service satisfies the authority as constituting public need. Hines described this understanding:

If the developer says “I want you to be my utility” and the city and the county and the utility district—if there is one—says “I [am not] going to do it”, TRA will not deny [the request for that certificate]. (Hines 2007)

Developers typically desire to connect to a conventional central sewer system where such a connection is economically viable. As such, developers do not generally seek to use a decentralized system for sites serviceable by sewer. Pickney described their operation as “a provider of last resort. So, if there is anybody else out there that wants to do it [or] can do it [then] the TRA is not going to give it to us, not even a parcel” (Pickney 2007). Elaborating on this logic, Hines related:

I tell [developers] right up front, “If you can get to a municipal sewer at a reasonable cost, then by all means do so.” But by the very nature of what that means, it is almost always not economical. There is a tremendous cost difference between putting in an eight-to-ten inch sewer line, with manholes every 400 feet or less, just to get it to the front entrance to the subdivision. . . . It generally is not economical by comparison to what we do. (Hines 2007)

Developer choice in infrastructure is ultimately driven by costs. Whichever wastewater service option provides the desired density at the lowest costs is typically
preferred (Hines 2007). Thus, because the decentralized system provides a low-cost alternative for peripheral locations decentralized systems have been favored. Furthermore, because most certificate requests to the authority have been for sites that are economically unserviceable by central sewers, they have been largely uncontested by providers of conventional sewer service.

*Technical and Managerial Ability*

The second criterion the authority considers is whether the applicant’s financial, technical, and managerial abilities are suitable to provide the services they desire to offer. The authority also considers the “proposed rates and such other matters as the authority finds relevant” (TRA 2007d). The 2006 Wastewater Rules require various documents be filed by utilities to aid the authority in making its determination. These include rates, schedules, and special contracts, as well as the utility’s operating rules and regulations. A tariff has to be filed which describes rules, terms and conditions, and the policies and practices of the utility. Although they have not always been required, the utility must also provide the authority with the designs for the system approved by the Department of Environment and Conservation, as well as the operating permit for the system.

*Intervention*

In addition to whether or not a neighboring utility was available and willing to provide the service and an investor-owned utility’s ability to provide the service, the authority is also influenced by whether or not anyone intervenes in the petition for a service territory. Director Miller stated that the authority not only considered the availability of another utility but also whether or not:
It is a contested case. . . . So, if anybody intervened and put on testimony about why it should not be done [then] we would hold a public hearing to allow the public to have input, and we would evaluate all [the input provided by interested parties]. But generally, we looked at whether or not local governments were interested [in providing the service]. (Miller 2007)

As there is little interest to extend conventional sewer lines into these areas and as there are only a few investor-owned utilities providing this service, there has been—with a few exceptions—little intervention. Nevertheless, the authority is sensitive to the intervention of outside parties, reflecting another influence guiding the authority. Charles Pickney explained that the authority requires that a need exists for the service and that “there was no voice of opposition” (2007).

**Service Territories: Policy Positions Resulting From Conflict**

Since the late 1990s, the authority has granted certificates for service territories that encompass both large and small areas. Some service territories correspond to the bounds of the residential, resort, or commercial developments being serviced. Others have been granted for large expanses of a county. Examples of both extended and isolated service territories are shown in Figures 5.1 and 5.2. No single rule, finding, or policy was identified that indicated why the authority grants some certificates for large expanses and others for more limited areas. However, Charles Pickney described the process as:

Basically, if you go in to claim a larger area and you can show there is a need . . . and nobody else objects—there is no other provider that cares—you can get it. If there is somebody who cares, you probably can not get it. (Pickney 2007)

In 2003, Tennessee Wastewater Systems, Inc. filed a petition to amend its
certificate to include unserved portions of Sevier County (Figure 5.3). Through the ensuing interventions and the authority’s ultimate findings, insight can be gained into the authority’s practice regarding the granting of service areas larger than an individual site. In their original petition, Tennessee Wastewater proposed to service remaining areas of the county outside of its existing service territories or areas “presently being served by the East Sevier Utility District and areas presently within the city limits and planned growth area of Sevierville, Pigeon Forge, Gatlinburg and Pittman Center” (TRA Docket 03-00329).  In September of 2003, the company amended its request for the unserved areas of Sevier County to exclude the two territories then served by Integrated Resource Management, Inc. In October of 2003, the authority approved Tennessee Wastewater Systems’ petition. However, an order granting this approval was not issued until March of 2004. In February of 2004, Tennessee Wastewater filed to amend its petition to include the area within the urban growth boundary of the City of Pigeon Forge. However, in April of 2004, East Sevier Utility District filed a petition to intervene in Tennessee Wastewater Systems’ original petition and requested the authority reconsider its approval, claiming that it had not received notice of the hearing (TRA Docket 03-00329).

In March of 2004, East Sevier County Utility District intervened in Tennessee Wastewater Systems’ request for the area within Pigeon Forge’s urban growth boundary. Pigeon Forge also filed a petition to intervene in this second docket. These two dockets were consolidated and were contested for over a year. Integrated Resource Management

32 Although this is referred to as the “planned growth area” of these cities, this undoubtedly was intended to be the urban growth boundary of the respective cities. Under Public Chapter 1101, cities do not have legally established “planned growth areas.” Rather, they have urban growth boundaries. The term urban growth boundary was used in the companies’ February 2004 amendment.
Figure 5.3  Decentralized wastewater service territories in central Sevier County, Tennessee.

also filed a petition to intervene in July of 2004. Ultimately, the authority issued an order approving in part and denying in part Tennessee Wastewater Systems’ service area extension into the unserved balance of the county. The authority granted approval to extend its service to properties for which it had immediate plans to service. However, the authority denied the utility’s request for the rest.

Important policy positions regarding the granting of certificates resulted from the conflict in Sevier County. In its determination, the authority found that granting a service territory inclusive of most of Sevier County would remove the opportunity for developers or landowners to have a say in which investor-owned utility should have the authority to service their property. Second, the authority determined that granting an expansive service territory could have the undesirable effect of requiring persons who desire wastewater service to contract with a particular utility, one possibly not of their choosing. This was seen as unnecessarily removing the property owner’s “ability to make independent decisions about the least costly and best system for their purposes” (TRA Docket 04-00045). Additionally, the authority found that the granting of a countywide service territory might have precluded the ESCUD or the City of Pigeon Forge from extending service to customers desiring wastewater service from these entities. As the hearing officer determined that the present and future public convenience did not require granting a countywide service territory in this case, there was seen to be no reason to create a potential legal impediment to these entities. Director Miller explained it as follows:

The monopoly is created, and then we regulate it. The developer comes in and hires whoever they want to develop their system and then turns it over to them. At that
point, they come to us for approval to service an area. [At that point] then there is a
well defined plan for development. And so, they have already kind of created the
monopoly, the developer makes that decision. (Miller 2007)

We do not want to create a monopoly. We want to regulate a monopoly once a
developer has chosen somebody. . . . But this has all developed, it is a developing
process, and it is developed out of conflicts and law suits and interventions of CCN’s.
(Miller 2007)

Evident in the authority’s Sevier County decision is a reluctance to dictate to
developers whom they can choose as a wastewater provider. Nevertheless, the Tennessee
Regulatory Authority has granted larger territories since the conclusion of the Sevier
County issue. In such instances, however, there was local support for the granting of the
large area. When asked what has determined whether service territories are granted for
large areas or are for project-specific boundaries, Director Miller indicated that, in the
case of Fentress County, the county mayor asked that Tennessee Wastewater be granted
the authority to service a large portion of the county. Relating this situation, Miller
stated:

We would not [have] grant[ed the request]—for example, in Fentress County—had
the county government not been supportive. And it is my recollection we had a
resolution from the county commission and the support of the county mayor saying
“We want to do this.” . . . If you grant a large area like that, then . . . whoever holds
the CCN can dictate development. Then you put the developer in a position of only
having one choice if he wants to develop that property, and that is not TRA’s role
either. (Miller 2007)

Certificates: Individual Basis/Individual Merit

Due to the authority’s aversion to creating monopolies—unless requested to by a
county government or no one intervenes in the petition—the granting of service territories
has been development driven. Service territories have thus been determined in the field between providers of these services and the developers. The authority evaluates each request for a service territory on its own merits, with little or no consideration for service provided in the neighboring area. The authority does not consider that one service provider is already operating a number of systems in a general area. This has certain advantages—namely, the authority does not dictate the service provider for a certain area. However, as Figure 5.1 and 5.3 indicate, the authority’s practice of evaluating each proposal on its own merits—whether or not a neighboring utility can provide service in a timely manner, whether someone intervenes in the petition, and whether the utility is managerially and technically capable of providing the service—has produced a seemingly irrational service pattern of wastewater provision. In the case illustrated in Figure 5.1, the authority granted Integrated Resource Management and Tennessee Wastewater service territories on different corners of an intersection of two roads. In this small area, three different utility providers operate systems. This is because the authority evaluates each request for a service territory on the basis of public need at that site and the ability of the proposing provider to supply the service requested.

ISSUES OF GROWTH AND TIMING OF DEVELOPMENT

Although the authority is charged with determining that the public need exists prior to the granting of the certificate, no evidence was found that the authority considers the timeliness of the development or the availability of other necessary infrastructure like roads, water systems, or schools. This is because the authority has accepted the desire by a land developer to construct a project at a location as public need. Asked what satisfies
the Tennessee Regulatory Authority as evidence of public need, Director Miller responded:

The fact that there is a developer that has a plan for developing an area would demonstrate a need.

[Curtis: At this time, does TRA look at other infrastructure issues? . . . ]

No. I mean well, is your question whether it is realistic that the [development occur]? . . . I think we do look at [whether or not] there is a real plan for development, but I do not know how deep our investigation [goes]. . . .

There is a bigger issue going on out there and that is planned growth, which we do not have a real role in. We try to make other agencies aware that it is going on. We have had enquiries from legislators on what ought to be done about it, but nobody has picked up the ball and said, “We [should] coordinate further than what we have done so far.” (Miller 2007)

Planning issues, such as the timing of development and the coordination with other services, are not directly considered by the authority. Issues such as road access are typically only involved if someone were to use that as cause in their intervention. However, this is not something that the authority seeks out because such issues are beyond the strict purview of the authority as established in its enabling legislation.

Well I do not think you can point to anything in our statute that gives us the authority to establish, you know . . . there was nothing in our legislation, there was nothing in 1101 that gives us the authority to make planning type decisions. (Miller 2007)

Asked if it is Tennessee Regulatory Authority’s duty to consider the timing of development, Director Miller responded:

No. I do not think it is our role. I mean, I think it is something that I know ought to be looked at and . . . that is why I invited the legislature and the comptroller’s office to be involved in this because there is a role for somebody to play. Probably the
[Tennessee] General Assembly to set out some rules on developmental growth, but I do not think it is our role. (Miller 2007)

As established in their enabling legislation, the goal of the authority’s regulation is to assure that the need exists and that the utility proposing to provide the service is capable of doing so. Although, the authority requires that need exist, the enabling legislation does not require the coordination with other services or with local land-use regulation. It simply requires that the present or future need for the service exist.

Therefore, issues regarding planning, land use, and the timing of development do not fall within the scope of the authority’s regulation, and they are not something for which the authority has chosen to assume responsibility.

I do not want to presume any authority. We were really just trying to make sure that this new industry . . . was [regulated] in a manner that ensured that there would be an entity around to take care of customers in the future and that we coordinated our efforts with other state agencies that had to be involved with this process. (Miller 2007)

When asked if there is any coordination between service territories and the growth plans established under Public Chapter 1101, Director Miller responded:

Not other than we check with the local government to make sure that they have no interest in serving the area. And I would assume, if it were within, for example Collierville’s urban grown boundary and they respond to us “No, we plan on serving that area at some point so we do not want you to grant the CCN.” In that respect we take [growth boundaries] into account. . . . There is no planning aspect to our granting the CCN. . . . We are limited to if they demonstrate the managerial, technical, financial background; it is hard for us not to grant it. (Miller 2007)

The authority’s actions further indicate that the authority does not feel it is their responsibility to look independently for the relation of service territories to planning
boundaries—whether to the extraterritorial region of a planning commission or the county’s growth plan. No enabling legislation, rules, nor statutes require or direct them to do so. Neither in the interviews with people knowledgeable of the authority nor from the observed actions of the authority has this research found evidence that they do. As Charles Pickney explained:

All they are concerned about is if we authorize somebody to provide sewer to these 87 homes . . . ten years from now or 20 years from now are those homes still going to have sewer? That is all they care about. . . . They are not in the planning and zoning business. . . . The TRA is not the place for that. The actual planning commissions themselves are where all that needs to be worked out. (Pickney 2007)

Nonetheless, through its granting of CCNs and its determining of public need, the authority has absorbed a critical role in community planning.

CONCLUSIONS

Through the granting of service territories, the Tennessee Regulatory Authority has had a direct role in the establishment of the wastewater utilities operating many of the decentralized wastewater systems in the state. Without the authority’s granting of service territories, investor-owned utilities could not directly provide wastewater service. This would likely have hindered the adoption of decentralized wastewater systems. Guided by goals derived from its enabling legislation and a historical mindset oriented to customer protection, the authority has provided a regulatory mechanism to allow investor-owned public utilities to use technology to meet an immediate market demand where conventional infrastructure and service providers are often not alternatives. Guided by the letter of its enabling legislation, the authority has interpreted the requirement for need
as the desire for development without consideration of larger planning policy concerns.

The Tennessee Regulatory Authority has allowed the establishment of both small, dispersed service territories and large territories. This has resulted from the authority’s sensitivity to intervention and its reluctance to create a monopolistic condition by granting expansive service territories, except to accommodate the requests of local government. The granting of uncoordinated service territories resulted from the authority’s practice of evaluating each request on its own merits. The granting of small areas when conflict exists, such as in Sevier County, reflects the authority’s desire to appease all groups involved as much as possible. The granting of service territories has allowed investor-owned utilities to use decentralized systems to respond to market demands—whether real or perceived—based on developer initiative with no consideration of the impact on land use and development patterns.

In addition to the authority’s direct role in establishing the service territories and regulating the utilities operating in these areas, it also played an indirect role in the introduction and use of decentralized systems in the state in at least four ways. First, as the initial and leading operator of systems in the state, Tennessee Wastewater Systems did much to promote and locally prove the viability of decentralized systems. The ability of this utility company to secure service territories from the authority was critical to the proving of decentralized systems. Second, through its regulatory authority, it bestowed legitimacy to investor-owned public utilities. Such entities were not widely recognized as wastewater service providers prior to the mid-1990s. Because these utilities were regulated by this state agency—as well as the Department of Environment and Conservation—they could claim that they were approved by “The State.” This status
boosted the confidence of local officials, developers, and customers when they were presented with an unfamiliar technology and unique utility provider. Third, investor-owned utilities could claim the status of a “public utility” under local land-use regulations.33 Because such regulations often bestowed greater development densities for sites served by a “public utility”, the systems carry with them density bonuses which had only previously been afforded by central sewers. Finally, the authority provided the regulatory mechanism to ensure customers that these utilities would be protected. This protection came in the form of the authority setting the rates that could be charged and providing oversight of their financial solvency, which was important to furthering the credibility of these utilities. In time, the authority also came to require financing be established to ensure continuous service to customers. This uninterrupted operation of the systems had been a concern of the Division of Water Pollution Control because it is important to the environment. However, the division had no control over rates and financing. The authority’s provision of this element of control may have eased some reservations held by the Division of Water Pollution Control. Through these direct and indirect influences, the Tennessee Regulatory Authority played an important role in expanding the use of decentralized systems in the state.

33 It should be noted that the term “public utility” is not used here in the conventional sense of the term to describe an entity providing a public service. Rather, it is used in the distinct sense of its common use in land-use regulations in the state of Tennessee. In these regulations, the term “public utility” is often used to distinguish utility service provided through a “private” septic system from that provided by the “public” sewer system. In these communities there was often only a single sewer system and it was typically operated by an entity of local government.
CHAPTER VI

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Having examined the role of the Tennessee Regulatory Authority in the previous chapter, we now turn to an examination of the goals and responsibilities of the other state agency influencing the use of decentralized wastewater systems: the Tennessee Department of Environment and Conservation.

REGULATORY AUTHORITY: DIVISION OF WATER POLLUTION CONTROL

State Operating Permit

The Tennessee Water Quality Control Act of 1977 requires that persons operating a sewerage system obtain a permit (Tennessee Code Annotated [TCA] 69-3-108(c)).\(^{34}\) This act makes it unlawful to alter the physical, chemical, radiological, biological, or bacteriological properties of any waters of the state without one (TCA 69-3-108(b)(1)). As such, discharging sewage or other wastes into waters or to a location from which it is likely that the discharged substance will move into waters is prohibited except in accordance with the provisions of a valid permit (TCA 69-3-108(b)(6)). The Commissioner of the Department of Environment and Conservation is authorized to grant the necessary permits. The law states that by granting such permits the commissioner “shall impose such conditions, including effluent standards and conditions and terms of periodic review, as are necessary to accomplish the purposes of this part” (TCA 69-3-

\(^{34}\) Persons exempted from this requirement include those discharging domestic wastewater into a privately owned septic system or into a publicly owned treatment works (e.g., a city sewer system).
108(e)). Under no condition is a permit to authorize an activity that would cause a condition of pollution as defined under the law (TCA 69-3-102).

Because the Division of Water Pollution Control (WPC) within the department has been charged with administering this Act, it issues state operating permits for sewage treatment systems that do not directly discharge to surface or subsurface waters. Various kinds of entities hold state operating permits for sewage treatment systems, including public utility districts, water and wastewater authorities, municipalities, county school boards, and investor-owned public utility companies, among others. All decentralized wastewater systems, as defined in this research, are regulated by this permit. Additionally, the division issues National Pollutant Discharge Elimination System permits for systems discharging directly to a surface water body. Conventional sewer plants typically discharge to a surface water body and, thus, are regulated by this permit.

*Permit Application Review and Approval*

An application for a state operating permit is first received by staff in one of the department’s eight Environmental Field Offices (Appendix VI). Staff from this local office then visits the site for a cursory evaluation of the site’s conditions. If this examination does not raise any concerns, the staff then forwards the application to the permit section in the division’s central office in Nashville. Upon receipt of a completed application, the application is processed and assigned a permit number and logged into the department’s permit database (O’Dette 2007).³⁵ The division considers the proposed

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³⁵ This review process was being altered such that Division of Ground Water Protection staff was beginning to assume some responsibilities that had previously been handled by staff within the Division of Water Pollution Control. However, most, if not all, systems considered for this research had been reviewed under the model described here.
activity and prepares a draft permit which includes any conditions or applicable performance standards as established in federal or state regulations and guidance. The division also considers what effect the proposed activity may have on surface and subsurface waters to ensure that all designated uses conform to applicable water quality criteria.

The effluent limits and monitoring requirements in a state operating permit are designed to protect water quality. Two aspects are critical in the review of the application. One is the engineering report/design, and the other is the soils map of the proposed disposal field. The engineering design is reviewed to ensure the quality of the system design. The soils map is evaluated from two perspectives. The first is to ensure that the proposed discharge—drip or spray—field is suitable to accommodate the proposed discharge (e.g., that the discharge will be absorbed without breaking out onto the land surface). The second concern is whether the discharge field can bring any pollutants down to the level specified in the permit. If, through this review, the soils for the site appear to be marginal for the proposed design, then the division requires that a soil scientist perform a special site evaluation (O’Dette 2007). Once the engineering calculations and the physical conditions are determined to be acceptable for the proposed design, a draft permit is put on public notice. This is a 30-day review period, during which the applicant and the general public can comment on the permit. If no concerns are raised by the public then the permit becomes effective. If concerns are raised, the division holds a public hearing. Public hearings are held on approximately ten percent of the permits submitted (O’Dette 2007; Qualls 2007). Following a public hearing, the division issues a notice of determination, in which it responds to both water quality and
operational issues and explains why it is either issuing or not issuing the permit in question.

In August of 2005, the division introduced a new application form for state operating permits. The new version requested greater detail regarding the system and the development it was intended to serve. The new application records the type development to be supported and the number of units the system is proposed to service. With this greater detail, state operating permits now stipulate the approved number of units (homes, business, or other facilities), the design flow, and the acreage of the disposal field. The plans and specifications that are approved are required to match this information.

Although information regarding the physical location of the treatment facility is recorded on the application, state operating permits do not specify an area for which the treatment facility is authorized to provide service. Such specification is not within the division’s regulatory purview. While the division may specify the design flow and the number of units, the permittee could theoretically—from the division’s regulatory perspective—extend collection lines 20 miles in every direction as long as the system does not exceed the design capacity of the permit. Early permits did not designate a system’s volume.

ROLE IN INTRODUCTION OF DECENTRALIZED SYSTEMS

Recognition of a Need

The initial role that the Tennessee Department of Environment and Conservation played in shaping the use of decentralized systems began not so much as a department-wide initiative or policy change but rather as a result of the actions of two individuals working in the department’s central office. Although certainly not solely responsible,
they were instrumental in the department’s role in the technology’s introduction. One individual was Steve Fishel, the other was Sam Weiland. Fishel was looking for economical wastewater disposal for sites generating small flows that were unserviceable by sewers (Source D13b 2007). The current Chief Engineer for the division portrayed Fishel as

unique in his role. He was in the Plans Review/Municipal Facility Section, but he was more of a technical advisor, somebody that folks could call and he could answer questions. Or if he did not know the answer, he knew who to call. . . . Steve became very involved in the decentralized system technology. And so, he and Sam were working on a way to promote, really promote that technology in Tennessee, because they did see all of these problem systems, especially Steve because he would get out [in the field]. Sam pretty much was in the office reviewing plans. (Qualls 2007)

In an interview for this research, Sam Weiland related that it was around 1988 when Fishel first began to hear about the use of recirculating sand filters to treat wastewater. Desiring to explore this concept further, Fishel sought to have the department fund travel to visit sites and speak with people using this technology. Although the department denied his request, Fishel went to Oregon on his own to examine sites using alternative technologies. Fishel became convinced of the technology’s usefulness and pressed Weiland to get them approved for testing in Tennessee (2007). For the next few years Fishel and Weiland continued to educate themselves on these technologies and tried to convince their supervisors in the department of the systems’ usefulness. In the meantime they worked with a few experimental systems to locally demonstrate the systems’ reliability and usefulness (Weiland 2007). Without the interest and support by these two individuals within the Division of Water Pollution Control, and the division’s recognition of problems with
existing package plants and homeowners associations, the challenge to the Pickneys in overcoming this regulatory hurdle would likely have been much greater.

Two issues facing the Division of Water Pollution Control during the late 1980s and early to mid 1990s prompted Fishel and Weiland’s interest in alternative technologies. The first regarded problems with activated sludge package plants. The second regarded the nature of operators available when government entities were not willing or able to operate these systems.

The Technology Aspect: Package Plants

While other small-flow technologies—such as facultative lagoons—were being used to a degree in the late 1980s, the principal treatment system used for unsewered sites—other than septic systems—was pre-engineered package wastewater treatment plants (package plants). As mentioned in Chapter Three, this system typically employed an extended aeration activated-sludge process to treat wastewater, which was then discharged to a surface water body. While the number of package plants in operation in Tennessee in the mid to late 1980s is not known, estimates by interviewees placed the number of systems at around 100 to 115 (Lemasters 2007; Source D13b 2007).³⁶ One source estimated this number was down to about 60 in the spring of 2007 (Source D13b 2007). These systems generally discharged directly to a stream.

Ultimately, package plants remained of relatively limited use in Tennessee. While a few had been used to serve residential subdivisions, developers generally stayed

³⁶ This number conforms to, although it is slightly lower than, the number Qualls estimated as existing around that time. Qualls stated, “I really don’t have a gauge on how many there were. About that time, you could maybe count 250 small domestics [domestic systems]. But that would include small towns. But, of those [250] a great percentage would have been package plants” (Qualls 2007).
away from this technology because it was costly. These systems also required either a long-term commitment to operate or the establishment of a homeowners’ association by the developer to accept operational responsibilities. Package plants more commonly served facilities where a long-term operator was available, such as a school board, the Tennessee Valley Authority, or the U.S. Army Corps of Engineers; these last two operated package plants at parks and campground facilities.

There were also several operating problems with package plants. These plants were susceptible to variations in both the volume and composition of wastewater flows (Crites and Tchobanoglous 1998; Lemasters 2007; Weiland 2007; Source D20a 2007; Source D13b 2007). To function properly, they needed to be loaded on a continuing and consistent basis. Therefore, they were susceptible to the seasonal and weekly fluctuation in the flows associated with schools or campgrounds. Proper operation and maintenance is critical to any wastewater system. This is especially true of package plants. However, many package plants served places—schools or campgrounds—where the operator was usually the janitor: “[someone] who kind of knew about turning on pumps and blowers . . . but as far as operational control that really was not his forte” (Lemasters 2007). Receiving attention on a part time basis, these systems tended to become strained, and they would discharge sludge into the receiving stream.

Due to these problems, package plants were recognized as prone to problems and potentially damaging to the environment. Because package plants often lacked the necessary operator control and/or had difficulty maintaining their permitted discharge limits, the department shifted its policy regarding this technology in the early 1990s (Lemasters 2007; Qualls 2007; Source D20a 2007; Source D13b 2007; Weiland 2007).
After this time, new package plants were discouraged. Existing plants were being taken off-line and connected to sewers where possible. Permits continued to be reissued for existing plants where it was not possible to connect to sewers, but new plants were not being approved (Lemasters 2007; Source D20a 2007; Source D13b 2007). Chapter 15 of the Division of Water Pollution Control’s *Design Criteria for Sewage Works* handbook presents applicants with a series of six steps through which they are to progress in order to select the treatment system for their sites.

First, applicants are to examine the possibility of discharging into a central sewer system. Second, they are to exhaust the possibility of using subsurface disposal. Water conservation and/or reuse systems are the third option. The fourth option is to exhaust the possibility of using “passive” treatment systems. Such systems include lagoons or artificial wetlands, systems that are less prone to mechanical and operational problems. The fifth option is easy-to-operate mechanical systems; recirculating sand filters are included in this category. Finally, as a last resort, applicants can consider a mechanical package-activated sludge plant. However, the criteria specify that, due to economic, operational, and maintenance requirements, package plants with flows below 50,000 gallons per day will not be approved. Interviewees unanimously stated that no new package plants regardless of size had been approved since the early 1990s (Qualls 2007; Source D20a 2007; Source D13b).

One source stated that, when many of these package plants went in, the department was simply glad to have treatment at all. This source related the following story, which is important for putting the use of package plants into perspective:
I had an outhouse till I was five years old, and I can remember going to that outhouse. And then I can remember going up to my great grandfather’s house in the country. I remember looking at the outhouses up there and thinking, “You know, those outhouses do not stink as much as my outhouse.” You know why? [It is] because they were built on stilts out over the creek. This was in the 1960s. So we have come a long way. When we were putting in package plants for schools in the 1960s, for some of them it was the first time they ever had any treatment. [You must] remember, prior to that, folks were running waste out in the ditches and the creeks raw. So, to [the department] at that time, [package plants] looked like a pretty good thing. (Source D13b 2007)

However, as time went on and technology progressed, package plants were increasingly unacceptable. The department began to question the reliability of this treatment option, and it was within this setting that Weiland and Fishel began to look at other technologies, ones that were more passive and less operator intensive (Source D13b 2007). This led to the introduction of the recirculating sand filter and later to other advanced wastewater technologies.

Operational Aspect: Homeowner Associations

In the late 1980s and early 1990s, most of the permittees for wastewater systems—from central sewer to package plant systems—were government entities. However, in many areas no such entity was available or willing to operate a package plant system. In such areas, the division required that developers proposing to use a package plant apply for the operating permit.37 Although this was not common, the permit would be issued to the developer, and he would be responsible for operation and

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37 This permit would have been for an NPDES permit if the developer was proposing a system that would discharge to a surface water body or for a state operating permit if the system was designed to discharge through some type of land application system which was rarely done.
maintenance. The developer could create a homeowners’ association to which he would transfer the permit and responsibility of the system when a critical mass of homeowners had bought lots or built homes in the development. Lemasters noted this transfer as being one where “the problem just shifted from one entity whose sewer operating responsibilities were not high on his priority list to a homeowners’ association who had similar inclinations towards operating a sewer plant” (2007).

Homeowner associations in Tennessee have historically proven to be poor operators of sewer systems (Lemasters 2007; Qualls 2007; Source D20a 2007). Homeowners associations are generally responsible for collecting dues to care for common areas or even possibly roads, the water system, or lighting. However, these are all aspects of a development that benefit from greater awareness by its residents, elements that are either aesthetically noticeable or more prevalent in their mind than a wastewater treatment system. “The whole sphere and the sewer plant and the sewer system was kind of like a ‘red headed stepchild,’ out of sight out of mind, throw the minimum amount of money and effort to it and hopefully it will run itself” (Lemasters 2007). Often they had trouble keeping a certified operator for the system or they would become unwilling to pay for the necessary maintenance.

Not only was the operation of a sewer plant low on their priority list, but these associations did not maintain a consistent membership due to turnover in the residents of the development. It is quite possible that individuals buying into a development might not know that their association was responsible for the wastewater system since they are often perceived as the responsibility of a local government. This combination of unconcern and unawareness coupled with the transient nature of their membership made
these associations unreliable permittees. Further, it was often “very difficult to get a bunch of homeowners together and have [them] spend extra money on something they weren’t necessarily planning on funding” (Source D13b 2007). Indeed, some of the worst examples of failing or poorly operating systems were associated with homeowners’ associations (Qualls 2007).

Recognizing problems with the operation of wastewater systems by homeowners’ associations, the Division of Water Pollution Control was resistant to issuing them permits. However, the division could not legally discriminate based on the nature of a permittee. Lemasters, the division’s Chief Engineer from the late 1990s to the early 2000s, asked for a legal opinion from the department’s general council as to whether the division could deny a permit on the grounds that the permittee would be a homeowners’ association (2007). The legal opinion was that the division could place conditions in the permit for operation and maintenance but could not deny a permit based solely on the nature of the permittee. While the division did try to discourage the permitting of homeowners’ associations, ultimately if a development was far “away from a sewer system, then [the division] struggled trying to put enough verbiage in there that would put the onus on them to operate these things properly” (Lemasters 2007).

Solutions: Technological and Operational

Starting slowly and building throughout the 1990s, the Division of Water Pollution Control was increasingly presented with permit applications for wastewater systems on sites where conventional sewers were not available and septic systems were not suitable. From the perspective of the division, problems with package plants and homeowners’ associations had hindered the provision of wastewater system in these
areas. This decade witnessed the solution to both issues.

Using more passive and less operator-intensive technologies, such as the recirculating sand filter, decentralized wastewater systems solved many of the problems related to package plants. These technologies refined the wastewater to a point where it did not contain any visible solids. While not maintenance free, these systems tended to be more forgiving of fluctuations in flow volumes and concentrations. Not as susceptible to the technological problems associated with package plants, these systems experienced a more rapid and widespread use. Coincidentally or not, the increased use in these “low-tech” systems coincided with the division’s policy to no longer permit new package plants. While it cannot be said conclusively that the division’s resistance to package plants prompted the turn to technologies such as the recirculating sand filter, that these two events occurred at roughly the same time suggests a very strong coincidence if not influence.

The establishment of the Pickney’s investor-owned public utility company presented the solution to the operational problem associated with homeowner associations. At that time in Tennessee, the Pickneys were unique because they desired to design, build, own, and operate small-flow wastewater systems on a for-profit basis. Their willingness to operate wastewater systems as a business allowed them to offer both the developers and the Division of Water Pollution Control something that had not been available before: a reliable permittee desiring to assume responsibility for these systems. Very different from a developer expecting to turn operations over to a homeowners’ association, the Pickney’s company presented the division with both an entity to operate the system—something important even with the use of “low-tech” technologies—and
someone to be held accountable should something go wrong. With the division wanting to move away from permitting homeowners’ associations, the timing was right for an investor-owned utility to approach the division (Source D13b 2007; Weiland 2007). The Chief Engineer for the division in the late 1990s stated that “after issuing several permits to Tennessee Wastewater [Systems] we started having a little bit better feeling about them” (Lemasters 2007). However, their comfort level was not established overnight, for the division retained concerns about the company selling its interests to another entity (Lemasters 2007).

The Pickney’s company presented a new way of permitting and operating wastewater systems. As with any new idea, it took time for the division to truly become comfortable with this model. Additionally, around this time the U.S. EPA was also looking into decentralized systems and identified them in a 1997 report to Congress as a viable option for wastewater disposal in suburban and rural areas. It began to publish manuals and reports on these systems, which undoubtedly lent support to the Pickney’s case with the division. Once decentralized systems were shown to work, the division’s initial concerns more or less dropped away. Additionally, when the division stopped permitting the operation of these systems to homeowners’ associations and required them to be operated by a public utility it improved the quality and operation of the systems, which, in turn, aided their acceptance.

THE DIFFERENCE OF A DIVISION

Two divisions within the Department of Environment and Conservation regulate activities related to wastewater collection, treatment, and disposal. As indicated, the
Division of Water Pollution Control is responsible for administering the Tennessee Water Quality Control Act of 1977 and is, thus, responsible for regulating wastewater systems under this act. However, this act specifically exempts homeowners using a septic system. Septic systems are regulated by the Division of Ground Water Protection (TCA 68-221-401). Through this second division, the department administers the Subsurface Sewage Disposal Program. The goal of this program is to regulate subsurface sewage disposal to ensure that the ground waters of Tennessee are maintained in a safe and usable condition (Tennessee Department of Environment and Conservation, Division of Ground Water Protection [TDEC GWP] 2007).

Although both are divisions of the Department of Environment and Conservation, they differ in the systems they regulate and their approaches to this regulation. In a general sense, these two divisions regulate systems at the two extremes of the continuum of wastewater treatment: onsite septic systems and central sewer systems. These two systems are vastly different in levels of operation and maintenance as well as technical specialization. Sewer plants require regular operation and maintenance; thus, they are issued operating permits that specify environmental standards that must be maintained. These permits have sampling requirements and limits associated with the facility as well as maintenance and inspection requirements. While the importance of maintenance issues related to septic systems should not be discounted, if a septic system is properly designed, sited, and installed, it will typically function reliably. One source indicated as much, stating that the “beautiful thing about a septic tank is it’ll pretty much work if you don’t abuse it too bad [and] . . . if you have a good site to start with” (Source D13b 2007). Because proper design, siting, and installation are so important, the Division of Ground
Water Protection issues construction permits rather than operating permits.

*1997 Memorandum of Agreement*

Decentralized wastewater systems possess certain aspects of both a conventional septic system and a central sewer system. Similar to a septic system, they typically discharge through some type of land application system rather than through surface discharge. However, these systems require ongoing operation and maintenance, like a sewer treatment plant in a centralized system.

During the 1990s, the department was receiving an increasing number of applications for alternative onsite wastewater systems. It was sometimes unclear how to distinguish which systems fell under the purview of the Division of Water Pollution Control versus the Division of Ground Water Protection. To address this, the two divisions signed a memorandum of agreement in 1997, establishing how these alternative systems would be regulated, systems which they referred to as “large septic tank effluent pump/gravity sewage disposal systems” (Appendix VII). This agreement distinguished systems by the depth at which the disposal lines were installed. The Division of Water Pollution Control was to be responsible for “those systems, other than conventional or alternative systems regulated by the Division of Ground Water Protection, that are designed to be installed at a depth of seven (7) inches or less” (Tennessee Department of Environment and Conservation Memorandum of Agreement [TDEC MOA] 1997). The Division of Ground Water Protection was to be responsible for systems where the disposal lines were installed at depths greater than seven inches. Ground Water Protection was to provide technical assistance upon request, particularly with regard to the suitability of the soil.
As a result of this agreement, regulation of decentralized wastewater systems in the state—through 2006—had been by the Division of Water Pollution Control. Placing the review of decentralized systems under this division was logical. First, these systems require a considerable degree of engineering. Second, they contain various components requiring ongoing operation and maintenance. In these two regards, the Division of Water Pollution Control was the natural fit because its staff had a background in conventional sewer treatment plants. The Division of Ground Water Protection has not historically possessed an ongoing monitoring presence of their systems and has been historically oriented to soil science rather than engineering.

*The Division’s Resulting Influence*

Placing decentralized systems under the review of the Division of Water Pollution Control affected the use of decentralized systems in Tennessee in two ways. First, by being regulated by Water Pollution Control, the systems were reviewed and approved based on design criteria rather than prescriptive rules and regulations, allowing for a greater degree of design flexibility. Second, the Division of Ground Water Protection requires a duplicate area be held in reserve should the disposal field need to be replaced. Thus, regulation by this Division would have doubled the area required for a system.

These two divisions differ in the means by which they evaluate systems. The Division of Water Pollution Control reviews systems based upon the handbook entitled *Design Criteria for Sewage Works* while the Division of Ground Water Protection reviews systems based upon prescriptive-based regulations (Tennessee Department of
The Division of Water Pollution Control’s *Design Criteria for Sewage Works* are performance based criteria designed to achieve a desired outcome. Performance criteria do not prescribe a specific solution but rather a level of treatment necessary to ensure the protection of the public health and environment. A performance-based code, such as that of the Division of Water Pollution Control, requires proper operation and maintenance to ensure continued performance. Additionally, this approach allows various solutions to achieve a desired outcome. During the early and middle 1990s, engineers operating under the division’s design criteria started developing systems based on technical and scientific reasons. It was understood that if these systems failed, the permittee would be required to replace the system, but it was this latitude in design that allowed the engineers to introduce new technologies.

Regulation by the division of Water Pollution Control not only gave engineers the latitude afforded by the design criteria, but the division did not require that systems hold a duplicate area in reserve. The Division of Ground Water Protection requires such an area. This undoubtedly generated pressure from the developers and engineers to place decentralized systems under Water Pollution Control’s review. Sources indicated that they felt that there had been a kind of “division shopping.” As the Division of Water Pollution Control did not require this duplicate area, this division was identified as the “Path of Least Resistance” (Qualls 2007; Source AA1 2007; Source D13b 2007). One source indicated that land savings afforded by this regulation was one of the guiding influences in using a decentralized system instead of a large conventional common drainfield serving septic tanks at multiple sources:

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38 Although the department’s name has since changed, this previous department name appears on the cover sheet of the *Design Criteria for Sewage Works* handbook.
[A decentralized system is] cheaper in the fact that it does not require as much land. [Land is expensive;] particularly when you are taking a lot out of the developer’s hand. The difference is, at this point in time, the regulations do not require duplicate disposal areas for drip systems; they do for septic systems. (Source C24a 2007)

This influence is illustrated in an engineering report prepared for a treatment system in Cumberland County. In evaluating various wastewater treatment options available to a particular site, the report stated that insufficient area was found on each lot for individual septic systems due to inadequate soil depth. However, an area of suitable soil was found in which a common large subsurface sewage disposal system could be installed. Such a system would use septic tanks at homes and a common drain field. However, this type system would be regulated by the Division of Ground Water Protection and, thus, would have been required to include a duplicate area. The engineering report found that the “area [of suitable soil] was not of sufficient size to accommodate a system serving 117 lots and have the required duplicate area as per Division of Ground Water Protection Regulations” (SOP file 06027). Because a duplicate area is not required for systems regulated by the Division of Water Pollution Control, it undoubtedly encouraged both the use of a decentralized system and the regulation of these systems by the division.

THE INFLUENCE OF ENVIRONMENTAL REGULATIONS

Evolving Requirements

Following Fishel’s and Weiland’s research into such technologies as the recirculating sand filter, they, along with the Chief Engineer, revised Chapter 16 of the Design Criteria for Sewage Works to better reflect advancements in these technologies.
In modernizing Chapter 16, they drew on information from Orenco, the division staff’s own experience with soils and wastewater systems, and the knowledge and experiences of others who had researched the use of these technologies. One important source of experience was Michael Hines, a pioneer of the recirculating sand filter technology. Hines assisted in the development of the *Design Criteria for Sewage Works* used by the division (Hines 2007). Weiland stated, “Well, it didn’t take long to find out, from the West Coast [Orenco began in Oregon] and Mike Hines, that these [systems] are so simple, that they’re almost fail proof” (Weiland 2007). The changes they developed for the criteria were finally adopted into Chapter 15 in April 1996. Additional guidance was obtained from regulations used in other states, such as Georgia, which had developed design criteria more tailored to the kind of decentralized systems that were being proposed.

During the period of initial use, there was a progression in terms of how the division understands and reviews these systems. From the late 1990s through the early 2000s, an ad hoc committee of engineers, regulators, soil scientists, and utility operators worked to establish an acceptable rate at which wastewater could be applied through drip application: “There was no science out there, there were lots of regulations, a lot of states had regulations but they were based on septic tank drain field regulations, [which is a] different animal” (Hines 2007). Eventually, the group established an acceptable rate for applying wastewater to the land surface and the Division of Water Pollution Control agreed to accept systems operating at this rate. However, around 2002 changes were made to tighten up the division’s requirements for these systems. This occurred because the division became aware at that time of issues with soils beyond what had been realized.
previously. At that point, staff began taking a closer look and asking applicants to do a better job of evaluating the soils for their discharge sites (Qualls 2007).

*The Influence of the Environmental Regulations*

The technologies—such as the recirculating sand filter—introduced in the 1990s enabled a movement away from surface water discharges and towards land application of wastewater. This was made possible by the fact that these technologies refined the wastewater to a point where it did not contain any visible solids. This enables the use of drip irrigation systems and so removes the constraint of discharging to a surface water body. Although these systems can be designed to discharge to a surface water body, the ability to discharge through land application provided greater siting flexibility. For many sites, discharge to a water body may not be possible as a major water course may not be available within a reasonable distance. Additionally, a nearby stream may have such high levels of pollutants that a National Pollutant Discharge Elimination System (NPDES) discharge permit could not be issued for a surface water discharge. However, most sites will likely have at least a small area of suitable soils to receive the refined wastewater.

Regardless of the evolving requirements in environmental regulations, it is revealing to note that interviewees generally agreed that these regulations have not proven much of a barrier to the use of decentralized wastewater systems. It is revealing to consider that only two permits identified in the division’s permit database—for decentralized system as defined in this research—had been denied. Another 53 were classified as inactive; these had never been built. One reason for the low number of
denials undoubtedly relates to the fact that the engineers and utilities are unlikely to submit an application for a system that they know is unlikely to be approved.

Larry McElroy, General Manager of Consolidated Utility District of Rutherford County; Charles Pickney; and Eddie Harris, the Executive Director of the Water and Wastewater Authority of Wilson County all indicated that only on limited occasions had a developer approached their respective utility and been denied service due to physical site constraints. McElroy indicated he could recall one such case, and Pickney stated:

I would say out of 40 [systems], it would probably be a couple, which would fit that category. Not often though. If you’ve got 200 acres, I will almost guarantee you, if you want to do 100 houses or something, we need, on average, about one acre for every 25 homes. So we’d need four acres of good soil out of 100.

[Curtis: And you would probably find that?]

Probably [would] find it. So I mean it would be rare, but there are some cases. I mean especially out in Wilson County and other places where there is no soil. I mean it’s just rock and cedars, and that’s it. If a guy has 20 acres and it is all rock and cedar, you can not help him. (Pickney 2007)

If the demand exists and the economic return on that demand is such that the cost to engineer the system will justify pursuing the project, then systems, for the most part, can be designed to meet the environmental regulations. This technology has allowed development to occur to a great degree unhindered by the normal physical constraints to wastewater disposal. Qualls related this succinctly stating: “I mean my opinion is you can engineer anything at a certain cost. But . . . you have got to figure out whether it is cost effective to engineer” (Qualls 2007). When shown a map of the distribution of decentralized systems in the state, O’Dette stated:
But looking at your map I have seen nothing in the criteria [that] really has limited
[these systems]. It is basically been where people want to go. It is the growth, kind
of the supply and demand. Where do people want to live, Wilson County,
Williamson County, or they [want to] have resort homes up there [in Sevier County].
I mean that is where [the growth of the systems] is.

[Curtis: You do not feel environmental regulations influence the siting of these
developments?]

I do not think they have yet, they may in the future. (O’Dette 2007)

Qualls indicated that the division worked with developers and engineers to find a solution
to meet the environmental requirements. Qualls stated:

But what you do not really see so much, and you are not going to be able to see [from
just looking at the numbers in the database], is how much back and forth happened
between us and the applicant and the engineer until we got something that we could
approve. But ultimately they got something that would work. Well, hopefully, they
did. What I would say, Kendrick, is as you move forward in time, you are more
assured of systems that are going to work. (Qualls 2007)

DEPARTMENT PURVIEW REGARDING GROWTH AND INFRASTRUCTURE

State law empowers the Department of Environment and Conservation to issue
permits authorizing activities, such as the operation of a wastewater system. In issuing
permits, the Division of Water Pollution Control’s role is as the permitting authority
responsible for enforcement and compliance monitoring regarding the impact of the
system on the waters of the state. The division’s staff has only the authority and
responsibility to protect the public health and water quality. As such, the division’s
regulations are based upon science and experience to ensure the protection of both. Thus,
the division is obligated to issue a permit for a system that does this (Source D20a 2007).
As one source indicated, “eventually he is going to promise you enough combination of engineering and management to where you are going to have to give him a permit” (Source D13b 2007).

In many rural areas of the state neither zoning nor subdivision regulations exist, and where they do they are very basic. Such land-use regulations are often based on the “zoning-by-septic” premise, which allows greater densities and smaller lot sizes for sites served by water and sewer systems. These regulations are often incapable of controlling growth liberated by decentralized systems because the systems allow the greater densities to occur regardless of proximity to a central sewer system. In such areas, the division’s state operating permit and the Certificate of Convenience and Necessity—for systems operated by an investor-owned utility—constitutes the major regulatory hurdles to overcome. Consequently, obtaining the permit or certificate becomes the focus of opposition to a development.

This opposition is often voiced at public hearings held on a permit application. At these hearings, the division is often presented with planning issues rather than environmental concerns. Such issues include impacts to neighboring property values, traffic concerns, air pollution concerns, and concerns over overcrowding in schools. While possibly valid, these issues are not germane to a SOP permit because they are beyond the scope of the division’s regulation. Notice of determinations issued by the division in response to such public hearings offer insight into the limits of the division’s authority and the additional concerns presented.

Illustrative sections from two notices of determinations are presented here. The first is from a permit application in Blount County. In seeking to provide service to
approximately 60 homes in the county, Tennessee Wastewater Systems, Inc., applied for a state operating permit in August of 2004. In January of 2005 a public hearing was held. In response to planning concerns raised by the public, the division stated:

The division’s authority concerning the issuance of sewage treatment permits is limited to public health and water quality protection. Issues of growth and infrastructure related to projects of this type can be significant, but they are beyond the scope of the division’s regulatory authority. The division wishes to emphasize then that because the regulatory authorities of the department and the local planning commission are different, a permit action by this department does not overrule or negate any decision at the local planning level. (SOP file 04047)

In April of 2005, concerned citizens again met with Division of Water Pollution Control staff regarding this project. The first item of concern listed in the notice of determination from this meeting was that the department was “promoting high density growth by permitting these decentralized wastewater treatment systems.” The division’s response was “The department is growth/density neutral, and is only concerned with the protection of water quality” (SOP file 04047). The division identified no water quality or public health reason to deny a permit for this system; the permit was issued in August of 2005.

The same sentiment is found in a notice of determination issued for a system in Robertson County. In response to concerns that a decentralized system would possibly violate one or more aspects of the Coopertown zoning ordinance, the department stated:

The Division has no jurisdiction over local zoning issues even if zoning issues relate to wastewater treatment facilities. It is the responsibility of the Division to issue operating permits for wastewater collection and treatment facilities with limitations and requirements that protect public health, preserve quality of public waters, and require documentation of permit compliance. (SOP file 01028)
The public raised concerns at the hearing that wastewater treatment systems “foster a change in land-use from rural to urban and in turn places demand on local services paid for by local taxes” (SOP file 01028). The division’s response in the notice of determination was “Again, the Division has no jurisdiction of local zoning issues” (SOP file 01028). Ultimately, the division issued a permit for this facility.

Decentralized systems are allowing growth to occur in areas where sewers cannot be economically extended and where septic tanks are of limited use. This is placing increased pressure on local governments for planning and zoning in rural areas. The following story by a member of the division’s staff clearly relates this reality:

I was down at a meeting several months ago. I thought I was going to get roasted because people were asking [all these questions]: “What is the quality of the effluent? What are these systems?” And they were concerned about water quality and public health issues. And after talking for a while, I think they were convinced [that] “Okay, these [wastewater systems] are good; we are not really going to have a public health problem [from them].” And then [the concerned citizens] said to the local [officials]: “Well, you know two people were killed on this road out here last year, what are you going to do? We are going to bring more subdivisions, we are going to bring 200 or 300 more families into this area and you are going to do nothing about the roads? You are going to do nothing about the schools? You know, we already have overcrowding in the schools.” So a lot of times people are looking to [Water Pollution Control]. You know we get calls all the time [stating], “Well I did not know this, I just bought this nice piece of property and built a house and I thought I was going to have a farm behind me and now they are going to put 150 homes in there. Can’t you stop this?” And then they will come up with things on these state operating permits to try to stop them for water quality reasons where I believe really the crux of it is that they want to stop them because they do not want the growth. So that is becoming more of a political [situation] that has to be settled at the local
You know these local planning and zoning commissions are going to have to step up to the plate, I think and say, “We are going to have to slow this down if we do not have the infrastructure to support it.” (O’Dette 2007)

Ultimately, the Division of Water Pollution Control’s concern is with the decentralized wastewater system operating in compliance with the environmental terms of the permit. For the company to do this, they needed to be economically viable and stable over the long term. While Water Pollution Control had concerns with regard to the financial solvency of the Pickneys’ company, the division had no power to ensure their company charged rates that were fair and yet sufficient to ensure their long-term economic viability. Although the division needed their viability to be ensured in order to guarantee that the Pickney’s company would remain in operation, such regulatory action of rates and finances fell to the purview of the Tennessee Regulatory Authority. The opportunity and willingness for the Pickney’s company to be an authority-regulated utility freed the department to permit them as the operator of systems where conventional governments had not been willing or able to. Due to the Pickney’s credibility as professional engineers and their willingness to be regulated by the Tennessee Regulatory Authority, the department developed a trust in the company’s operational capacity and perpetuity.

INTRODUCTION TO COUNTY CASE STUDIES

In these last two chapters we have seen the role the state has played in regard to decentralized wastewater systems, a role expressed almost exclusively through two state agencies: the Tennessee Regulatory Authority and the Tennessee Department of Environment and Conservation. These agencies are basically fulfilling the role for which they were created. Concerned with customer service, rates, and ensuring perpetual
system operation, the authority has taken action to protect the customer and ensure the operating utility is viable. Charged with protecting the environment, the Department of Environment and Conservation has taken action to ensure decentralized systems do not damage the environment or threaten public health. Pursuing these goals, these two agencies have had a part in shaping the use of decentralized wastewater systems in the state. However, because there is no requirement that state agencies consider the county growth plans or local land-use regulations, the coordination of infrastructure and the planning of communities is solely the purview of local planning commissions. Thus, we must examine factors at work on a local level.

Decentralized wastewater systems have been used in numerous counties across the state and have been subject to myriad local regulations. However, three counties stand out as the most interesting cases. Each is located in one of the two areas of the state where decentralized systems have been most prominently used. Two case study counties—Wilson and Rutherford—are in the core of the Middle Tennessee concentration while Sevier County is central to the concentration in East Tennessee. Beyond the intense use of decentralized systems, these three counties are illustrative cases due to their unique local situations and responses to the technology.

Close to Nashville, Wilson and Rutherford counties have experienced tremendous demand for growth in recent years. However, each county has a physical setting of shallow soils and prominent outcroppings of bedrock that has long presented challenges to conventional wastewater disposal. While similar in physical setting and demand for development, these counties differ in the nature of their local planning jurisdictions, public policies, and land-use controls. In Wilson County, cities hold extraterritorial
planning authority over their surroundings and have successfully implemented public policies over a wider area. These cities chose to resist the use of decentralized systems. In Rutherford County, the technology’s use played out in the absence of formal extraterritorial control by cities and was largely unimpeded by the county’s zoning ordinance. Thus, Rutherford County presents a contrasting picture where decentralized systems have largely been unrestrained by planning policy or regulation.

In East Tennessee, Sevier County provides additional contrast due to its unique tourist-oriented development. Located on the western flank of the Great Smoky Mountains, Sevier County serves as the gateway to the national park and has become a national tourist destination. For years, the county’s towns were the only places with the infrastructure to support large numbers of tourists. However, decentralized wastewater systems have enabled development in the county’s more rural and scenic areas. As might have been expected, factors such as location of tourist attractions, the presence of scenic vistas, and road access were locally important. But so too were an uncoordinated mix of utility extension policies, municipal annexation policies, land-use regulations, and planning jurisdictions.

The differences among these counties provided rich insights into how various local conditions have influenced the use of this technology. However, there were also common factors in all three case studies. Such factors included the influence of uncoordinated land-use regulations implemented in limited planning jurisdictions, a strong pro-land rights influence over public policies and land-use regulations, market demand and accessibility to transportation infrastructure, public policies regarding the extension of conventional sewers beyond cities, and the legacy impact of “zoning-by-septic” practices.
CHAPTER VII
THE CASE OF WILSON COUNTY

Due to its proximity to Nashville, Wilson County has experienced rapid population growth in recent years (Figure 7.1). Much of this growth has occurred in the unincorporated areas of the county where sewers are scarce and septic systems have long been the only option for wastewater disposal. Yet sites suitable for septic systems were becoming increasingly scarce as development pressures mounted in the late 1990s. The tremendous demand for exurban housing, a scarcity of available land suitable for septic systems, and the limited extent of sewers have positioned Wilson County at the forefront of use in decentralized wastewater systems. Between the late 1990s and January of 2008, 36 systems were permitted or under review by the Department of Environment and Conservation in Wilson County (Figure 7.2). These systems constitute 11 percent of the decentralized wastewater systems in the state in 2008.

The local governments and planning commissions in Wilson County have adopted divergent positions and policies on decentralized systems. While resisted by the cities of Lebanon and Mt. Juliet, these systems have been welcomed by the county’s Water and Wastewater Authority. Although not as overtly, the Wilson County Commission and the Wilson County Regional Planning Commission have also furthered the use of decentralized systems through their willingness to rezone property to be developed on these systems to higher densities. The diverse positions of local authorities have played

39 During 2007, the Department of Environment and Conservation received application for six additional systems in Wilson County. These systems constituted 10 percent of the systems added in 2007 (TDEC 2008).
Figure 7.1 Wilson County, Tennessee.
Figure 7.2  *Top row*, Recirculating sand filter treatment units; *center and bottom rows*, Residential developments served by a decentralized wastewater system in Wilson County, Tennessee.

out on the landscape in an observable pattern of where decentralized wastewater systems are used versus where they have not. Additionally, Wilson County offers a setting where the public adopted a land use plan in 2006 which called for focusing growth in specific areas. Because the plan was developed some years after the introduction of these systems we can observe both the incorporation of this technology into the plan as well as the technology’s corresponding use after the plan’s adoption.

LOCAL NEED FOR AN ALTERNATIVE

Wilson County is being transformed from a rural, agricultural county into a Nashville exurb. Since 2000, Wilson County’s population has grown 17 percent (Table 7.1).\(^4\) Fifty-seven percent of this growth has been absorbed by the county’s two largest municipalities: Lebanon and Mt. Juliet. Lebanon, the county seat and historic center of commerce, remains the most populous city, but Mt. Juliet is growing more rapidly, due largely to its proximity to Nashville. Between 2000 and 2006, Mt. Juliet grew at a rate of 37 percent while Lebanon grew by only 16 percent. The third largest city, Watertown, located in the county’s remote southeastern corner, has yet to experience intense growth pressure. The remainder (42 percent) of Wilson County’s growth since 2000 has occurred in unincorporated areas (U.S. Census Bureau 2007).

\(^4\) The U.S. Census Bureau estimates the total resident population for areas of general-purpose government on an annual basis. This estimate is derived by calculating the county’s population based birth, death, and migration data. The Bureau then uses the “Distributive Housing Unit Method” to distribute the county population to internal subcounty areas based on housing unit estimates. Housing unit estimates are based on building permits, estimates of construction where building permits are not reported, shipments of mobile homes, and estimates of housing unit loss. Estimated housing units are multiplied by the rates for occupancy and average persons per household from the latest census. This estimate is then controlled to the final county population estimate. The non-household population is calculated by the change in the group quarters population. The group quarters population is then added to the household population (Census 2008).
Residential development in the county’s unincorporated area is largely unsupported by the central sewers, which are operated by, and largely limited to, the three cities. Additionally, due to the shallow soils and bedrock conditions, many areas of the county are ill-suited for septic systems. Residents commonly say, “We have only one rock in Wilson County, the problem is that it covers the whole county.” As such, many sites are unsuited to development utilizing septic systems and others required large and uniquely configured lots due to the fickle nature of a site’s soils. Such physical constraints to wastewater disposal had long favored development of sites with access to central sewers. Thus, the county’s large scale subdivisions were located where sanitary sewer lines were available, which meant this development was either in the cities or right on their outer fringes where they were willing to extend sewer. (Brashear 2007)

During the 1990s it became increasingly difficult to design desirable subdivisions

<table>
<thead>
<tr>
<th></th>
<th>Population Estimates July 1, 2000</th>
<th>July 1, 2006</th>
<th>Population Change Absolute Change</th>
<th>Percent Change</th>
<th>Share of County's Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lebanon city</td>
<td>20,394</td>
<td>23,702</td>
<td>3,308</td>
<td>16%</td>
<td>22%</td>
</tr>
<tr>
<td>Mount Juliet city</td>
<td>14,160</td>
<td>19,369</td>
<td>5,209</td>
<td>37%</td>
<td>35%</td>
</tr>
<tr>
<td>Watertown city</td>
<td>1,366</td>
<td>1,403</td>
<td>37</td>
<td>3%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Unincorporated</td>
<td>53,374</td>
<td>59,561</td>
<td>6,187</td>
<td>12%</td>
<td>42%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>89,294</td>
<td>104,035</td>
<td>14,741</td>
<td>17%</td>
<td>100%</td>
</tr>
</tbody>
</table>


41 Lebanon and Wilson County jointly extended a sewer line to service industrial and commercial properties to the south of Lebanon; however, residential developments are not permitted to connect to this sewer line. Metropolitan Nashville does provide sewer service to a small portion in the northwestern part of the county.
that were not on a central sewer system. A lack of available land served by central sewers and the expense to extend these lines coupled with an increasingly limited supply of available land with perkable soil created a bottleneck to development. This shortage proved critical to the expanding use of decentralized systems in the county (Harris 2007). One member of the county planning commission explained that decentralized systems were presented to their board as a means of

alleviating some of the problems that we were having as far as trying to . . . establish developments on the septic tank systems. They were getting to be very hard [to establish]. There [was] a lot of pressure—a lot of twisting and dancing—on approvals and it was very restrictive to growth, the type of growth that was coming on us. . . . The pressure, the volume of the growth, the demand by builders in the area, [it was] just almost impossible to get the larger developments in place because there was just not enough perkable soils to do so. And obviously conventional sewer is horribly expensive. (Source A22c 2007)

In response to the growing need to find an alternative, the Water and Wastewater Authority of Wilson County began operating systems in the late 1990s.

THE WATER AND WASTEWATER AUTHORITY OF WILSON COUNTY

In July of 1975, the legislative body of Wilson County created The Water and Wastewater Treatment Authority of Wilson County, Tennessee. Although established to supply both public water and sewer to unincorporated areas, the Water and Wastewater Authority functioned for many years solely as a water provider (Wilson County Commission 1975; Harris 2007). However, developers had approached the Water and Wastewater Authority as early as the 1980s desiring a sewer system for the unincorporated areas. Due to low population densities throughout much of the county,
the authority had been unable to provide this service through conventional means (Harris 2007; Source B2a 2007). In the early 1990s, the authority’s board directed its staff to study decentralized wastewater systems as an option for the county (Harris 2007). This interest in decentralized systems eventually resulted in the decision in the late 1990s to provide wastewater service to the Tuckers Crossroads Elementary School (Harris 2007). This was the first use of a decentralized system in the county. Since that time, the Water and Wastewater Authority has assumed greater responsibility as it has expanded the sites to which it provides wastewater service.

The Wastewater Service Area

State law (Tennessee Code Annotated [TCA] 5-6-120) enables water and wastewater authorities to establish service areas for each service they provide. From its inception until the late 1990s, the Water and Wastewater Authority served only in a regulatory capacity over its wastewater service area. As a result of its newfound ability to provide wastewater service via decentralized systems, the authority recognized a need to redefine these areas. In 2001, the authority adopted a resolution to reestablish its service areas. The authority’s “Wastewater Service Area” was defined at that time as follows:

2. The Authority establishes its Wastewater Service Area, in which it shall be the sole and exclusive provider of wastewater collection, disposal and treatment services, as including all areas in Wilson County, Tennessee, located outside the corporate limits of all cities and metropolitan governments on January 18, 2001, and presently exceeding 200 feet from an existing wastewater collection line in existence and in operation by a city, metropolitan government, or utility district outside its corporate limits on such date. (Water and Wastewater Authority of Wilson County 2001b)

The resolution further provided that, should a city, metropolitan government, or
utility district desire to provide wastewater service within the Water and Wastewater Authority’s service area, it could only do so by petitioning the authority for such area and have the authority agree to cede that area to it. Thus, jurisdictionally the Water Wastewater Authority can operate a decentralized system and provide wastewater service throughout the unincorporated portion of the county so long as the system is not within 200 feet of an existing sewer line.

*Establishment Process: From Inception to Ownership and Operation*

A land developer desiring wastewater service from the Water and Wastewater Authority is first required to obtain approval for service. After approval, a study of the site’s soil and other physical qualities is conducted (Harris 2007). Once the system is designed and internally approved, an application is submitted to the Department of Environment and Conservation for a state operating permit. Upon issuance of the permit, the developer is required to install the system at his expense and to the authority’s specifications. Upon completion, the system and the site where it is installed are dedicated to the authority, who then contracts with Adenus to provide operation and maintenance services (Harris 2007).

The pioneering influence of the Pickneys is not readily apparent in Wilson County because their company is not assuming direct ownership of the systems. Nonetheless, the Pickneys were important to local introduction. Through Wilson On-Site Systems, they provided the technical and operational support to the Water and Wastewater Authority for its decentralized systems. Unlike the Consolidated Utility District of Rutherford County,

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42 In March of 2007, the monthly sewer bill was a little over forty dollars per month for the first 300 gallons. Adenus received 80 percent and the Water and Wastewater Authority 20 percent of the bill (Harris 2007).
the Water and Wastewater Authority contracted with Wilson On-Site Systems to provide operation and maintenance services. Another Pickney affiliated company, Adenus, has since assumed this responsibility. 43

*Conditions Necessary to Provide Wastewater Service*

The Executive Director of the Water and Wastewater Authority explained the criteria used by the board in making its determination of whether they would provide wastewater service to a property:

[The board of directors] takes the recommendation from staff here and also from Adenus on whether or not we can feasibly serve decentralized sewer on the site. We do not get into the planning process. We are in the sewer business.

*Curtis: What criteria are you using to make that decision?*

Whether the soils work. . . . The only thing we got to know is if we have enough soil to have a drip field. After that, it is a go. . . . And when [the soils] do not work, what we usually do is take them to another treatment system. (Harris 2007)

In addition to having suitable soils for a drip field, the Water and Wastewater Authority requires the developments they serve with a decentralized system to be on public water. This provides the control the authority may need in the event a customer fails to pay his or her wastewater bill. Due to public health and safety concerns, the authority cannot discontinue wastewater service. However, discontinuance of water service is allowed. The Water and Wastewater Authority has entered into agreements with the utility districts providing water service to areas not on the authority’s water system (Harris 2007). As public water is widely available in the county, sites throughout

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43 The Water and Wastewater Authority had previously contracted with a Pickney affiliated company named Wilson On-Site Systems. This company had initially applied for state operating permits in its name rather than that of the Authority. These permits were transferred to the authority in 2005.
much of the county are potential sites for the use of decentralized wastewater systems.

THE COUNTY: LEGISLATIVE BODY AND PLANNING COMMISSION

[B]efore the STEP system, you were somewhat restricted by what the land would avail you in sewage disposal on site.44 After the STEP system, . . . that limit or that restriction was taken off and you were pretty well left with whatever the zoning would afford you. (Brashear 2007)

Zoning: Districts and Densities

In 1972 Wilson County’s legislative body adopted a zoning ordinance which designated most unincorporated areas as either in the A-1 Agricultural district or R-1 Rural Residential district. Due to growth pressures from Nashville, the county foresaw the westernmost portion of the county developing into a residential area. This portion of the county was zoned as R-1 Rural Residential, a zone intended for single-family homes at low densities (Wilson County Commission 1990). In the early 1970s, the eastern two-thirds of the county was primarily agricultural in nature. Due to the preferences of those residing here, this area was zoned as A-1 Agricultural (Source B2b 2007; Source B3a 2007). This zone allows uses typically conducted in agricultural areas in addition to residences at rural densities. Commercial and industrial zones contained much smaller areas. This pattern remains in effect as 20 percent of the unincorporated area is currently zoned R-1 while 78 percent is zoned A-1 (Figure 7.3). Like many zoning ordinances, Wilson County’s ordinance allows various densities in residential zones depending on the availability of public water and sewer. As public water is largely available throughout

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44 The term used locally for decentralized wastewater systems is STEP. This is the acronym for Septic Tank Effluent Pump. This is the term that was first introduced to many in the county and the term persists although the system in question incorporates more aspects than simply the collection system. Regardless, this is the term locally used, and it is not replaced in the quotes made by sources in Wilson County.
Figure 7.3  Wilson County zoning and decentralized wastewater systems.  
the county, public sewer has been the main arbitrator of density.\textsuperscript{45} Prior to the advent of decentralized systems, greater residential densities were confined to the perimeter of cities where conventional sewers were available. By default, this constrained more dense development to areas where other elements of infrastructure and public services were of higher quality while limiting densities in more remote areas. However, in Wilson County, decentralized systems are operated by the Water and Wastewater Authority and as such are recognized as “public sewer” systems under the county’s zoning ordinance. The county’s Planning Director explained:

The way we have viewed that since I have been here is that the Water and Wastewater Authority, as I understand it, has jurisdiction straight up to the corporate limits. So, they are [the county’s] sewer provider. . . . If they say sewer is there, [if] they are willing to serve it, then I have no choice but to say “Okay they have sewer service.” Effectively they meet that requirement. (Brashear 2007)

In 2000, the county amended the zoning ordinance to increase the minimum lot size from 15,000 square feet in the R-1 district for parcels served by water and sewer to 25,000 square feet (Wilson County Commission 1990, 64). The minimum lot size was increased in the A-1 district to 40,000 square feet (Wilson County Commission 1990, 76). Sources related that this change resulted from concern on the part of the planning staff and county planning commission that decentralized systems would allow dense development to occur on remote properties which might not be adequately served by other infrastructure and services (Harris 2007; Source A23b 2007; Source B3a 2007).\textsuperscript{46}

\begin{footnotesize}
\begin{enumerate}
\item Approximately 90 percent of residential housing in the county is served by public water, while only 32 percent is served by a central sewer system (Tennessee Office of the Comptroller of the Treasury’s Computer Aided Assessment System database, August 2007).
\item Due to staff turnover in the planning office and lack of detail in the minutes of the planning commission meetings, little additional background on this change was available.
\end{enumerate}
\end{footnotesize}
This change prevented developments from occurring at the higher densities previously possible. As such, it made certain developments less economically feasible than would have been the case had the minimum remained at 15,000. Regardless, the county recognized the potential impact of this technology and responded by reducing the permitted densities. This move seems to indicate reservations regarding this technology. However, their actions with regard to rezonings in later years do not seem to indicate this concern.

Rezoning Requests: A-1 to R-1

Rising demand has made housing desirable in south central and north central Wilson County. This is an unincorporated area zoned A-1 Agricultural (Figure 7.3). However, because the minimum lot size (40,000 square feet) allowed in the A-1 district is too large for viable development, developers have sought to rezone A-1 parcels to an R-1 Rural Residential designation to build at the greater densities this zone allows. The number of requests to rezone property from A-1 to R-1 increased from a single request in 2000 to 19 in 2006 (Wilson County Planning Office 2007). The county’s Planning Director explained that he was told “routinely by both developers and the Water and Wastewater Authority [that] to make the numbers work . . . they need the density at a minimum of what R1 allows; which, with public sewer, R1 allows a 25,000 square foot lot (Brashear 2007). In order to develop properties within the area originally zoned as A-1, developers must rezone the property to R-1 and have public sewer available. As indicated, decentralized wastewater systems satisfy the requirement for public sewer, and many owners of the properties rezoned from A-1 to R-1 in recent years use, or are proposing to use, a decentralized wastewater system (Figure 7.4).
Figure 7.4  North Central and South Central Wilson County, Tennessee.

Map shows how decentralized wastewater systems closely match the properties rezoned from an A-1 designation to an R-1 designation.

Most A-1 to R-1 rezoning requests have been approved by the county commission; 34 of 45 such requests since 2000. To understand this high approval rating, we must examine the guidance provided for such action in the county’s planning documents. Although the earliest planning document still in effect is the twenty-year land use master plan the county adopted in 1990, this document provides little guidance under current conditions. However, in 2001, Wilson County adopted a countywide growth plan as mandated by Tennessee’s comprehensive growth policy (Public Chapter 1101, Acts of 1998). This plan designated the majority (70%) of the county as a “Rural Area”. Because this rural area has been the site of 76 percent (22 of the 29) of the decentralized systems used in Wilson County, policy guidance for this area is critical to understanding these rezonings. The Wilson County Coordinating Committee adopted a “Rural Area Preservation Policy” in December of 1999. The policy states:

The primary land use within the Rural Areas shall be wildlife, park, recreation, forest and agricultural. Low to moderate density residential, commercial and industrial land uses shall be permitted within the Rural Areas where infrastructure is available to support the development. (Wilson County Coordinating Committee 1999)

This policy allows for the rezoning of property in the rural area to low-to-moderate density zones, assuming infrastructure is capable of supporting the denser development. These two criteria were the basis for the planners’ rezoning recommendations and should have been the basis for the action of both the planning commission and the county commission. As both the R-1 Rural Residential zone and the A-1 Agricultural district are low-density residential districts, the infrastructure criteria was, therefore, the critical issue to be considered in determining a rezoning request. The county planning director explained:
The land use direction I have in the 2001 Growth Plan in particular and the new land use plan update calls for low-density residential development in most of the county. If they are rezoning from a low-density district to another low-density district, just because it happens to be a little more dense, I am not going to recommend denial unless the infrastructure is inadequate. If the infrastructure is in whole inadequate—i.e., the roads are bad, sewer and water are bad, schools are bad, fire service is not there—I will recommend denial. And you will find some record of my recommending denial, particularly as you go east where the road infrastructure gets worse and the fire service gets worse. . . . I can not plan in a vacuum; relative to other parts of the county, these areas [in the west, particularly near the cities] are relatively capable of sustaining that additional development. . . . As long as the infrastructure is somewhat feasible, [I would recommend in favor of the rezoning]. Now [in areas where] you do have a fire response zone issue, I have recommended denial, and my planning commission, in many cases right in this area, has overruled me. (Brashear 2007)

Because the R-1 zone is a low-density zone and because decentralized wastewater systems had removed a serious, in cases the most serious, infrastructure limitation, there was little cause for denying these rezonings even though they seem counter to the spirit of the rural area designation.

Policy guidance provided by planning documents is only one aspect influencing the actions of the planning commission and the county legislative body when considering a rezoning request. Thus, it is necessary to examine the insights and experiences of those who have observed this process. One source indicated that the zoning ultimately had little influence over the outcome of a project with which he was familiar. Interestingly, he indicated that the planning commission placed greater emphasis on signage than on the density of the development. One developer recounted his experience in rezoning property:
No. I did not have a bit of problem. I talked to the neighbors and quite a few of them knew me. So that helped. . . . At first they were a little concerned but . . . [when I] showed them what we have done, some of the houses, they were very, very pleased. So it went right on through. We rezoned it because we wanted to go from 40,000 square foot lots down to 25,000 square foot lots. So everything is between 25 and 30,000 square foot lots. You know, to be very honest with you, I do not know that the people thought much about what we were doing. All they saw was what we had done in the past on the larger lots. I do not know that they really realized that it would have somewhat of an impact as far as more cars going from a 40,000 square foot down to, let’s say 28,000 square foot lots. . . . We probably picked up 25 to 30 more houses. . . .

[Curtis: And you probably would not have done the project had they not rezoned it?]

Well, no, we could not have. No. . . . We had to get that [density] . . . for what [we paid] for the property. (Source A20a 2007)

Due to the politically sensitivity of the county commission and county planning commission, the actions of developers and the wishes of neighboring residents were identified as critical influences of these rezonings. Decisions were often determined by these influences rather than by planning policies. One source related:

[Of course half of [the rezoning requests the county’s planning director] will recommend against. Because he says it is out of his growth plan. But the thing of it is [the county planner] can sit up there at that office and he can draw out an area that he wants to develop, but it does not mean it is going to develop. He does not have that control. Because . . . they will politic him. [The developers] will play politics with him. . . . And they will override [the planner]. They will override him even in his own planning commission. He can make a recommendation to his planning commission; that does not mean that is the way it is going to go down. I have seen them; I have sat in those [county] planning commission meetings and seen them vote exactly opposite of what he is recommending. Because he said, “Well, my growth
plan says” or . . . “You can not build a subdivision [there because it] is not in the [land-use plan].” And that Planning Commission will say, “Well, we recommend it to be rezoned.” And [that] just changes it. . . . He will say, “Well, this subdivision is not in my land-use plan,” but yet it gets done. (Source A23a 2007)

Planning Policy Response to Decentralized Systems

In 2006, the county developed and adopted an updated land-use plan focusing on specific areas of the county designated as gateways. Although, the Gateway Land Use Master Plan Update was only in effect for part of the period under consideration by this study, it offers insight into the response by the planning authority to decentralized systems. Although numerous decentralized systems had been used in the county by 2006, the Gateway Plan did not recognize or address their impact on land use patterns (Lose & Associates, Inc. 2006). Although public input to the plan indicated a desire by citizens to avoid the uncontrolled growth they felt was encroaching upon the farmland throughout the county, nothing in the plan addressed the growing use of decentralized systems. However, many sites had been converted from farms into half-acre lot developments due to the availability of decentralized systems. Decentralized (STEP) systems were mentioned only in regard to the Gladeville community as follows:

    STEP sewer systems have been used to address the longstanding lack of sewer availability in the area. This has allowed for a maximized level of residential density under current zoning regulations. (Lose & Associates, Inc. 2006)

    Examination of Figure 7.5 reveals that decentralized systems had not been used to support the land use pattern desired by the community. Many systems existing before 2007 (black dots) were located within the areas where low-density development was desirable (yellow areas). However, systems proposed during 2007 were all located in the
Figure 7.5  Comparison of decentralized wastewater systems to the Gateway Land Use Plan.

area that the 2006 plan had identified as within the “rural preservation area.” Such developments may not be counter to the letter of the law; however, they seem counter to the desire of a community wanting to avoid the conversion of farms into one-half acre lots. Overall, there seems to be a great disconnect between the importance of decentralized wastewater systems and the lack of recognition of them in the county’s 2006 land use plan.

THE CITIES: LEBANON AND MT. JULIET

[Lebanon and Mt. Juliet] do not have the desire or the capacity to continue to expand [sewers] in an area where homes are very desirable to be owned. (Source A22b 2007)

Unlike the Water and Wastewater Authority, the cities of Mt. Juliet and Lebanon have opposed the use of decentralized systems in areas over which they possess an extraterritorial interest and influence. In areas under their control, the policies and outlook of Mt. Juliet and Lebanon have played a critical role and influenced the use of these systems. This influence is the product of two different spatial jurisdictions: extraterritorial planning regions and urban growth boundaries.

Each city planning commission is designated as a municipal-regional planning commission and, as such, possesses certain planning authority within an extraterritorial planning region surrounding its city. When Tennessee passed its initial planning legislation in the 1930s, planning regions were envisioned as a means of providing cities a measure of control over areas expected someday to be within their bounds. However, state law made no special allowance for annexing within a city’s planning region. Thus, planning regions, at best, present a logical indication of a city’s future extent but carry no
legal advantage in determining the eventual extent of a city. In 1998, the Tennessee legislature passed Public Chapter 1101, Acts of 1998, which introduced a new geographic overlay into the fabric of planning in the state. This law required the creation of county growth plans delineating urban growth boundaries, planned growth areas, and rural areas. Urban growth boundaries were to encompass areas within which cities were expected to grow and annex. Within this boundary, cities can annex by any statutory method, including annexation by ordinance and referendum. Beyond the boundary, a city may only annex by referendum. While growth boundaries more formally identified areas likely to be within a city someday, they provided for no extraterritorial planning authority in their own right. Such control remained the responsibility of the city’s regional planning commission. As such, these controls are limited to the extent of their extraterritorial planning region. However, urban growth boundaries may have influenced the outlook of city officials who now have a clearly delineated area for which they will likely someday be responsible. Mt. Juliet’s urban growth boundary and extraterritorial planning region are the same, but these jurisdictions are slightly different for Lebanon.

City of Lebanon

Like many cities, Lebanon holds to the concept of concurrency. This concept stipulates that new development will not be permitted without adequate infrastructure and services (Barge Waggoner Sumner and Cannon, Inc. [BWSC] 1999). Lebanon considers

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47 In 2002, the Local Government Planning Advisory Committee adopted a resolution amending Mount Juliet’s planning region so that it would correspond exactly with its Urban Growth Boundary. The City of Lebanon made a similar request to the Local Government Planning Advisory Committee to amend its planning region also to coincide with its Urban Growth Boundary. However, this growth has never occurred, and the two areas remain slightly different. It is likely that this slight discrepancy would only impact a land development decision if a property being seriously considered for development happened to lie within the area within Lebanon’s Urban Growth Boundary but not within its planning region. In this case, it could have an impact; however, this does not seem to have occurred.
it the city’s responsibility to provide the larger, general elements of infrastructure such as
the city’s water plant, wastewater treatment plant, and trunk sewer lines while
infrastructure to new development is to be provided by developers (Figure 7.6). New
development is required to “pay for sewer, water or any other utility extensions to or
from the regional infrastructure item” (BWSC 1999). Lebanon’s Mayor, Don Fox,
explained that, when a developer approaches the city about developing a residential
subdivision, he “has to understand that he has to come and tie on to the city sewer,
wherever it may be, and bring it to his subdivision” (Fox and Baines 2007). Much of the
land within Lebanon’s planning region is not suited to an intense use of septic systems
and can be far removed from an existing sewer line. The developer’s viable options are
to install sewer lines to connect to the city sewer system or use a decentralized
wastewater system.48 However, many properties are far from an existing sewer line, and
the use of a decentralized system has not been looked upon favorably by the city. The
Director of Public Works for Lebanon explained:

You know they come to see us first; we just say to them, “Look, our policy is pretty
much, [if you are] going to be in our . . . growth boundary, you are going to probably
be in our city. Therefore, you are going to be on our gravity [sewer] collective
system.” We start there. (Fox and Baines 2007)

In speaking of the use of decentralized systems, Mayor Fox related the city’s
policy regarding their use:

Inside of our urban growth boundary, we require the [central] sewer systems. Our

48 Although new development is required to be serviced by the city’s sewer system, the city’s subdivision
regulations do allow for an alternative system when—in the opinion of the city’s planning commission and
engineer—the property can not be reasonably served by the city sewer system. Under this condition, the
developer could make application to the city for the installation of an alternative sewage collection and
disposal system (City of Lebanon 2005, 30).
Figure 7.6  City of Lebanon sewer network, 2006.

Source: City of Lebanon 2007.
city engineers must be approached and application made by any developer for any development within that urban growth boundary. And, we are going to require . . . we do require public sewer, our sewer system. (Fox and Baines 2007)

It is Lebanon’s policy that “No city sanitary sewer service shall be extended by the City or any developer to any area until the property is annexed” (BWSC 1999). Therefore, for development on the perimeter of the city to receive the sewer service, it most likely requires annexation by the city.49 Sewer is viewed by the mayor as the city’s tool to fill its urban growth boundary.50 However, Mayor Fox was careful to state that a decentralized wastewater system might be allowed in the future at a far corner of their planning region if it was for the greater good. However, such a system would be required to connect to the city sewer when it became available (Fox and Baines 2007). The principle of concurrency and the requirement that infrastructure be extended by the developer when coupled with Lebanon’s disfavor of decentralized systems have influenced both the use of the decentralized systems and the nature of development within the unincorporated area of Wilson County over which Lebanon exerts extraterritorial control.

City of Mt. Juliet

Mt. Juliet holds the same view on decentralized systems as Lebanon, and it also requires developers to pay for any necessary extension of sewer lines. City officials

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49 This policy may be waved under extraordinary situations or circumstances. In such cases, a request for extraterritorial sewer service shall be submitted to Lebanon’s Commissioner of Public Works for review. The mayor shall then be advised of this request, and these two officials then make a recommendation to the city’s planning commission, who then recommend to the city council. The city council is then to review the request and can enter into an agreement or contract with a developer for this service. Through this process, a developer could conceivably obtain access to the city’s sewer system and not be annexed.

50 “[At] virtually every meeting we have, people want to be annexed and rezoned into the city. And that’s the reason.” [Curtis: Wanting to extend that sewer?] “Extend the sewer to the . . . so that is our tool to actually . . . to fill our urban growth boundary” (Fox and Baines 2007).
indicated that it is the city’s desire that areas within their growth boundary be served by the city’s sewer system (Franklin 2007; Keel 2007). Mt. Juliet’s subdivision regulations require mandatory connection to a public sanitary sewer where accessible, a determination made by the planning commission. While Mt. Juliet’s regulations do not define public sewer, the commission has interpreted this term as meaning a central sewer system rather than a decentralized system. Where a conventional sewer system is not available, the regulations make allowance for use of “individual disposal systems” although the decentralized systems considered in this research do not meet the regulation’s definition of an “individual system” (Mt. Juliet Municipal/Regional Planning Commission 1997). Also like Lebanon, Mt. Juliet requires developers to extend the sewer line from its existing location to the “development”. City policy has encouraged the annexation of properties to which sewer service is extended. The city planner for Mt. Juliet related that in his six years on the job, he had seen very few—probably two—subdivisions using septic systems. However, these had been smaller developments (Franklin 2007). Much of the development occurring within the Mt. Juliet area is occurring near existing lines where connection is economically feasible (Figure 7.7).

*A Shared Rationale: Lebanon and Mt. Juliet*

Officials in both cities expressed various reasons for their positions regarding decentralized systems. First, city officials held the perspective that their city’s sewer system is a viable solution to wastewater disposal, and therefore, they have little reason to allow an alternative. When asked if Mt. Juliet would consider operating these systems, the city planner responded:
Figure 7.7  City of Mt. Juliet sewer network, April 2006.

Why would we? We have a superior system. We have a system that I do not believe . . . there is any question of whether it is polluting. Our manholes are not coming off the ground. We have unlimited capacity. We have a long-range agreement [with Metro Nashville for treatment services], and the effluent is leaving our community. I can not see that this [decentralized] system is superior. (Franklin 2007)

A second concern expressed by city officials relates to the long-term viability of decentralized systems. City officials expressed unease for allowing systems to service areas within their growth boundary for fear that the failure of a system in an area that had been annexed would require the city to provide wastewater service to these residents (Franklin 2007; Source A27a 2007). This service could conceivably take the form of the city either repairing the failed system or extending their sewer to the site. Officials stated that the city had to be responsible for ensuring development occurred in a viable form in areas that would be annexed either immediately or in the future, i.e., areas within its urban growth boundary (Source A27a 2007). Thus, concerns about the long-term viability of these systems and the expense to extend sewer service to these developments have influenced the city’s position on allowing development to occur on decentralized systems. Franklin indicated:

How do you know that these systems—if they are constantly being added in these high density situations—how do you know that these rain events are not putting all these nitrates and all the effluent, all these chemicals in this effluent that you are depending upon this bacteria and some time to digest, how are you sure that that is going to occur? When you are not sure, and there is no real standard that I am aware of to know how much soil you are putting them on. . . . How would you know that? They are not magic. I mean . . . You know when you buy a brand new car, works great, but it does not work forever. [It is the] same way with a sewer system, same
with any utility. Problem with these STEP systems, as I see it, there is no real oversight. There is no one [who] knows how long they will last or to what extent they will have to be completely replaced. (Franklin 2007)

Third, the cities have a vested interest in providing—and planning—for the extension of their city sewer systems to their peripheries. Anticipating the future need for sewer services is an important aspect of designing a sewer system capable of expansion into surrounding areas as a city grows. The potential for a portion of Lebanon’s surrounding area to be served by decentralized systems would have important impacts on the projected populations someday wanting sewer service by the city. Therefore, these cities have an interest in accurately designing their sewer system to enable expansion. However, they must also ensure the possibility for future extensions to protect the system’s economic viability. Mayor Fox related:

Well, that goes back to design and engineering. When you leave our plant, [there are] certain size interceptors that you have to build. And you do not build it for that project that is just coming in. You build this [sewer system] for what is the [situation] going to look like 20, 30 years from now. What do we need here [back closer to the plant] to carry what we project could be out there [on the expanding edge of the city]? So we are going to build our line this size. And we do not want to build our line this size if there are [not going to be] customers out there. And we do not want to build it this size because they are on a STEP system and [when we] get out there the STEP system fails, [and] they say, “Oh, we have got to be on [Lebanon’s sewer system].” Then are we going to come back and upsize all of this all the way back? No. It is smart planning along with smart growth. You can not plan when you have STEP systems scattered out all over this county. How can anybody plan to take those up? But, will they fail? Yeah, they will fail. They, at a point in time, will fail. Can they, can they correct it when they fail? How do you
correct what has failed due to the permeability of the ground? It is saturated. It is a problem. (Fox and Baines 2007)

Whether the preference for central sewers is rooted in concerns city officials have regarding the long-term viability of decentralized systems or a feared negative environmental impact within their surroundings or whether it is related to a fear of loss of territory and control in which to expand their system is impossible to know. Regardless, through their extraterritorial planning authority, Lebanon and Mt. Juliet have taken a protectionist position over the area they view as eventually being their responsibility.

OUTCOMES

A compilation of data reveals that in Wilson County decentralized wastewater systems are largely located in two east-west bands (Figure 7.3). One band lies to the north of Mt. Juliet and Lebanon, and the other parallels these cities to the south. Two observations are apparent in this distribution.

First, decentralized systems are primarily located in the western half of the county. Sources attributed this western concentration to housing demand in the area nearest Nashville (Harris 2007; Source A20a 2007; Source A22b 2007; Source A23b 2007; Source B3a 2007). This underlying influence is understandable, for developers are most willing to develop in areas where the economic return on their investment would be the highest and most assured. This western focus is further to be expected because decentralized systems have almost exclusively been used for new construction in Wilson County. Areas of the county widely recognized as having failing septic systems could benefit from use of decentralized systems. However, to date, these systems have not
been used to any significant degree to service such areas (Source A22c 2007).

Additionally, the density increase for sites served by a decentralized system is most pronounced in the R-1 district. As such, the western portion of the county zoned R-1 is doubly attractive to residential development on decentralized systems. Within this area, development can occur at the higher densities without rezoning the property. This zoning may have contributed to the western concentration of systems, although as the county commission willingly granted most A-1 to R-1 rezoning requests, this influence is likely marginal at best. Nevertheless, Mt. Juliet’s planner explained the influence of the density increase in the R-1 district:

Because of the density enhancement that you get from these systems, the arbiter of density is the [Water and] Wastewater Authority. It is not a county commissioner; it is not a county commission board like it should be, [like] everywhere else. Not only is it cheaper to develop out here in the rural where there is no infrastructure, it is easier to get your zoning because you only have to persuade the director of the [Water and] Wastewater Authority to provide a system for you. You do not even have to go to a county commission vote to increase your density. . . . If you [allow] 40,000 square foot lots out here [in the] R1 zoning [district], all you have to do is get the [Water and] Wastewater Authority to provide you a system, and you can have 25,000 square foot lots. Sort of like buying your zoning from a utility district. (Franklin 2007)

Another influence contributing to the western concentration relates to the fact that certain areas of east Wilson County do not have public water lines readily available. There are two reasons this would exert a spatial influence. First, the Water and Wastewater Authority requires access to a public water supply in order to provide the control it desires. Second—and probably more fundamental—is the fact that the Wilson County zoning ordinance only allows the higher densities in R-1 if the site is served by
both public water and public sewer. However, it is only in those more limited instances in the eastern periphery of the county where lack of water may exert an influence.

Further, this need for public water is likely pushing both the Water and Wastewater Authority and the utility districts to extend and improve their water distribution network. The Water and Wastewater Authority’s director stated:

> But we are running public water line on what . . . I call a one lane road. I mean . . . we are so far ahead of the county road department, we are forcing those guys into [improving these rural roads] . . . and they do not like it. (Harris 2007)

If demand for housing continues, water will soon be extended throughout the county; thus, removing the density constraint imposed by a lack of public water.

The second observation is that no decentralized systems are located within the urban growth boundaries and extraterritorial planning regions of either Lebanon or Mt. Juliet. At first glance, one might assume this absence is due to the presence of sewers, yet sewers are infrequently present—or expensive to extend—in this area (Figures 7.5 and 7.6). Rather, this void has resulted from the quiet war that has been waged in Wilson County regarding decentralized wastewater systems, a confrontation with Mt. Juliet and Lebanon on the one hand and the Water and Wastewater Authority and developers on the other.

The staunch policies of both Lebanon and Mt. Juliet regarding decentralized wastewater systems have influenced the actions of developers operating in Wilson County. One developer related that it was his understanding that the cities are going to fight the use of decentralized systems through whatever means they have to keep them out of their respective growth boundary (Source B25c 2007). Therefore, developers have

51 One system is operated inside the City of Lebanon at the office of the Water and Wastewater Authority.
not contested the position of either city. Their reluctance results from the time and expense of such a fight with no certainty of the outcome. Fighting the cities was particularly worrisome for developers who fear endangering current or future projects they have within the bounds of these cities (Harris 2007). Ultimately however, challenging the cities’ position has not been worth it because developers have another option: use a decentralized system to develop just beyond city control. As the planner for Mt. Juliet explained:

And so the developer now has a choice. He can pay higher per square foot price [for land] close to infrastructure and hook into a sanitary sewer system . . . or he can opt to go two or three miles outside of the infrastructure area and . . . put one of these systems in. (Franklin 2007)

Because of the decentralized system, developers are free to build on sites regardless of proximity to sewer. This freedom has allowed them to construct developments comparable to those on city sewer and yet without the expense of sewer extension, higher municipal development fees, or the costs associated with the cities’ more stringent land-use regulations. The Water and Wastewater Authority’s director explained a developer’s rational:

[For] what they make a developer do inside these cities, he could build that same subdivision out in the county, a lot cheaper. . . . And [have] bought the land cheaper, and does not have to follow the same codes, and does not have to put up with all that grief that he has to put up with from these cities. (Harris 2007)

Not only are developers reluctant to contest the city’s prohibition on the use of decentralized wastewater systems, but they are reluctant to extend the city’s sewer system beyond a certain distance. When asked about the availability of sewer lines within the growth boundaries, one developer responded:
They are not, and that is the problem. And [Lebanon and Mt. Juliet] are not going to bring the sewer to you. You have to bring it from “Point A” to your project, and it might be more than a mile away in some cases. (Source A20a 2007)

One source expressed a developer’s response to this city policy as:

As long as I am not bound to use and pay the infrastructure cost of the utility system—as long as I do not have to pay the cost—I do not have a problem. If I am compelled to pay the infrastructure cost if I get too close, I am going to back away. It does not make economic sense. (Source A22b 2007)

In revealing his understanding of the local situation, the following statement by a developer illustrates the influence that city policies and jurisdictional bounds have had on the actions of developers and the reasons for the outcomes produced:

I looked at a farm somewhere in here [outside of Lebanon, but inside the city’s growth boundary] to develop. And this is a problem for me. It was in the growth [boundary], but [Lebanon] will not run sewer out there. And it is probably three quarters of a mile from the sewer. . . . They will not let me have the STEP system either. Well, I guess they would let me [pay to run the sewer], but to run a city sewer three quarters of a mile to your property is not feasible. . . . The Lebanon Public Works, it is their policy in that urban growth area [that] you cannot put in a STEP system. . . . The City of Lebanon does not like the STEP system . . . because you are getting into their turf. See, people do not want to give up their territory.

[Curtis: So why do you think they are being located where they are?]

They are outside of that pattern aren’t they? Every one of them. . . . See, they are all outside of that growth [boundary] there because nobody wants to get into a lawsuit with them. But if you start one in there, they will stop it for years. . . . I am high on the STEP system but I will not develop anything in Lebanon or Mount Juliet’s urban growth plan. (Source B2a 2007)
Mt. Juliet and Lebanon’s requirement that developers use and extend their cities’ sewer systems coupled with the constraints to development imposed by septic systems in this area has rendered the large sections of the county under the control of these cities as economically undevelopable at the current time. Due to the policies of the cities, the area within the urban growth boundaries and planning regions—beyond where sewers can be economically extended—has become a no-man’s land where neither sewers nor decentralized systems are possible.\(^\text{52}\)

CONCLUSIONS

Wilson County has been divided into areas where decentralized systems are effectively prohibited and where they are welcomed. This division has resulted from the parties involved in the development process acting in a boundedly rational manner. Whether motivated by a fear of the unreliability of the technology or to protect future extensions of their sewer system, Lebanon and Mt. Juliet have successfully resisted this technology within areas they control, reserving a considerable area for their sewer systems. But beyond their area of extraterritorial control, parties have responded very differently. Through this technology, the Water and Wastewater Authority is now able to provide wastewater service to unincorporated areas of the county, something it was created to do. The ability to provide this service has enlarged the authority’s customer base, making it a more viable utility. As wastewater service is now effectively available throughout the county, developers are able to develop at densities and in areas previously

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\(^{52}\) If the possible opportunities offset the cost of contesting city policies, someone would challenge the cities’ positions. Depending on the outcome, this would either galvanize the cities’ position or open this area to the technology.
prohibited. Further, the legacy of the county’s “zoning-by-septic” policies, which afford greater densities in the R-1 district when a “public sewer” is available, has fostered an increase in A-1 to R-1 rezoning requests. These requests have been largely granted. Their dispersement reveals that they result from developer initiative rather than from broader planning goals. Ultimately, each local government—the county and the two cities—and members of the development community were found to act in a rational manner. However, due to jurisdictional limits, the policies of these local governments have played out within limited horizons. The consequence is a development pattern that, from a larger perspective, is irrational and inefficient because it has pushed growth away from its logical anchors, the established cities.
CHAPTER VIII

THE CASE OF RUTHERFORD COUNTY

Rutherford County is located to the south of Wilson County in Middle Tennessee (Figure 8.1). Due to their proximity, these two counties share many commonalities. In recent years, both have experienced rapid growth (Tables 7.1 and 8.1). Additionally, these counties share a common physical setting of shallow soils and prevalent bedrock outcroppings. This presents challenges to conventional wastewater disposal in both counties. Due to its pronounced population growth Rutherford County has experienced a greater use in decentralized wastewater systems. More systems are located in Rutherford County than in any other county in the state. Almost all, 43 of the county’s 44 decentralized systems, serve single-family residential developments (Figure 8.2).

Unlike Wilson County, the use of decentralized systems in Rutherford County played out in the absence of formal extraterritorial control by cities and was largely unimpeded by the county’s zoning ordinance. Whereas the cities of Lebanon and Mt. Juliet possessed a measure of extraterritorial land-use control in Wilson County, the cities of Rutherford County do not possess this same formal control at their periphery. Land-use planning and regulation are the purview of the Rutherford County Commission and county planning commission. In the early 1980s the Rutherford County Commission adopted a zoning ordinance that zoned nearly the entire unincorporated area as R-15.

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53 As in Wilson County, the common term used in Rutherford County for decentralized wastewater systems is STEP, the acronym for Septic Tank Effluent Pump. Because this is the term locally used, it is not replaced in the statements made by local sources.
54 Rutherford County was the site for eight additional permit applications during 2007, putting the total systems for the county at 52 in January of 2008 (TDEC 2008).
Figure 8.1  Rutherford County, Tennessee.
This blanket zoning allows the development of residential lots of 15,000 square feet throughout the county. Consequently, any land owner is entitled to develop fairly high density subdivisions. Due to the nature of land-use regulation and control in Rutherford County, this case study presents a picture in contrast to Wilson County and reveals outcomes produced when development is liberated from the sewer pipe but unrestrained by planning regulations.

**DECENTRALIZED WASTEWATER: LOCAL NEED AND PROVIDER**

Positioned amid the counties forming the outer ring of the Nashville-Davidson Metropolitan Area, Rutherford County has experienced robust population growth in recent years. One of the fastest growing counties in the nation, Rutherford County’s population grew from 183,482 in 2000 to 228,829 in 2006, an increase of 25 percent (Table 8.1). With direct access to major employment centers via Interstate 24 and State

<table>
<thead>
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<th>Population Estimates</th>
<th>Population Change</th>
<th>Share of County's Growth</th>
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<tr>
<td></td>
<td>July 1, 2000</td>
<td>July 1, 2006</td>
<td>Absolute Change</td>
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<tr>
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<td>70,411</td>
<td>92,559</td>
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<tr>
<td>Smyrna</td>
<td>27,316</td>
<td>34,491</td>
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<td>La Vergne</td>
<td>18,935</td>
<td>27,255</td>
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<td>Eagleville</td>
<td>463</td>
<td>471</td>
<td>8</td>
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<tr>
<td>Unincorporated</td>
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<td>74,053</td>
<td>7,696</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>183,482</strong></td>
<td><strong>228,829</strong></td>
<td><strong>45,347</strong></td>
</tr>
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</table>

Figure 8.2  *Top and bottom,* Residential developments served by a decentralized wastewater system in Rutherford County, Tennessee; *center,* installation of infrastructure in rocky conditions. (Continued)

Figure 8.2  Top, bottom, and center left, Residential developments served by a decentralized wastewater system; center right, a recirculating sand filter treatment unit in Rutherford County, Tennessee.
Route 840, Rutherford County is a bedroom community for Nashville. Approximately 35,000 Rutherford County residents commute to jobs outside the county (Table 8.2) (Rutherford County Chamber of Commerce 2008a). In 2005, it was estimated that the majority (25,297 or 72%) of commuters left for jobs in Nashville-Davidson County. However, Rutherford County’s pronounced population growth is also attributable to the county’s strong local economy. Leading employers in the county include Nissan North America, Middle Tennessee State University, Bridgestone/Firestone, Ingram Book Company, and various medical facilities (Rutherford County Chamber of Commerce 2008b).

Murfreesboro, the county seat and largest city, has been the focus for most of this population growth. Murfreesboro grew from over 70 thousand residents to over 92 thousand in just six years, an increase of 31 percent (Figure 8.1 and Table 8.1). The 22,148 people who moved to Murfreesboro represent 49 percent of the county’s growth.

<table>
<thead>
<tr>
<th>County</th>
<th>Commuters leaving for Davidson</th>
<th>Number 25,297</th>
<th>Percentage 72%</th>
<th>Commuters entering from Williamson</th>
<th>Number 3,870</th>
<th>Percentage 11%</th>
</tr>
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<tr>
<td>DeKalb</td>
<td>Not reported</td>
<td>Not Reported</td>
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<td>1.7%</td>
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<td>Other</td>
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<td>35,000</td>
<td>100%</td>
<td></td>
<td>20,000</td>
<td>100%</td>
</tr>
</tbody>
</table>

Table 8.2 Commuting Patterns, Rutherford County, 2005

during this period. Located in the county’s northwestern corner, the second and third largest cities, Smyrna and La Vergne, attracted comparable shares—16 and 18 percent respectively—of the county’s growth between 2000 and 2006. Smyrna grew by over seven thousand to a population of 34,491 while La Vergne added over eight thousand new residents. Smyrna and La Vergne share a corporate border, which forms much of the southeastern boundary of La Vergne and the northwestern boundary for Smyrna. La Vergne is bound on the northwest by Williamson County and on the northeast by J. Percy Priest Lake. Thus, La Vergne’s spatial growth is limited. Located in the remote southwest corner of the county, Eagleville has yet to experience the intense growth pressures felt throughout much of the remainder of the county. Outside these four cities, Rutherford County’s unincorporated area grew by 7,696 people or 17 percent during this six-year period. In contrast to Wilson County, growth in Rutherford’s unincorporated area is a lower proportion (17%) of the county’s overall growth. However, the absolute increase in this area is comparable to the absolute growth in Wilson County’s unincorporated area. Wilson County added just over six thousand people in the unincorporated area while Rutherford County added over 7,500 people (Tables 7.1 and 8.1). The population growth that these counties experienced in their unincorporated areas has driven the use of decentralized systems, so the policies, jurisdictions, and realities existing in these areas have most influenced the use of this technology.

Initial Interest in Alternative Wastewater Systems

Like many areas in Tennessee, conventional sewers are of limited availability in Rutherford County. Additionally, due to the county’s shallow and rocky soil, the use of septic tanks is often problematic. The county’s soils best suited to the use of septic
systems are located in the county’s central basin and the river and stream basins (Figure 8.3). Because Murfreesboro is located in the heart of the county’s central basin, much of the county’s development has already occurred on these fertile lands. Farther out from Murfreesboro, the pockets of good soil become more scattered and fragmented. One source described the county’s physical setting as:

Murfreesboro is in . . . the middle of the basin. The flat part of the county is surrounded by hilly, rocky areas. . . . A lot of the best farmland was around Murfreesboro and Smyrna and that is where . . . all the growth is. They call Rockvale Rockvale for a reason. . . . A lot of the surrounding areas did not have good soil. (Source B19d 2007)

Residential development outside of the cities historically occurred on the county’s farmland best suited to septic systems (Source B25b 2007). Therefore, it has become increasingly difficult to find available tracts that contain large areas of soils suitable to septic systems. In many cases, farms have only fragmented and scattered pockets of suitable soils. One source described the fragmented availability of suitable soils as:

“Right there where my truck is might be the best soil in the county, and you move across the road, and there is no soil over there. It is all crawfish dirt” (Source B25b 2007). A longstanding member of the Rutherford County Regional Planning Commission related:

Most of the area for individual septic tanks has been used in Rutherford County, and that was limited in the beginning because we have quite a bit a rock. Quite often there would be a farm, let’s say [as an] example 100 acres and there might be . . . 10 acres that was perfect for [septic systems] but because of rock or even maybe sink holes the rest of it was not useful for individual septic tanks. (Source B26b 2007)
Figure 8.3  Soil suitability for septic systems.
The county’s physical challenges to development are reflected in the strategic plan that the county developed in the mid 1990s. The plan makes the bold observation:

Whether one looks upon the residential suburban sprawl that has characterized land use in the unincorporated areas of Rutherford County as positive or negative, one thing is certain—it is about to come to an end. The availability of land that is suitable for subsurface sewage disposal systems—land that “perks,” if you will—is dwindling fast. (Rutherford County 1998, 41)

This statement was based on a study conducted by the Rutherford County Regional Planning Commission in 1994. Assuming that all agricultural land in the county was suitable to septic systems, then the study estimated that, at current rates of consumption, the county’s farmland would be consumed by the year 2065 (Rutherford County 1998). However, all of the county’s agricultural land is not suitable for septic systems. Referencing this assumption, the county’s strategic plan stated:

We know, of course, that nowhere near all agricultural land in the county perks. In fact, it is probably a very small percentage. We know that we are running out of land in the unincorporated areas that is suitable for residential development. Developers report that it is harder and harder to find such land. (Rutherford County 1998, 41)

By the late 1990s, individuals involved with the development of land in the county, the developers themselves, the planning commissioners, and the civil engineers, were recognizing that an alternative means of wastewater disposal was needed if land was to continue to be developed in unincorporated areas. As in Wilson County, subdivisions were being designed to accommodate the fickle nature of a site’s soil (Rutherford County Commission c1998; Source B24a 2007; Source D28d 2007), requiring large and uniquely configured lots and, thus, longer internal infrastructure, such as roads and water lines, both of which add to the expense of a development and affect its
profitability. Thus, a scarcity of land suitable for easy use of septic systems and associated higher costs of development created a situation in which development costs in the unincorporated area were often higher than those associated with developing in the cities (Rutherford County Commission c1998; Source D19c 2007). This constraint coupled with the high local demand for new housing encouraged local developers to try an unfamiliar technology. Additionally, members of Rutherford County’s planning commission were also interested in an alternative means of wastewater disposal. One source described the interest of the planning commission:

At the planning commission meetings, they had discussed for some time how the farmland was being taken up and how lots had to be quite large because the septic fields. . . . You would have to have . . . well over an acre sometimes to get . . . one buildable site. And they said, “We have got to come up with something to stop [using] up so much of the farms.” And, they started looking to the engineering community. (Source B24a 2007)

Thus, for various reasons, the conditions in Rutherford County were specifically suited in the late 1990s for the introduction and use of decentralized wastewater systems. However, members of the Rutherford County Regional Planning Commission and County Executive Nancy Allen had concerns about allowing these systems to be operated by private developers, homeowners associations, or investor-owned utilities (Source B24a 2007; Source B24b 2007). The Planning Commission and the County Executive were receptive to their use if the Consolidated Utility District of Rutherford County would assume the ownership, maintenance, and operation of the systems (Allen 2007; Davis 2007; Source B19a 2007; Source B26b 2007). One planning commissioner explained:
And, I think one of the threshold things for Rutherford County was when Consolidated Utility District came forward as the body that would regulate them. And that I know made the county executive at the time—it was Nancy Allan—more comfortable with it; made all of us more comfortable. (Source D28d 2007)

_A Willing and Viable Operator: Consolidated Utility District_

In the early 1960s, four utility districts were created in Rutherford County to provide water service to the county’s rural areas (Consolidated Utility District of Rutherford County [CUD] 2008). However, they did not last long as separate districts. In the late 1960s, these four original districts merged to form the Consolidated Utility District of Rutherford County (CUD). Since that time, the utility has grown into one of the largest utility districts in the state. In September of 2007, it provided service to over forty thousand water customers (40,262) and over two thousand (2,121) wastewater customers (Dempsey Vantrease & Follis PLLC 2007). While wastewater customers constitute a small proportion of the utility’s customer base, the number of wastewater customers has grown rapidly. In September of 2005, Consolidated Utility District reported serving 1,284 wastewater customers. Between 2005 and 2007, the number of wastewater customers increased by 43 percent (Dempsey Vantrease & Follis PLLC 2005).

There was a growing need in the 1990s for wastewater service in the county, and Consolidated Utility District was the logical provider. In the early 1990s, it applied to the Department of Environment and Conservation for a permit to operate a conventional sewer system and wastewater plant to provide wastewater service to unincorporated areas of the county. However, its application for this permit was denied (Davis 2007; McElroy 2007). This denial emphasized to the utility that additional conventional wastewater
plants were unlikely to be permitted in the area and, thus, an alternative was needed. The utility’s interest in wastewater service prepared the way for it to assume operation of decentralized wastewater systems a few years later.

In 1997, Consolidated Utility District petitioned the county to amend its charter to allow the utility to provide wastewater service, a service to be provided via decentralized wastewater systems. On September 30, 1997, the county held a public hearing to receive comments on CUD’s petition. At the public hearing and in a letter dated September 29, Joe Kirchner, the Director of the Murfreesboro Water and Sewer Department, informed County Executive Nancy Allen that his department intended to extend sewer lines and provide wastewater service to unincorporated areas of the county inside the city’s 201 Planning Region (Figure 8.4). This service area encompassed the 130 square miles of the county that the city expected to experience urban development during the next fifty years. The capacity of the city’s treatment plant and its major trunk lines were sized to serve the population growth projected for this area through 2040 (Rutherford County Executive Order 12-15-97). Therefore, the Director requested that the utility’s petition be amended to remove the area of the county in which the city planned to extend sewers, reasoning:

Alternative sewage disposal systems could diminish the ability of Murfreesboro and private development to provide service to an area for the long term. From our own experience we have found it to be considerably more expensive to provide sewerage to areas where a substantial amount of development has preceded with septic tanks. (Rutherford County Executive Order 12-15-97, Exhibit 1)

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55 Although the current title for this position is “County Mayor,” the term “County Executive” was in use in the 1997 executive order regarding the amendment to CUD’s charter. For historical consistency the title “County Executive” is used here.
Figure 8.4  Murfreesboro 201 Planning Region.
Source: City of Murfreesboro 2007.
Because Murfreesboro’s Water and Sewer Department indicated intent to provide sewer service to a portion of the area to which CUD also desired to provide wastewater service, County Executive Allen suspended action on Consolidated Utility District’s petition for 60 days in order to allow the city time to submit its plans (Rutherford County Executive Order 12-15-97). After considering the city’s plans and hearing the views of those involved, County Executive Allen would determine the provider best able to service the area in question. In the end, Allen found that “the Supplemental Petition of CUD is well taken and should be allowed” (Rutherford County Executive Order 12-15-97, 5-6). However, Allen granted Murfreesboro two years to undertake construction of any of the sewer lines it desired to install in the contested area. Any areas in which Murfreesboro had undertaken the construction of sewers by January 1, 2000, were reserved as areas in which Murfreesboro had the right to provide wastewater service.

LOCAL GOVERNMENTS: JURISDICTION, REGULATION, AND POLICY

Each of the four incorporated municipalities—Murfreesboro, Smyrna, La Vergne, and Eagleville—have an active municipal planning commission. However, these commissions do not have extraterritorial planning authority beyond their corporate limits (Source B19c 2007; Waller 2008). While Murfreesboro was originally designated as a municipal/regional planning commission in 1947, the city’s planning commission no longer functions in this capacity. No map of the city’s extraterritorial region was on file with the Local Government Planning Advisory Committee or available from the City of Murfreesboro’s Planning Department (Lewis 2007; Roach 2008). Due to the city’s territorial expansion, Murfreesboro has likely annexed beyond its original planning region
boundary (Maples 2007). Therefore, the area over which Murfreesboro once had extraterritorial planning authority is probably now within the city. Smyrna, Laverne, and Eagleville were never designated as regional planning commissions and never possessed an extraterritorial region (Waller 2000; Roach 2008). Although each of these cities enforces a zoning ordinance and subdivision regulations, they do so only within their corporate limits.

In 1999 and 2000, Rutherford County developed its countywide growth plan, which was mandated by Tennessee’s Growth Policy Act (Public Chapter 1101). Public Chapter 1101 left open the possibility that a county could elect to not designate planned growth areas. Rutherford County took advantage of this allowance and chose to only designate unincorporated areas as being either within an urban growth boundary or in a rural area. Nearly half (47%) the county was designated as being in the rural area while 38 percent was designated for urban growth. The remaining 14 percent was inside the cities at that time.

**County Planning Regulation**

In 1961, the Local Government Planning Advisory Commission established the Rutherford County Regional Planning Commission. This commission’s planning region encompasses all of the unincorporated areas of the county. The county has regulated the subdivision of property in this region since the early 1960s. The county’s subdivision regulations require that decentralized wastewater systems used in the county be operated by Consolidated Utility District. Additionally, the subdivision regulations require that residential lots approved for a septic system must have soil conditions suitable to support a minimum of a three-bedroom house. Each lot is required to have adequate area for the system to function properly and cannot use area on another lot to dispose of wastewater
(Rutherford County Regional Planning Commission [RCRPC] 2004). This provision prevents the use of common drainfields. These limitations limit the usefulness of septic systems and offer additional incentive for decentralized systems. The county’s subdivision regulations require that a development’s density and lot sizes conform to the county’s zoning ordinance. Therefore, the zoning ordinance, rather than the county’s subdivision regulations, exerts the more critical influence over these developments.

**Zoning.** Although amendments have been made, Rutherford County’s current zoning ordinance has been in place since 1984 (Davis 2007; Source B19c 2007). The county’s zoning is unique. The county had initially zoned the majority of the unincorporated area as an “agricultural” district. However, this pattern was changed in 1984 when virtually the entire unincorporated area was rezoned to an R-15 designation (Figure 8.5). The only parcels that were not rezoned to R-15 were those few that had previously been zoned for commercial or industrial uses (Davis 2007; Rigsby 2007; Source B19d 2007). This general zoning pattern remains in place today. Nearly the entire (97.8%) unincorporated area of Rutherford County is zoned R-15 (Rutherford County Office of Information Technology 2007). In the R-15 district, residential lots can be created as small as 15,000 square feet (Rutherford County Commission 2004). While the zoning ordinance has allowed the creation of lots of this size since 1984, it was often difficult to actually realize this density of development due to the common physical constraints to septic systems. Prior to the introduction of decentralized wastewater systems to the county, the area required to site a septic system on each lot was the *de facto* influence of lot size and, thus, density. Through the use of a decentralized system, development was liberated to realize the higher densities that the ordinance afforded.
While there are various zoning districts, the vast majority of the county belongs to a single one: R-15.

As nearly the entire county is zoned R-15, residential development typically occurs in this district. However, if lots smaller than 15,000 square feet are desired or if the developer seeks to use an innovative design, the developer can request a planned development permit from the county. Through the granting of this permit, the developer is allowed to use flexible techniques of land development and site design. The county grants configuration and density allowances in exchange for the dedication of common space and amenities (Davis 2007; Rutherford County Commission 2004; Source B19c 2007; Source B24b 2007). To achieve the densities and designs allowed under these provisions, some type of wastewater disposal other than septic systems must be employed. Limited development has occurred in the county through these provisions (Source B24a 2007; Source B24b 2007). Sources indicated that, for a period of time, the county’s planning commission had been somewhat hesitant to allow designs under these provisions but that they were becoming more comfortable with both cluster developments and planned unit developments (Davis 2007; Source B20a 2007; Source B24a 2007). Because of the county’s reluctance to use these provisions, development of 15,000 lots had been pursued instead. One source explained, “The county only recently has been receptive to some PUD’s coming through, [so] we haven’t attempted one. We’ve just gone through with the straight zoning [of] 15,000 square foot lots” (Source B20a 2007).

For several years, the county planning commission operated under the understanding that the area of the county that is zoned R-15 was actually R-20 and, thus, required 20,000 square foot lots (Davis 2007; Source B24b 2007; Source D28d 2007). As the County Planning Director explained:
When I came here [in 1996], they told me everything was zoned R-20 and then . . . four or five years later some citizen asked me to show them [documentation] where everything was zoned R-20. They thought that there was still an Agricultural Zone. And they thought if it was not rezoned to R-20, then all that land out in the county would be Agricultural. . . . We looked at the records, and we found that the Planning Commission did recommend it be zoned R-20, but it was never submitted to the County Commission. And the County Commission never acted on it. So, everything was actually [found to be] zoned R-15. (Davis 2007)

A few of the planning commissioners who were inclined toward requiring larger lots were unsuccessful in changing the lot size to the 20,000 square foot minimum. As a planning commissioner explained:

It was news to all of us . . . on the [planning] commission when the Planning Director turned up this zoning decision in which it turned out that it was not R-20; it was R-15. Because, we had worked for a number of years assuming it was R-20. . . . A few of us who were kind of leaning that way were not even able to get them to consider going to the zoning that we thought we had been operating with all this time.

[Curtis: You couldn’t go from R-15 to R-20?]

Could not go to R-20, no. . . . We theoretically have other zones in the document but everything has just stayed R-15. (Source D28d 2007)

This planning commissioner’s experience with the inability to change the minimum lot size even to that which they had been enforcing in error illustrates the strong interest by the majority of the planning commission and the community in having a rather small lot size available throughout virtually the entire unincorporated area.

Rutherford County Community Strategic Plan. In the mid-1990s, Rutherford County produced a community strategic plan. It originated in a series of countywide visioning workshops that were held in 1994. These workshops led to a group of 200 citizen
volunteers meeting weekly in eleven workgroups for several months to identify the community’s goals and objects. During 1996 and 1997, a representative from each workgroup met to evaluate the overall direction of the plan (Rutherford County Commission 1998). Although no date indicating adoption was identified in the document or interviews, sources generally felt the plan had been adopted in early 1998 (Source D19c 2007; Source D28d 2007). The county’s strategic plan is important to the present study for several reasons. First, it offers insight into the conditions as they existed in the county leading up to the introduction of decentralized wastewater systems. Second, it offers insight into the mindset of the planning commission regarding alternative wastewater technologies.

The Rutherford County Community Strategic Plan identified four overall themes common to each of the working groups. One of these themes was the desire to manage growth to maximize benefits and minimize costs. The first strategy identified to help accomplish this management was to identify unincorporated areas unlikely to be sewerized and to identify alternatives to municipal sewer that might serve these areas (Rutherford County Commission 1998). This interest in alternative means of wastewater disposal was fundamental to realizing an objective that the authors of the strategic plan included in both the “Infrastructure and Transportation Goals” and the “Land Use Goals” (1998). This common objective was to use the traditional communities in the county as nodes of development. As explained by one source:

There were a number of us who felt that a more logical . . . land use plan—[one] that would help Rutherford County manage the growth better—would be to have this pattern of growth based upon the historic communities, the historic villages [in the county]. Have dense residential patterns around those [communities] and then have
open space in between. Now the problem with that is these historic communities weren’t necessarily [in areas suitable to septic systems]. So that meant that . . . if Rutherford County really wanted the growth to go into those historic villages, we had two choices: we could either run sewers out there to every one of those villages—which we couldn’t do—or the alternative was find some alternate means of treating wastewater so that we can direct growth to were we want it to go. (Source D19c 2007)

The Strategic Plan thus recognized that if the county was to implement this strategy, which envisioned a land-use pattern based upon “nodes” of development around the traditional communities—Christiana, Lascassas, Walter Hill, Kittrell, Rockvale—an alternative means of disposal would be necessary (Rutherford County Commission 1998).

*Murfreesboro’s Extraterritorial Influence*

While the City of Murfreesboro exerts no formal extraterritorial influence through the city’s planning commission, city policy regarding the extraterritorial extension of sewers has influenced the use of decentralized systems at its periphery. Fearful that decentralized wastewater systems would short circuit the city’s long-range wastewater planning program, Murfreesboro was not initially favorable to their use (Source B26b 2007; Source B27a 2007). However, while the county did not reserve the entire area within Murfreesboro’s 201 planning region for the city to service, this oversight has not impeded the extension of the city’s wastewater infrastructure. This is principally because developers still prefer to connect to a central sewer system when economically viable to do so and because Murfreesboro has been willing to extend sewers beyond its corporate limits. Furthermore, the city has established special assessment districts for wastewater infrastructure both inside and outside its corporate limits (Figure 8.6). Through these
Figure 8.6  Special assessment districts, City of Murfreesboro, Tennessee.

Source: City of Murfreesboro 2007.
areas, the city has carved out a considerable territory from which developers can connect to the city’s sewer system.

Murfreesboro requires the developments that it services with sewers outside their corporate limits be built to city standards (Source B24c 2007; Source B27a 2007). However, this has not always been the case. In the late 1980s and early 1990s, developments beyond the city limits were requesting—and receiving—water and sewer service from the city. At that time, the city would extend service without requiring the property be annexed. However, because these developments were not under the regulatory purview of the city’s planning commission, they were not being developed in accordance with the city’s regulations. Rather, they were being developed to standards designed by the county (Source B27a 2007). The city realized that, as it annexed these developments, the infrastructure needed to be improved to city standards. Thus, the city implemented a policy requiring that extraterritorial development that receives city services be built to city standards. In this way, the city extended the regulatory purview beyond its city limits.

Murfreesboro started using special assessment districts for sewer in the early 1990s. However, the majority of city’s existing districts were established from 1997 through 2001. One district was established in 1997, one in 1998, two in 1999, one in 2000, and eight in 2001 (City of Murfreesboro 2007). An additional district was established in 2006, and there were seven proposed districts under consideration at the time this research was conducted in the spring of 2007. Whether Murfreesboro created these special assessment districts in response to the advent of decentralized wastewater systems locally is not known. What is important is that the districts were created and
lines were extended in the area beyond the corporate limits. Thus, the city reduced the need for decentralized wastewater systems in its immediate surroundings.

OUTCOMES

The use of decentralized wastewater systems has opened many areas of Rutherford County to more intense development than previously possible. However, developments supported by decentralized systems have not been located uniformly throughout the county. Rather, there are distinct patterns to and influences on their use. In a general sense, three areas can be observed in which decentralized systems have been used (Figure 8.7). One area is located to the north and one to the south of Murfreesboro. Both lie along the periphery of Murfreesboro’s urban growth boundary, with some systems located in the county’s rural area; sixteen systems (36%) throughout Rutherford County are located in the rural area. The third area in which decentralized systems have been used is located midway between Murfreesboro and Smyrna and is within the urban growth boundaries of these cities. These three areas are roughly equidistant from the center of Murfreesboro and form a ring around the city. In order to understand the reasons for this, we must recognize the factors that have influenced their use. As was the situation in the other case study counties, there were several.

Apparent in the statements of key informants and the distribution of systems in Figure 8.7 are the influences of sewer availability, market demand, transportation access, soil constraints to septic systems, and the availability of land for development (Allen 2007; Source B26b 2007). While each of these factors has influenced the development enabled by decentralized systems in its own way, there is an influence that proved critical
Figure 8.7  Decentralized wastewater systems. Rutherford County, Tennessee.
in the other counties but does not exist in Rutherford County: extraterritorial planning control by the cities—such as exerted by Lebanon and Mt. Juliet. Because the cities’ planning commissions in Rutherford County function only as municipal planning commissions, they possess no extraterritorial planning authority. Murfreesboro’s ability to require development in the county, which uses city services such as sewer, is the notable exception. However, this is a *de facto* influence rather than a product of planning jurisdictions.

*In the Absence of Municipal/Regional Planning Commissions*

While a gap exists between the locations of decentralized wastewater systems and cities in the other case study counties, the gap observed in Rutherford County is different. In this setting, the direct influence of market demand, transportation infrastructure, and the availability of sewers is not impeded by extraterritorial planning control by the cities. Developers in Wilson County recognize that due to the positions taken by Lebanon and Mt. Juliet their options for wastewater service inside the urban growth boundaries are either to use the city’s sewer system or septic systems. If neither is viable, a developer in Wilson County must either contest the city’s position or develop beyond city control. As developers in Wilson County had yet to confront the cities, the planning region creates a geographic boundary that has influenced the use of this technology. In Wilson County, the decision regarding which means of wastewater to use is based on whether the project is inside or outside Lebanon’s and Mt. Juliet’s growth boundaries and planning regions. As one informant described the situation: “unless you want to be the one right in the middle of that battle . . . you will accept that you are going to be on sewer, if it is available in [the urban growth boundary,] or if it is outside you are going on the STEP
The situation in the other case study counties stands in stark contrast to the situation in Rutherford County, where no extraterritorial planning regions exist for the cities. Development enabled by decentralized wastewater systems in the unincorporated area of Rutherford County is not influenced by policies implemented by the cities. This can be observed in the fact that systems have been located regardless of the urban growth boundaries in the county’s growth plan (Figure 8.7). The only measure of extraterritorial control by a city in Rutherford County is that exerted by Murfreesboro through its requirement that developments served by city sewer conform to city standards. Because the use of decentralized wastewater systems is not subject to extraterritorial control by the cities, development supported by decentralized wastewater systems has been subject to the influences of market demand, accessibility to transportation and sewer infrastructure, and availability of land for development.

Market Demand and Access. Market demand was observed to exert a strong influence over the location of developments using decentralized wastewater systems in Rutherford County. As in Wilson and Sevier counties, decentralized wastewater systems have almost exclusively been used to service new development. Thus, the locations desirable for new housing are fundamental to their use. Demand is naturally associated with accessibility, and thus, transportation infrastructure plays a prominent role in influencing development supported by decentralized wastewater systems.

The influence of transportation infrastructure is most apparent in the north part of Rutherford County, where decentralized systems appear as beads on a string along State Highway 266 (Figure 8.7). To a lesser degree, this influence is also apparent along U.S.
Highway 231 to the north and to the south of Murfreesboro. State Route 840, a controlled access highway extending through the northwest quadrant of the county, has placed this area within easy commuting distance of Nashville/Davidson County and Williamson and Wilson Counties. The main section of State Route 840 through Rutherford County was completed in 1996 and so coincided with the local introduction of decentralized wastewater systems. While the decentralized developments do not necessarily appear to cluster along 840 at the scale shown in Figure 8.7, the improved accessibility this controlled access highway has provided to the entire northwest of the county has made this entire area more attractive for development. Speaking of the influence of transportation and market demand on the location of decentralized systems, one informant explained:

[The] first thing [that] jumps out at me is they are near major roads. Most all the [systems] are near a state route . . . and just on the outskirts of Murfreesboro . . . where sewer is not available. . . . Developers, if they had a choice of putting their development on Highway 96 . . . versus out here in Rockvale, are going to put it on Highway 96, unless the land cost is too high. So, I think it is . . . just economics. (Source B19d 2007)

The Influence of Sewers. The influence of the market and transportation access is understandable and apparent; however, the use of decentralized systems has also been influenced by the availability of Murfreesboro sewer lines in unincorporated areas. Where soils were suitable, some development on septic systems occurred outside of Murfreesboro; however, such lands are limited, and some other means of wastewater

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56 When completed, State Route 840 will provide a controlled-access beltway around Nashville. Construction on the southern half of the State Route 840 project began in 1991 at the route intersection with Interstate 40 in Wilson County. The easternmost section between Interstate 40 and Interstate 24 near Murfreesboro was completed in 1996 (Center for Transportation Research 2003).
disposal is needed. Therefore, since the late 1990s, Murfreesboro has extended sewer lines in areas the city annexed and created special assessment districts beyond its corporate limit (Figure 8.8). This has made sewers available to a large area that was beyond the city limits of Murfreesboro when decentralized systems were first being considered.

Central sewers, if accessible, remain the preferred means of wastewater service. One source explained the preference for sewer as “if we have access to city sewage . . . that is just the way we go, period. That is the most economical way. You do not lose any density to the drip field [or] that sort a thing. So, if sewer is available, that is what we use” (Source B19d 2007). Thus, the availability of sewers within the area near Murfreesboro has reduced the need for decentralized wastewater systems here. Although Consolidated Utility District may technically have the right to provide wastewater service to areas which Murfreesboro provided service after January 2000, it has generally not chosen to do so. CUD was described as being very conservative in its provision of wastewater service in the area near Murfreesboro (Source B27a 2007). This may well have resulted from the developer’s preference for sewers if they are available. Nevertheless, CUD’s General Manager Larry McElroy explained that when the utility’s charter was amended the utility agreed to contact Murfreesboro officials to determine if the city had or would have sewer available for sites proposing to use a decentralized system (2007). McElroy indicated that in most instances sewer had not been available to these sites. As with Murfreesboro, McElroy explained that, if there was a possibility of sewer availability from Smyrna, then Consolidated Utility District “certainly would honor their request that it be sewered by them” (McElroy 2007). Just as Michael Hines
Figure 8.8  Murfreesboro sewer availability. Rutherford County, Tennessee.
tells developers that if they can connect to “a municipal sewer at a reasonable cost, then by all means do so” (Hines 2007). CUD also defers to the cities in those areas where city sewer lines exist.

Therefore, the availability and preference for sewers has a pronounced influence on the use of decentralized systems. Because the decision to extend a sewer line to a project depends on spatial factors—the length and cost of the extension as well as the expense and ability of the developer to obtain an easement to install the line through properties that he does not own—sewer must be rather close to property for a connection to be economical (Source B19d 2007; Source B24b 2007). Due to the difficulty and expense of extending sewers, development took place sequentially in a radiating pattern as sewers were extended. However, the advent of decentralized wastewater systems has changed this.

The preference to access central sewers explains the void of decentralized systems in the area of the county in which Murfreesboro has extended sewers. Therefore, a different reason for the gap between the decentralized systems and the city was observed in Rutherford County than was identified as causing the void of systems in Wilson County. Rather than being created by extraterritorial planning jurisdictions as in Wilson, in Rutherford County the gap was determined by the availability of sewers and the area in which the extension of sewers is imminent (Figure 8.8). However, sewers are no longer the only option for achieving higher densities, so they no longer exert as strong a spatial influence over growth patterns. While developers may still wait for the extension of a sewer line if the extension is expected to occur in the very near future, developers who are removed from the area in which extensions seem imminent and who want to move
forward no longer have to wait—or pay for—the extension. Because the demand for housing is not constrained to the areas to which sewer can be readily extended, properties in these slightly removed areas can be developed through use of a decentralized system.

**Zoning and Land Availability**

Due to the county’s near-blanket zoning of R-15, residential development can occur on small lots throughout the county. The county’s zoning regulations do not guide or influence residential development enabled by decentralized wastewater systems. This zoning however dates to a time when realizing the high densities was possible only on sewers. Due to the advent of decentralized wastewater systems, intense development can now take place on most sites in the county. Therefore, so long as a developer is content to develop at a 15,000 square foot minimum, the developments can be located at almost any site in the county. While it cannot be said that the zoning ordinance guided the growth this technology enabled, it can be said that the near ubiquitous nature of the R-15 zoning has removed any planning obstacle to the use of this technology to support intense development in the unincorporated areas. As one Rutherford County Regional Planning Commissioner explained:

> This county is unique in the state of Tennessee in that it had—back in the ‘80s—blanket zoned the entire unincorporated area of the county . . . R-15. . . . The upshot of that was that any land owner is entitled by right to develop fairly high density subdivisions. And there is no [required] approval process to say, “Well, this is a good place to put a subdivision” because that option was taken out of our hands 20 years ago. . . . I remember very clearly the day that the light sort of went on in my own

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57 While not all sites have enough suitable soils that are required to site a decentralized wastewater system, this physical limitation has not been a considerable constraint to the systems. CUD’s General Manager, Larry McElroy, explained that CUD had only a few systems that were unable to find soils suitable to construct a system.
head about what the implications were with this blanket zoning. You know, it had
been mentioned, but I had not really thought about it as being different [than in] other
areas. And it was just kind of stunning when I realized how much that [R-15 zoning]
sets a course for the county. We are all going to have to live with this kind of
unregulated development pattern as a result. (Source D28d 2007)

Unlike in Wilson County where numerous requests have been made to rezone
properties to allow for a minimum lot size of 20,000 square feet, rezonings are generally
not necessary in Rutherford County. Only in the limited instances where developers
sought to develop lots smaller through the use of a planned unit development or cluster
development was a change to the zoning necessary.

This lack of influence by the zoning ordinance and districts is evident in the fact
that the County Planning Director, John Davis, felt that a greater influence over the use of
decentralized wastewater systems had been the issue of which properties developers had
been able to purchase land for development. When shown a map (Figure 8.7) of the
location of decentralized wastewater systems in the county and asked about the reasons
influencing the pattern of their use, the County’s Planning Director responded:

You can not tell anything from this [map] because the way land is developed here is
whoever [is willing to sell their land] . . . Whenever they can find somebody to sell it.
[It] has nothing to do with any logic. It is just when land comes available. That is
when a development occurs. When a farmer decides he wants to sell and a developer
is there ready to buy it and build something. There is no pattern. There is no way
you could have any pattern. It just does not follow a pattern. (Davis 2007)

The same opinion was expressed by a member of the Rutherford County Planning
Commission. When asked to explain the factors influencing the local use of
decentralized systems, this commissioner stated:
It would be hard to explain. . . . Farmer Jones is out here on 500 acres and he wakes up one day and says, “I want to retire,” and he calls the realty company. [Who responds], “Yeah, we will be right out.” Two weeks later, they have struck a deal, and maybe six months later, we get a plat for those 500 acres. I think this might indicate that there is no planning in the classical sense. Otherwise, I think, if there were planning you could explain the rationale behind the [location of the systems]. . . . So, I think if you asked me to explain why the [systems] are where they are, I would have to say probably because there has been no planning. (Source B24c 2007)

OBSERVATIONS

*Advantages of a Decentralized Wastewater System*

Although often not a developer’s first choice, a decentralized wastewater system is often the only viable means of wastewater disposal available in many parts of Rutherford County. A great deal of the influence determining whether a decentralized system is used or not has to do with the availability of sewers, the physical character of the site, and the density of development that is desired. While the influences of the market, transportation and sewer infrastructure, and land availability were identified as influencing the location of developments using decentralized wastewater systems, the advantages of these systems have also contributed to their use. Paramount to these advantages is the density that the systems afford in unsewered areas.

**Density: The Need and Desire for Smaller Lots.** As land prices have risen in the unincorporated areas of the county, developers have tried to realize higher lot yields by creating smaller lots. As one source explained: “You have to get the lots a little bit smaller to get your [lot] yield up to pay for the [land]” (Source B24b 2007). By increasing lot yields, a developer is able to distribute a project’s expenses over more lots.
and, thus, lower the cost to create each lot. One source explained that, due to the costs of road excavation and paving as well as the installation of other infrastructure, a developer will typically seek to get as many lots on each street as possible. As he explained “Any little thing like that you can do will boost your numbers. You shorten the road up, and this helps you keep your lot costs down. The lower I can keep my lot costs, the quicker I can sell my lots. (Source B25a 2007)

The desire for smaller lots and higher densities in a setting constrained in ability to site septic systems has favored the use of decentralized wastewater systems. Without this technology, these developments would not have occurred in the form that they exist, and some would have not occurred at all. Achieving the densities the systems allowed was the key to the economic viability of these projects. Otherwise, certain properties may have developed as larger tracts along the existing road frontage of the site. Others “would not have developed, I would say at this time. Because [without the STEP system, you] do not get the yield to generate the economics to pay the price that people are wanting for the land” (Source B19d 2007).

The ability to reduce lot costs by creating more and smaller lots translates into either greater economic return or allows for the development of less expensive houses. If lot costs are high, then only a higher-end home can be constructed on that lot. Typically, developers prefer that their lot cost be 20 to 25 percent of the final house price. As the cost of the lot increases, so too does the cost of the house. Sources indicated that there was demand in the county for homes in the $175,000 to $200,000 market (Source B24b 2007; Source B26b 2007). As a result, developers were seeking to place homes in this price range on smaller lots. In the absence of decentralized systems, the developers
would be left to construct lots that could accommodate septic systems. In some cases, this would not be possible without subdividing farms into a few tracts of several acres. In other cases, projects would have larger lots to site the septic systems. Homes on these lots would have to be more expensive to make the project economically viable although they might be in less demand. Thus, decentralized wastewater systems not only allowed the development of many properties that otherwise were undevelopable at anything other than very low densities. They have also allowed development on smaller lots, which has permitted the construction of homes for which the market was strongest.

**Design.** By removing the physical constraints imposed by septic systems, decentralized systems also enable greater siting flexibility in terms of the design and continuity of a development. Whereas the site constraints of septic systems can impose undesirable design configurations, decentralized wastewater systems do not require lots to be designed to use the limited soils suitable to septic systems, making for a more attractive development (Figures 8.9 and 8.10).

The subdivisions can be more uniformly designed; your setback lines are all the same; you do not have to worry about drip [fields or] septic lines in the front yard or the back yard. It certainly lends to a more symmetrically designed subdivision. (McElroy 2007)

The ability to create better designed subdivisions has increased the market appeal of these developments. Furthermore, because a higher density and better design can be realized, developers can afford to invest more in the infrastructure—such as curbs—than would typically be expected in developments outside the cities. Although not all have done so, such investments have altered the feel of certain developments constructed on the decentralized wastewater. One informant explained:
Figure 8.9  Divergent development patterns: design and lot configurations on septic systems versus a decentralized wastewater system. Wilson County, Tennessee.

Source: Tennessee Department of Finance and Administration, Office of Information Resources. 2007.
Figure 8.10  *Top and center*, Residential landscapes served by decentralized wastewater systems; *bottom*, residential landscape served by conventional septic systems.

It makes your subdivision look more uniform. Let’s say we do a conventional septic system development, and we have a road running in. Well, the first lot may be a half acre, the next lot may be an acre and a half, the next lot may be three quarters [of an acre], and the house may be up front and the soil in the back. So you get houses jogging in and out and around, and you get lot sizes that are [variable]. And it is not a real pretty pattern, whereas with the STEP system it is just smooth. . . . In fact, we have seen developers put down curb in the county now, whereas that was always a city thing. Now they are putting in curbs to make it even look more like a city subdivision. . . . And it gives it a more “city feel.” . . . And, some of the ones that we are doing on STEP now, if you did not know where you were, you would think you were in the city. (Source B19d 2007)

Site Utilization. In Rutherford County, it is common for all the soils suitable for septic systems on a site to be concentrated in a few pockets while the remainder of the site has rocky and shallow soils unsuited to septic systems, a situation which has made the use of decentralized systems all the more attractive. By enabling the development of areas not suitable to septic systems, decentralized wastewater systems have enabled the more thorough use of these properties. Prior to the use of decentralized systems, it was common for properties to be intensely developed on the portion suitable to septic systems while the remainder of the farm would be subdivided into larger tracts.

I have seen farms that maybe had 100 acres [with] 20 acres of good soil. Somebody [would place] a subdivision on that 20 acres and then tract up the other [part of the farm]—if they could find the soils to have 5 [or] 10 acre tracts. Now, you put [the decentralized wastewater system’s] drip field on 10 acres of that 20 and you have 90 acres you can develop and maybe get 180 lots. So, let us say 180 lots versus 40 lots [on the portion that was suitable to septic systems]; you know, [in] that case it is four and a half times the yield. And most people, when they sell you a farm, they want to sell you the whole thing. Not just the best [land]. (Source B19d 2007)
Summarizing the dual advantage of density and site utilization, another source explained:

The big picture is [that on] this piece of ground, he may have only [developed] 50 houses [here on septic] because the way the soil is. This creek comes around here and makes a bend, and it has laid this soil in here. Whether it was laid in here by the creek or washed down off this hill behind us, the soil is down here. You can see all that rock up there behind us. You go from 50 houses to 400 [with this system]. That is your economies of scale. [It] makes everything work better. (Source B25a 2007)

Finally, the technology has permitted the more complete development of these sites and increases the economic viability of the project as it increases the number of lots possible. This technology has also allowed the developments to absorb growth that might otherwise have taken a different and more land-consumptive form. These advantages have both encouraged the use of this technology and altered the settlement patterns in the county.

*Unrealized: Complementary Planning Goals*

At the onset of the local use of decentralized wastewater systems, two complementary planning goals were recognized. The first was the preservation of agricultural lands. The second was the focusing of development around Rutherford County’s historic communities. Although these two planning goals were not formally linked, they both required decentralized wastewater systems to make them physically and economically possible. However, planning policies and regulations were also needed to ensure that the goals were realized. While the technology arrived in Rutherford County, the necessary land-use regulations were not implemented.

*The Preservation of Agricultural Lands.* In his 1981 article, Popper recognized that alternative wastewater technologies might be used to locate development away from
prime agricultural and other environmentally sensitive land. Popper’s rationale was drawn from the fact that good agricultural soils are often well suited to disposing of wastewater through septic systems. As alternative technologies could enable development to occur largely on “non-agricultural” soils, it would reduce the pressure to develop agricultural lands (Popper 1981). Schiffman, Johns, and Banathy also cite the ability to accommodate development on non-agricultural lands as an advantage of alternative wastewater technologies. However, they contend that cluster residential developments made possible by decentralized wastewater systems can provide some economic relief to farmers by “allowing limited development on farmland in a manner that preserves the vast majority of the land for agriculture” (Schiffman, Johns, and Banathy 2003, 30).

In Rutherford County, we can observe the outcome of decentralized wastewater systems as it pertains to the preservation of agricultural lands. While the outcome that Davis anticipated—that of developing unproductive land while leaving the remainder in active agricultural production—has not occurred, the technology has enabled the more complete and intense use of the properties that have been developed. This has thus allowed these properties to absorb growth that, had it occurred at lower densities on septic systems, would have consumed more land. As such, this has delayed the development of other properties and, thus, slowed the consumption of agricultural lands. Nevertheless this may not be a long term solution and is not the one advocated by authors such as Schiffman, Johns, Banathy (2003). Rather, this outcome has resulted not from a policy initiative but from the profit benefits that developing at higher densities yields to the developers.
The second outcome pertaining to the preservation of agricultural lands relates to the complete development of properties rather than only the least fertile areas. Agricultural lands were not preserved, although this was promoted as an advantage of decentralized systems. As one member of the Rutherford County Regional Planning Commission explained:

One of the selling points of this was that we could leave the farmland and build on less desirable property. Well, I do not think that has worked. . . . We still have a few farms in the county, but I do not think that we have done anything as planners to give other incentives for people to preserve farmland. So if a farmer is ready to sell, this just helps him get more lots on his land than he would otherwise. And of course, the development community had a natural interest in this and [also] the land owning community—which is primarily farmers, but not entirely—but people with large parcels of land. The land is worth more if you can put more houses on it. And so, it was kind of a pretty good idea from the planning standpoint in terms of conserving land. [It] could have been better if we had done some other things at the same time to really direct growth to areas that we thought were best for it. But I think there was also a lot of momentum on the development side of “Let’s get more value out of each parcel of land.” (Source D28d 2007)

John Davis, the County’s Planning Director, explained that in he saw in the use of these systems the opportunity to preserve agricultural lands by allowing farmers to sell those portions of their property that were less suited to agriculture while continuing production on the more fertile areas. He foresaw that this would offer the farmer the best of both worlds by allowing income to be realized from the sale of less productive areas while still maintaining farming in the community. However, Davis felt it was not happening because entire properties were sold rather than only the more marginal areas for agriculture (Davis 2007).
Because properties are more intensely and completely developed through use of decentralized systems, these technologies have slowed the development of other properties (Source B25a 2007). While the technology has slowed the consumption of some farms, the preservation of agricultural lands on a site level has not been realized, as Davis had envisioned, because entire farms are being sold and developed. There is no policy incentive to encourage the preservation of those portions of farms suited to agriculture while allowing development on unfertile areas. Little support exists for such a policy. As others have recognized, once the value of land is derived from its potential for urban or suburban use rather than its ability to generate income from agriculture, farming becomes less viable, and landowners often become inclined to sell their land for development (McCuaig and Manning 1982; Tassie 1998). This seems to be the situation in Rutherford County.

Farmers are not inclined to sell only that portion of their land not suited to agriculture, but rather tend to sell entire farms and quit farming (Davis 2007; Source B19d 2007; Source B24c 2007). Landowners want the greatest income from selling their land. As Rutherford County’s Planning Director John Davis explained:

> Usually when a farmer sells, he is ready to quit farming. And his children [do not] want to continue farming. So he just sells the whole land. . . . So even though it made sense and seemed like a good idea, in practice it just did not work because of the economics of it.

> [Curtis: And your experience here is that, it hasn’t really preserved agriculture?]

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58 For agriculture to remain viable, it takes an entire community support structure from feed and equipment suppliers to agricultural buying points to a younger generation interested in pursuing farming as its occupation. As the agricultural infrastructure weakens in the face of development pressure, agriculture does not remain a viable operation on those limited and most fertile lands. Thus, entire farms are being developed rather than only the areas least productive for agriculture.
No, it has not preserved agriculture. I saw it as a really good tool to preserve agriculture, and the planning commission could have dealt with it differently if they had chosen to do so, but they did not want to do that. They could have established that STEP systems can only be used in a [planned residential development] and that only land that was unsuitable for septic tanks could be built on and everything else had to be left in open space or for agricultural use. . . . But again, there was no support for that. (Davis 2007)

Davis further explained that in his experience the considerable demand for development and high property values locally had played a part in the sale of entire properties rather than only the more marginal areas for agriculture. “And I think the growth drives that too. I mean, the land gets so valuable that they can not afford not to sell it. So the economics of it is just driving this whole process” (Davis 2007).

While the preservation of agricultural lands through the development of areas of unsuitable soils was recognized as an advantage of these systems, this preservation has not occurred in Rutherford County. The necessary policies and land-use regulations that would have guided the development of these areas were not implemented, and in their absence, the market and technology did not produce this outcome on their own.

The Focusing of Development around Historic Communities. The 1998 Strategic Plan identified the need for alternative means of wastewater disposal in order to orient future growth around the historic communities. However, the advent of this technology was not the only change needed for this land-use pattern to be realized. A change to the county’s zoning pattern was required to discourage growth in areas where it was not desired and encourage growth in the historic communities. While the technology became a reality, the change to the zoning did not.

The distribution of decentralized wastewater systems in the county reveals that
growth focused on historic communities was not realized as was intended (Figure 8.7). Rather, due to the ubiquity of the R-15 zone, decentralized wastewater developments have been allowed to respond in an unguided fashion to market forces, transportation accessibility, and availability of land. While some developments have been located in places such as Lascassas, this development was not due to the influence of the planning regulations. Had the Community Strategic Plan been followed through to its logical conclusion, it would have served as the basis for the county’s long-term land-use plan, and the county’s zoning pattern would have reflected the goals and objectives outlined. However, the zoning pattern was never amended to order growth.

**Why the Policies and Regulations Were Not Implemented.** The policies and regulations that would have guided growth into the areas unsuited for agriculture as well as into the historic communities were never implemented because they were not supported by the local citizens or policy makers. While identifying the historic communities as nodes of growth sounded like a sound general planning policy in the strategic plan, for this growth to occur would have required reducing permitted densities, possibly in large sections of the county. However, this was largely unsupported locally by both landowners and residents. As John Davis, the Planning Director, explained:

> No, there is no inclination to change the R-15. They have looked at it a couple of times. They discussed adding an Agricultural Zone, but there is no support for it on the Planning Commission. There is no support out in the community either. So it is not going to happen. I mean even if the Planning Commission recommended it, [the] County Commission would not [approve] it. There is no support for it out in the county. (Davis 2007)

Down-zoning the densities possibly would have resulted in a widespread
devaluation of the properties in these areas, a result that was unacceptable to the majority of local policy makers because it would mean determining areas where higher densities would be allowed and areas where they would not. This action would, in effect, mean allocating the value of properties and picking winners and losers, something very unpopular locally.

Decisions regarding where dense development could occur had long been determined by the physical constrains to septic systems and the limited extent of sewers. By removing these constraints, decentralized wastewater systems allowed dense development wherever a system could function: A certain amount of good soil is needed for even a decentralized wastewater system, although physical constraints to decentralized systems were not true constraints because enough suitable soil could generally be found in some pocket of the property. Following the introduction and of decentralized wastewater systems, neither the County Commission nor the County Planning Commission chose to make the unpopular policy decisions regarding where growth would occur. Rather, the systems were seen by many as a welcome solution to developing previously undevelopable properties, thereby realizing economic return from selling the property for development. Members of the Rutherford County Planning Commission are sensitive to the wishes and desires of the residents of the unincorporated areas, many of whom are landowners. One member of the Rutherford County Regional Planning Commission explained that he “want[ed] people to have the opportunity [to develop their land]” (Source B19a 2007). Another planning commissioner explained the attitude of certain members of the commission as:
I think Craig Lynch—he is a really strong Planning Commission chair[man]—. . . but he is very aware about how his neighbors out in Fosterville and Midland [feel and] what they want. And Will Jordan [another County Planning Commissioner and County Commissioner] will stand up every time and say, “You know, this is their 401K. Their family has held the land all these years. This is how they are going to be able to get something back out of it.” And, there are those kinds of sentiments—which I understand—that made me realize that we are never going to change that. It is one of those . . . decisions that are made sometimes that you can not undo. (Source D28d 2007)

Obtaining the support needed to rezone large portions of the county might require compensation for the reduced development potential. Such compensation has been done elsewhere through mechanisms such as the Transfer of Development Rights. However, there appears to be little support for such compensation. One long serving planning commissioner expressed that “Rutherford County, I do not believe, would ever adopt a concept, in my lifetime, of buying development rights” (Source B24c 2007). Thus, the planning objectives of preserving agricultural lands and concentrating development around the historic communities have not been realized because of lack of local interest to make sweeping changes to the county’s zoning pattern necessary to ensure this outcome is realized.

However, altering the densities the zoning allows in an area is not only resisted by the landowning community but also often by the neighboring residents. Sources indicated that the homeowners in an area were often concerned about allowing denser development. While owners of large parcels resist the down-zoning of their property, residents resist the up-zoning of other areas because they fear such increased densities would reduce their property values and reduce their quality of life. In many cases, these
are the people whom long time locals described as “wanting to shut the door on
development once they got in.” One planning commissioner explained that residents will
often resist higher densities proposed in neighboring developments because they “think
density is terrible, [that] it takes down their property values and loads up the roads. And
you can not persuade [them] to any of the planning arguments that we know about, [such
as] how scattering houses out does not make for less traffic, it makes for more traffic. . . .
We get it from both sides” (Source D28d 2007).

CONCLUSIONS

In Rutherford County we can see the outcomes produced when decentralized
wastewater systems are introduced into a setting with less restrictive land-use controls.
The outcomes observed reveal that these systems can produce both beneficial and
detrimental outcomes to land-use and settlement patterns. On the scale of site design,
decentralized wastewater systems offer benefits as they enable more intense and
complete use of a property than would be possible on septic systems. This has allowed
the developments that have occurred to absorb a greater share of the county’s growth and
so delay the development of other properties. Furthermore, by removing the constraints
of septic systems, subdivisions can be designed in a more pleasing and attractive manner.

However, when the use of these systems is considered at the county scale it
becomes apparent that no coordination or planning has gone into determining their use.
Rather, this use is the product of a development process designed to meet the needs and
desires of individual landowners, developers, and homebuyers. Outcomes produced are
the result of market demand, access to transportation and sewer infrastructure, soil
constraints to septic systems, and the availability of land for development. These influences have been allowed to operate unchecked by planning initiatives or land-use controls. This has occurred in part because there has been no articulated interest in using these technologies to create a coordinated pattern of development like that identified in Rutherford County’s strategic plan. As such, the zoning pattern of the county remains largely unchanged. While this control worked well when adopted because intense development was limited to areas with access to central sewers, with the advent of the decentralized system the county zoning has proven inadequate to guide growth liberated by this technology.
CHAPTER IX
THE CASE OF SEVIER COUNTY

Located on the western flank of the Great Smoky Mountains, Sevier County has become a national tourist destination. Sevier County through its innate scenic beauty, its role as the major gateway into the Great Smoky Mountains National Park, and its amusement and shopping attractions offers a wide range of activities for tourists. It has been estimated that at least 10 million tourists annually visit the county and that in 2004 they spent over one billion dollars in travel expenditures (Sevier County Economic Development Council [SCEDC] 2008). In the past, such visitors primarily found lodging in the county’s tourist towns—Gatlinburg and Pigeon Forge—and to a lesser degree in the county seat of Sevierville. For years, these were the only places with the infrastructure to support large numbers of tourists. Development in the mountains beyond these towns was constrained by the limited availability of sewer systems and by inappropriate terrain for septic systems. This left many of the county’s most scenic areas off-limits to development. However, in the last decade decentralized wastewater systems have been increasingly used to service development in the county’s more rural areas.

THE SETTING FOR TOURIST DEVELOPMENT

Tourists were first attracted by the beauty of the mountains in the Gatlinburg area. In 1934, this mountainous region became the Great Smoky Mountains National Park, and Gatlinburg became its main gateway. More than nine million people visit the park each year. To the north of Gatlinburg, the central portion of Sevier County is characterized by
an area of foothills (Figure 9.1). Although the elevations in this middle region are not as extreme, their southern facing slopes offer stunning views of the Great Smoky Mountains a short distance away. Over time, tourist development has rippled northward from Gatlinburg along the U.S. 441 Highway corridor into Pigeon Forge, the anchor of this middle region. The opening of Dollywood in 1986 solidified this city’s place in the county tourism industry. Today, Dollywood is Tennessee’s most visited tourist attraction and ranks among the 25 most visited theme parks in North America (Moonshower 2006). Dollywood, along with smaller tourist attractions, increases the county’s appeal by offering attractions in addition to mountain vistas. In recent years, shopping has become a tourist draw: the county boasts over one million square feet in outlet malls (SCEDC 2008). In recent years, tourist development has pushed still further north along State Highway 66 to its junction with Interstate 40. Lying within the Great Valley of East Tennessee, this is a more gently rolling area that is drained by the French Broad River. Established as the county seat in the late 1700s, Sevierville anchors this northern third and provides the typical government and commerce functions for the county, although its role in the tourism industry has been growing.

Patterns of Growth and Development

Tourist development has prompted local economic and population growth in recent decades. The county’s resident population grew from 28,241 in 1970 to over 70,000 in 2000. One informant described the progression of development in the county as: “If you watch the patterns of growth, you think ‘60s and ‘70s Gatlinburg, ‘80s and ‘90s Pigeon Forge, [and] now Sevierville” (Source D13b 2007). These trends are born out in Table 9.1, which indicates Gatlinburg’s population growth was most
Figure 9.1    Sevier County, Tennessee.
pronounced—nearly doubling—between 1960 and 1980. Although growth slowed during the 1980s and 1990s, Gatlinburg has experienced a resurgence in growth recently. Its population increased 15 percent between 2000 and 2006 (Table 9.2). The 1980s and 1990s were Pigeon Forge’s prime decades for growth. During this period, the city’s population grew from 1,361 in 1980 to over five thousand in 2000, an increase of 178 percent. Demand is so great and land so expensive that recent development in Pigeon Forge has largely been for tourist accommodations and attractions. Pittman Center, a rural community to the east of Gatlinburg, has largely avoided the intense development that has occurred in other parts of the county. A relative latecomer to the tourist trade, Sevierville has been the site for much of the county’s more recent growth. During the 1990s, Sevierville grew by 4,579 people, and between 2000 and 2006, the town accounted for 36 percent of the county’s overall growth. As demand has increased and as sites within the cities—particularly in Gatlinburg and Pigeon Forge—have become

<table>
<thead>
<tr>
<th></th>
<th>1960</th>
<th>1970</th>
<th>1980</th>
<th>1990</th>
<th>2000</th>
<th>Percent Change During Dominant Decade(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevierville</td>
<td>2,890</td>
<td>2,661</td>
<td>5,444</td>
<td>7,178</td>
<td>11,757</td>
<td>64% (1990 to 2000)</td>
</tr>
<tr>
<td>Pigeon Forge</td>
<td>(X)</td>
<td>1,361</td>
<td>1,822</td>
<td>3,027</td>
<td>5,083</td>
<td>178% (1980 to 2000)</td>
</tr>
<tr>
<td>Gatlinburg</td>
<td>1,764</td>
<td>2,329</td>
<td>3,500</td>
<td>3,417</td>
<td>3,382</td>
<td>98% (1960 to 1980)</td>
</tr>
<tr>
<td>Pittman Center</td>
<td>(X)</td>
<td>(X)</td>
<td>488</td>
<td>478</td>
<td>477</td>
<td>N/A</td>
</tr>
<tr>
<td>Total</td>
<td>24,251</td>
<td>28,241</td>
<td>41,418</td>
<td>51,043</td>
<td>71,170</td>
<td>71% (1980 to 2000)</td>
</tr>
</tbody>
</table>

scarce, development has spread into the unincorporated areas of Sevier County. Between 2000 and 2006, the unincorporated area absorbed the greatest share (40%) of the county’s population growth. Revealing as these statistics are, they offer only indirect insight into an important aspect of the county’s population: tourists.

Rental accommodations have long been an important aspect of the land-use pattern in Sevier County. While historic numbers are not available, Table 9.3 reveals the current distribution of rental accommodations in the county. Pigeon Forge is the county’s leading town with over twelve thousand rental rooms. Gatlinburg is a close second with eleven thousand. However, with an estimated 12,500 rental rooms, the unincorporated area of the county has more than either of these towns. Many of the rental rooms in the unincorporated area are available in cabin developments where vacationers rent a cabin for a period of time. The scale of cabin developments has expanded from a few small, rustic cabins built on property by a local landowner to entire development complexes

Table 9.2 Population Estimates, Sevier County:
July 1, 2000 and July 1, 2006

<table>
<thead>
<tr>
<th></th>
<th>Population Estimates July 1, 2000</th>
<th>Population Change Absolute Change</th>
<th>Population Change Percent Change</th>
<th>Share of County’s Growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevierville</td>
<td>11,983</td>
<td>3,506</td>
<td>29%</td>
<td>36%</td>
</tr>
<tr>
<td>Pigeon Forge</td>
<td>5,223</td>
<td>690</td>
<td>13%</td>
<td>7%</td>
</tr>
<tr>
<td>Gatlinburg</td>
<td>3,435</td>
<td>1,471</td>
<td>43%</td>
<td>15%</td>
</tr>
<tr>
<td>Pittman Center</td>
<td>486</td>
<td>117</td>
<td>24%</td>
<td>1%</td>
</tr>
<tr>
<td>Unincorporated</td>
<td>50,586</td>
<td>3,885</td>
<td>8%</td>
<td>40%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>71,713</strong></td>
<td><strong>9,669</strong></td>
<td><strong>13%</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

offering luxurious cabin accommodations. Common to many of the resort development complexes are onsite amenities, such as swimming pools and clubhouses. Some, such as Black Bear Ridge Resort, even offer a wedding chapel, salon and day spa (Figure 9.2).

The county’s wide recognition as a major tourist area has generated demand for resort cabin/chalet developments (Jagger 2007; Source D6a 2007; Source D13b 2007). Between the late 1990s and the mid 2000s, demand for rental cabins was spurred on by a strong national housing market and robust national economy. Seeking investment opportunities, many people saw real estate in Sevier County as a good investment (Ownby 2007). One source related that investors are often attracted to Sevier County because “such a highly desirable place . . . would make your house payment for you on the rental program” (Source D6d 2007). Expecting to gain a return from either rental income or from appreciation, tourists often become out-of-state investors and owners of Sevier County real estate.

<table>
<thead>
<tr>
<th>Available Rooms</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sevierville</td>
<td>4,698</td>
<td>12%</td>
</tr>
<tr>
<td>Pigeon Forge</td>
<td>12,301</td>
<td>30%</td>
</tr>
<tr>
<td>Gatlinburg</td>
<td>11,124</td>
<td>27%</td>
</tr>
<tr>
<td>Pittman Center</td>
<td>unavailable</td>
<td>-----</td>
</tr>
<tr>
<td>Unincorporated</td>
<td>12,500</td>
<td>31%</td>
</tr>
<tr>
<td>Total</td>
<td>40,623</td>
<td>100%</td>
</tr>
</tbody>
</table>

Source: Sevier County Economic Development Council 2008.
Figure 9.2  Top and center rows, Resort cabin developments served by a decentralized wastewater system; bottom row, recirculating sand filter treatment units in Sevier County, Tennessee. (Continued)

Figure 9.2  Resort Cabin developments served by a decentralized wastewater system in unincorporated areas of Sevier County, Tennessee.

Options for Wastewater Disposal

Although sources generally believed that developers preferred sewer to other means of wastewater disposal, this infrastructure item is not widely available—with one notable exception—outside of the cities. Outside those limited areas where connecting to sewers is an option, developers have two options for disposing of wastewater: septic systems or a decentralized wastewater system. The rocky and steep sites desirable for the rental resorts offering mountain vistas are not easily developed on conventional septic systems, particularly at the desired densities. Thus, demand for resorts in areas not served by conventional sewer systems and limited in their use of septic systems created a prime opportunity for decentralized wastewater systems. As one might expect, Sevier County is at the forefront of development using these systems. Second only to Rutherford County, 34 permit applications for decentralized wastewater systems either had been issued or were under review by the Tennessee Department of Environment and Conservation in December of 2006 (TDEC permit database 2006). Unlike Rutherford or Wilson counties, the predominant use of this technology has been to support resort development. Twenty-six of the 34 (76%) systems in the county support resorts. Commercial developments, with five of the 34 systems, are next. Two systems serve a mix of land uses, and one serves a development of residential homes.

Despite considerable use in the county, decentralized systems have been used locally only recently. The earliest application for a state operating permit in Sevier County was made in 2000. Their rapid adoption was recounted by David Taylor, the

59 During 2007, the Department of Environment and Conservation received ten new permit applications for decentralized wastewater systems in Sevier County. Rutherford County was the site for eight permit applications during 2007 (TDEC 2008).
county’ first planning director:

I started in ’96 and it was two or three years after that when we first [saw a few developments using decentralized systems], and then they really hit. . . . I mean they became extremely popular at that time. . . . When these systems first became prevalent, probably a third of every [planning commission] agenda was using this type of system, a third of all developments. (Taylor 2007)

The rapid adoption of this technology by the development community and its use to construct the large resort complexes is evident in the following account:

When [the decentralized wastewater systems] first started—or you know soon after they first started—they just mushroomed and part of that was the economy and the fact that these cabin developments. . . . You know they could not build [the cabin developments] fast enough; they were selling everything they built. But the systems themselves allowed for much greater density of development over the alternative up to that point. Well, there had not been an alternative to that point. You had to develop with conventional septic systems and not only satisfy the Health Department standards there but also planning commission requirements in terms of lot size and all of that. So with these [decentralized] systems it was possible to build more densely, which of course made property more valuable. (Jagger 2007)

LOCAL GOVERNMENTS: JURISDICTION, REGULATION, AND POLICY

Five separate planning commissions operate in Sevier County. Each of the four municipal planning commissions—Sevierville, Pigeon Forge, Gatlinburg, and Pittman Center—is designated as a municipal/regional planning commission (Figure 9.1) and has jurisdiction both within its respective city and within an extraterritorial planning region. Within its area of jurisdiction, each planning commission regulates the subdivision of property. Each city also enforces its own municipal zoning ordinance within the city limits. Gatlinburg is unique among these cities in that it adopted an extraterritorial
zoning ordinance in the early 1980s. Prior to September of 2006, when the County Commission adopted a zoning ordinance, Gatlinburg’s was the only zoning ordinance in effect outside of the cities. The unincorporated areas of the county outside of the planning regions of each city fall within the jurisdiction of the Sevier County Regional Planning Commission. This Commission was established by the Local Government Planning Advisory Committee in 1995 and adopted subdivision regulations in March of 1996. The developments using decentralized wastewater systems took place after 1996 but prior to the adoption of the county’s zoning ordinance in 2006. During this time, the county’s subdivision regulations were the only land-use regulations in effect.

*Regulation by the Sevier County Regional Planning Commission*

The County’s Subdivision Regulation. The Sevier County Regional Planning Commission’s subdivision regulations have been amended a number of times since they were adopted in 1996. However, the minimum lot size has always been determined by the availability of utilities. Originally, the regulations allowed for lots to be created as small as 5,000 square feet if they were served by both “public water” and a “public sanitary sewer” (Sevier County Regional Planning Commission [SCRPC] 1996). Within two months of their adoption, these regulations were amended to increase the minimum lot size to 7,500 square feet when both utilities were present. From 1996 through 2005, the subdivision regulations allowed for a minimum lot size of 20,000 square feet in developments that had either “public water” or “public sanitary sewer” but not both. When neither utility was available, the minimum lot size increased to 28,000 square feet. Many of the developments supported by decentralized systems were developed after these regulations were adopted but prior to June of 2005, when the commission again
amended this section of the regulations. At that time, the regulations were amended to add slope to the criteria determining minimum lot sizes. “One thing that the county did do—and it was all based on these [decentralized wastewater] systems—was to increase the minimum lot size in mountainous areas” (Taylor 2007).

As the terrain of Sevier County is very undulating, slope, along with utilities, is important to ensuring usable lots are created. The change to the regulations is complex and is best understood by examining the table that is presented in the regulations. This table is reproduced in Figure 9.3.

Like other subdivision regulations, the minimum lot size allowed under Sevier County’s regulations is variable based upon the availability of public utilities. Sites with public sewer and/or water were allowed to develop with smaller lots than those without.

<table>
<thead>
<tr>
<th>Average Lot Slope</th>
<th>Minimum Width at Setback Line</th>
<th>Min. Area W/ Public Water &amp; Sewer*</th>
<th>Min. Area W/ Public Water or Sewer**</th>
<th>Min. Area W/O Public Water or Sewer***</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 - 29.9%</td>
<td>50’</td>
<td>7,500 sq. ft.</td>
<td>25,000 sq. ft.</td>
<td>30,000 sq. ft.</td>
</tr>
<tr>
<td>30 - 49.9%</td>
<td>100’</td>
<td>15,000 sq. ft.</td>
<td>50,000 sq. ft.</td>
<td>2 acres</td>
</tr>
<tr>
<td>50% +</td>
<td>150’</td>
<td>22,500 sq. ft.</td>
<td>75,000 sq. ft.</td>
<td>3 acres</td>
</tr>
</tbody>
</table>

* Lots served by both public water and public sanitary sewer
** Lots served by public water or served by public sanitary sewer, but not both
*** Lots not served by public water and not served by public sanitary sewer

Figure 9.3 Article III, Section C, Subsection 3.a.i. of the Sevier County Regional Planning Commission’s Subdivision Regulations.

However, because an alternative method for wastewater disposal was not anticipated when the county adopted subdivision regulations in 1996, it was unclear whether these systems should be recognized as “public sewer” or not. As Taylor explained, “In ’96 when the subdivision regulations were implemented, we had never even heard of these systems, so ‘public’ was truly a municipal system” (Taylor 2007).

Unlike in Rutherford and Wilson counties, where a utility district or water and wastewater authority was available to operate the decentralized systems, decentralized systems were first proposed in Sevier County by Tennessee Wastewater Systems, Inc., an investor-owned utility company regulated by the Tennessee Regulatory Authority. Currently, two investor-owned public utilities—Tennessee Wastewater Systems and Integrated Resource Management—operate decentralized wastewater systems in the county under Certificates of Convenience and Necessity issued by the Tennessee Regulatory Authority (See Chapter 6). East Sevier County Utility District also operates several systems in the county. Because the county’s subdivision regulations did not define the term “public sanitary sewer,” it was not clear whether systems operated by a investor-owned utility—such as Tennessee Wastewater Systems—should be recognized as such under the county’s subdivision regulations (Taylor 2007). As Taylor explained:

> I remember we really struggled in terms of . . . whether it was truly a “public utility” and going through all the documentation with the Tennessee Regulatory Authority and all that. And of course, we later felt like we didn’t have any control over these systems. If the Tennessee Regulatory Authority approved them, you know, we had to treat them as a public utility unless we amended our regulations like Pigeon Forge did. So currently, in the county, they are treated as a public utility. (Taylor 2007)

Although the regulations did not originally define “public sanitary sewer,” the
county had recognized them as such. However, in 2005, the subdivision regulations were amended to define this term formally. By doing so, they recognized decentralized wastewater systems as “public sanitary sewer.” The regulations define this term as:

**Public Sanitary Sewer:** Sanitary wastewater service provided by either a municipality, utility district (as regulated by the Secretary of State), or public utility (as regulated by the Tennessee Regulatory Authority). (SCRPC 2005, Article I, Section F)

The Sevier County Regional Planning Commission chose to not amend their subdivision regulations—as the Pigeon Forge planning commission did—to allow only the smaller lot sizes for sites served by a conventional sewer system. Rather, they chose to formally define “Public Sanitary Sewer” to specifically include systems operated by an investor-owned utility. Thus, sites served with a decentralized system anywhere in the county’s planning region can be developed with smaller lots and, therefore, to greater densities. This has allowed developers using a decentralized wastewater system to develop at densities previously only afforded to sites with access to central sewers. This increased the attractiveness of decentralized wastewater systems.

**A Way Around: Horizontal Property Regimes.** From 1996 until zoning was adopted in September of 2006, the county’s subdivision regulations were the only land-use regulation in effect in the unincorporated areas beyond the cities’ extraterritorial planning regions. However, several—it is not known exactly how many—developments supported by decentralized wastewater systems were developed under the Horizontal Property Act, similar to condominium legislation in other states, and, thus, were not subject to the county’s subdivision regulations. The Horizontal Property Act was passed by the Tennessee General Assembly in 1963. This law allows the individual ownership of units within a larger development where common elements of the property are jointly owned.
In 2000 and 2001, Sevier County’s planning office began to deal with development being constructed under the Horizontal Property Act. In 2001, the county planning office requested an opinion from Tennessee’s attorney general as to whether property developed under the act constitutes a subdivision requiring approval by the Sevier County Regional Planning Commission (Taylor 2007). It was the attorney general’s opinion that the establishment of a horizontal property regime does not constitute a subdivision of property. Thus, the property owner does not have to seek the approval of a regional planning commission. This opinion conformed to the logic of a similar opinion that had been rendered in 1988 regarding municipal planning regulations (State of Tennessee Office of the Attorney General [STOAG], 1988). The 2001 opinion stated:

No, the establishment of a horizontal property regime under the Horizontal Property Act does not constitute a subdivision of property. Accordingly, if a property owner complies with the Act’s provisions for establishing a horizontal property regime, the property owner need not seek the regional planning commission’s approval under the statutory provisions governing subdivisions. (STOAG 2001)

Due to the attorney general’s opinion, the county planning commission and its staff felt as though they had no jurisdiction to regulate these developments (Taylor 2007). This situation offered developers two advantages. First, these developments were not constrained by the minimum-lot-size regulations. Developers could site as many homes as they desired and as could be physically created. In many ways, these developments look the same as other cabin development. The difference is that the buyer is purchasing only the cabin without owning the land. Second, it allowed developers to avoid having to
meet the road design standards in the subdivision regulations. Thus, these developments could be created using roads on grades and in locations that might not have been approved by the commission. One informant described the Horizontal Property Act as “a loophole to get [development] approved that otherwise would not meet the [subdivision] regulations” (Source D6d 2007).

It is surely no coincidence that the development of properties through horizontal property regimes coincided with the advent of decentralized systems. Prior to the introduction of these systems to the county, intense developments had been limited to sites with access to sewer. By removing the barrier imposed by this physical constraint, developers were allowed, through the horizontal property regime, to construct developments in any configuration and density that they desired (Source D6a 2007). In many ways, the decentralized wastewater systems removed a physical constraint on dense development, and the horizontal property regimes removed the constraints imposed by the county’s subdivision regulations.

**City of Pigeon Forge**

**Initial Use and an Expanded Region.** Of the cities in Sevier County, Pigeon Forge has experienced more development in its immediate periphery supported by decentralized wastewater systems. Development is especially attractive around Pigeon Forge due to views of the mountains in this area and its proximity to the main tourist attractions. However, development in Pigeon Forge’s periphery had been particularly constrained by the lack of a means of wastewater disposal. In describing the cabin development occurring in and around Pigeon Forge in the late 1990s, the Director of Community Development for the city stated:
At that time, . . . we were seeing some cabin development within the city, and where it was within the city it was on central sewer, but outside the city limits we were not really seeing these [cabin developments] until [decentralized wastewater] systems became more popular and prevalent. We were not seeing a great deal of cabin development within our planning jurisdiction just because they would have had to have been on septic systems. (Jagger 2007)

However, in 2000 and 2001, development using decentralized wastewater systems started to occur outside, but near, the City of Pigeon Forge. At that time, the Pigeon Forge Municipal/Regional Planning Commission exercised planning authority within a smaller extraterritorial region than it does today. As such, the initial developments using decentralized wastewater systems were located just beyond the planning jurisdiction of Pigeon Forge. Coincidentally, although unconnected, the development of the county’s growth plan mandated by Public Chapter 1101 coincided with the introduction of decentralized wastewater systems in the county. The growth plan that the county ultimately adopted designated an urban growth boundary for the city of Pigeon Forge that extended well beyond the city’s exiting planning region. In 2001, Pigeon Forge requested the Local Government Planning Advisory Committee to expand its planning region to correspond with its urban growth boundary. This request was granted, and in April of 2002, Pigeon Forge’s extraterritorial planning jurisdiction was extended outward to match its urban growth boundary. Several of the initial developments on decentralized wastewater systems in the county are located in the area added to Pigeon Forge’s region. Due to the manner in which several of these developments had been constructed, the City of Pigeon Forge and its planning commission did not have a very positive initial impression of the use of decentralized wastewater systems. As the Director Community
Development explained:

[T]he developments that we inherited were not quality developments. They were just cabins jammed shoulder to shoulder. . . . The county had no zoning regulations [at that time]. They just had subdivision regulations. Plus, if these developments were organized under the Horizontal Properties Act, which was basically to enable condominium type property development, . . . the county did not, and I think still does not, view that as a form of subdivision. So they were not getting any governmental oversight. . . . These projects that we inherited initially did not leave a good impression with us. They just were not quality projects; some of them had sewage lines running above ground, just over the surface of the ground. (Jagger 2007)

Following the expansion of the city’s planning region, the commission began to receive development proposals for projects located in this area. However, Pigeon Forge was leery of developments using decentralized wastewater systems based on their experience (Jagger 2007; Jessiman 2007).

Subdivision Regulation in the Pigeon Forge Region. In 1991, the Pigeon Forge Regional Planning Commission adopted subdivision regulations to govern the subdivision of land both within the city and in its extraterritorial planning region. Like the county’s subdivision regulations, the Pigeon Forge regulations initially allowed smaller lots (7,500 square feet) when property was served by a “public sewer system” (Pigeon Forge Regional Planning Commission [PFRPC] 1991). When public sewer was not available, the minimum lot size increased to 20,000 square feet. Similar to the county, the Pigeon Forge Planning Commission felt they had no choice but to recognize decentralized systems as “public sewer” and, thus, allow the smaller lot size—and greater density—for sites served by a decentralized wastewater system. The Local Planning Assistance Office’s planner, advising Pigeon Forge’s planning commission when this first became
an issue, explained that:

Well, [Pigeon Forge] did not define “sewer” and the Tennessee Regulatory Authority defined these on-site systems as “public sewer.” So when Pigeon Forge initially put in there, “You had to be on public sewer” . . . and did not define it and the TRA said these were public utilities with public sewer, then Pigeon Forge had no choice but to let those in [at the density stipulated for a sewer system]. (Jessiman 2007)

Therefore, Pigeon Forge initially allowed the same reduced lot size in developments served by decentralized systems as those served by conventional sewer. However, many of the developments served by decentralized systems were being located on sites accessed by narrow, winding mountain roads and away from other public services and infrastructure (Jagger 2007). In response to concerns about allowing this density of development to occur in rural and often isolated areas, Pigeon Forge’s planning commission amended its subdivision regulations in 2003 and again in 2004 to only allow 7,500 square foot lots in developments served by the city’s own municipal sewer system. The commission required lots served by a decentralized system or a conventional septic system to be 20,000 square feet or larger when water is supplied by Pigeon Forge. When municipal water is not available, individual wells must be used and lots must be one acre.

As explained by the Director of Community Development:

We do not equate those types of systems with municipal sewer anymore. We basically . . . look at them the same way as we do septic systems in terms of minimum lot sizes and all. So as it says here, if you have public water . . . our minimum standard is 20,000 square feet, just under half an acre, for either septic systems [or a decentralized wastewater system]. . . . We treat them the same as septic systems now. (Jagger 2007)
Annexation and Sewer Extension Policies. It is the City of Pigeon Forge’s policy not to extend sewers outside the city’s corporate limits. The Director of Community Development for the city described the situation as one where “the city does little, if any, annexing on its own. Almost all of the annexations begin in the form of a request. And it is typically [by] developers along the fringe of the city wanting to be annexed so that they can get access to the city sewer” (Jagger 2007). As with Lebanon and Mt. Juliet, the developer bears the cost of extending the infrastructure to the development. The city’s policy regarding annexation and sewer extension has reduced the options available for wastewater disposal in the region around Pigeon Forge to two: onsite disposal through conventional septic systems or through a decentralized wastewater system.

City of Sevierville

Subdivision Regulation in the Sevierville Planning Region. Like the other cities, Sevierville’s planning commission regulates the subdivision of property within the extraterritorial planning region. These regulations require the connection to a “public sanitary sewer” when such connection is reasonably accessible. When not accessible, the commission allows an alternative method of sewage disposal. When served by a public sewerage system, lots may be created as small as 7,500 square feet while those not served must be at least 20,000 square feet in area. Like the county but unlike Pigeon Forge, Sevierville’s planning commission allows the reduced lot size for sites served by a decentralized system (Sevierville Municipal/Regional Planning Commission [SMRPC] 2003). To date, only a single system had been used inside Sevierville’s extraterritorial planning jurisdiction. As there has been less interest in using this technology in its region, Sevierville’s Planning Commission has not seriously considered amending the
regulations in response to this technology. When asked whether Sevierville discussed changes, one informant explained that he did not recall “anybody who pushed for an amendment to the subdivision regulations to just absolutely prevent these [decentralized systems]. I do not believe anybody on the planning commission really voiced huge concern about it” (Source C17b 2007). This informant explained that such consideration might occur if more development in their area was being proposed on these systems.

[If we start getting more of these, there may come a point—where we will need to be very specific in where we allow an alternative system. When we do [allow] it, how much density to allow. That could come about if this really becomes a problem. (Source C17b 2007)

Annexation and Sewer Extension Policies. Sevierville’s utility extension and annexation policies are tightly coupled. However, unlike other cities in Sevier County, the Sevierville Water Department provides wastewater service to extraterritorial areas through sewers it operates beyond the city’s corporate limits. Because Sevierville is willing to extend water and sewer lines most development that goes in within Sevierville’s planning region generally has water and sewer (Source C17b 2007).

The water and sewer policies the city adopted in February of 2002 express the city’s policies regarding the extension of the city’s sewer and water lines. Of importance to the present study are the policies regarding extraterritorial extension of sewers for new development. These policies permit the extension of sewers within the planning region but require that either the area served be annexed or an agreement be executed whereby future annexation of the area will not be contested by area residents. Alternately, there is a provision for the city to extend sewers to the area and not require either annexation or the agreement (Figure 9.4). These policies also permit the extension of sewers to new
development outside the city’s planning region and urban growth boundary. In this situation, the city board of mayor and aldermen may require the developer (or petitioners) to request the project site be included in the urban growth boundary of the city. Alternately, the city can require a contract stating the area can be annexed without being contested. As within the planning region, the board does have the latitude to extend sewer to the site without requiring either. For the purposes of the present study, it is important to recognize that “there has been capacity for treatment as well as a willingness to extend [sewer] lines outside the city [of Sevierville]” (Source C17b 2007).

City of Gatlinburg

In 1971, Gatlinburg’s planning commission was designated as a municipal/regional planning commission. In 1982, the city adopted an extraterritorial zoning ordinance for its planning region. The planning commission’s current subdivision regulations were adopted in April of 1988 and require the minimum size of lots created in
the region to conform to the city’s extraterritorial zoning ordinance. Virtually all (98%) of the planning region is zoned “RR-1 Residential,” a zone intended to be a rural residential area. High-density uses are generally unfeasible or undesirable in this area due to its remoteness, soil constraints, and steep terrain. The minimum lot size allowed in this zone is 20,000 square feet. Gatlinburg’s regulations differ from the regulations of other planning commissions in the county in that the lot size and density allowed do not vary depending on the nature of water or sewer service. The subdivision regulations require that where “lots cannot be economically connected with a sewerage system, they must contain adequate area for the installation of approved septic tank and disposal fields” (Gatlinburg Municipal/Regional Planning Commission [GMRPC] 1988, 23). This language is vague and does not clearly indicate whether a decentralized wastewater system would qualify as a sewerage system. Nevertheless, Gatlinburg’s planning commission has recognized decentralized systems as such (Source H24a 2007). However, unlike in the county, this recognition gains no reduction in minimum lot size or greater density. It does, however, remove the requirement to design lots to accommodate conventional septic systems. Thus, the development can avoid possible increases to lot sizes required by the Sevier County Health Department (SCHD) for siting septic systems. Nonetheless, because Gatlinburg, much like Sevierville, has not experienced many proposals for developments supported by decentralized wastewater systems, there has been little interest in changing the city’s regulations to address this new technology (Source H24b 2007).

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60 The subdivision regulations do set a minimum lot size of 15,000 square feet for lots not served by a public water supply.
OUTCOMES

Examining the pattern of use for decentralized wastewater systems in Sevier County, we can observe four outcomes (Figure 9.5). First, all systems are located outside of the four cities. Second, decentralized systems are primarily located in central Sevier County just outside of Pigeon Forge. As Figure 9.5 indicates the initial use of systems (black squares) was in this area, particularly in the area to the east of Pigeon Forge along Upper Middle Creek Road. Third, more recent development on decentralized systems has spread east and south into the area between Pigeon Forge and Gatlinburg. Finally, the use of this technology has been less pronounced in the northern part of the county. Only a single system has been used within Sevierville’s extraterritorial planning region, and few have been used beyond it.

Views and Accessibility

Scenic views and accessibility to tourist attractions are driving the concentration of systems in the center of the county. These factors were particularly strong in the area to the east of Pigeon Forge, where views of the Smoky Mountains are available and where direct access to tourist attractions, particularly Dollywood, is available via Upper Middle Creek Road. Many of the cabins in developments located east of Pigeon Forge are positioned on south-facing slopes to offer spectacular views of the Smoky Mountains (Blazer 2007; Hose 2007; Jagger 2007; Taylor 2007).

They are selling views. I mean you have seen the ads, you know, the couple sits there in the hot tub overlooking the [mountains]. You are not going to get [those views] here at the bottom of the slope, even if you have great soils. You are not going to get that view. They want to get up there where they can see things. (Source D7a 2007)
Figure 9.5  Decentralized wastewater systems in Sevier County, Tennessee.
Another source described this driving force:

This is a tourism county, there is always a driving force to find picturesque areas to place cabins for tourists and visitors. And that plays some role in having these outside existing public water and sewer areas. . . . But also these would be areas that have a great deal of open space, [which] would not be in the cities or within intensely developed areas. I think all those things probably play a role. (Source C17b 2007)

In addition to views of the mountains, the area to the east of Pigeon Forge is particularly attractive to resorts because of its proximity and accessibility to tourist attractions in Pigeon Forge. While steep terrain limits accessibility in many directions from Pigeon Forge, the area to the east has relatively good access to town via Upper Middle Creek Road. Gatlinburg and its attractions are also more readily accessible from this area than many other parts of the county (Source C24c 2007; Source D6b 2007).

[F]amilies will come here, husband, wife, couple kids, three kids. . . . They are going to want to be near the attractions. They want to be near Ripley’s and near Dollywood and near the main strip where they can go to McDonald’s or T-shirt shops or ride go-carts or things. That’s what the attraction is in this area for a lot of families. (Source D12a 2007)

Because of the area’s scenic beauty and accessibility, cabins in the Pigeon Forge area are in great demand throughout much of the year.

_Pigeon Forge’s Peripheral Influence_

The terrain that attracts this development presents a challenge to disposing of wastewater. Septic systems are incapable of supporting the density of development desired, and conventional sewers are inhibited by both public policy and construction expense. Although the expense of extending sewers through this mountainous region is probably prohibitive for many sites, such extension from the city requires annexation
because Pigeon Forge will not provide wastewater service outside the city. This city policy is one of two ways the City of Pigeon Forge has influenced the use of decentralized systems at its periphery.

**Sewer and Annexation Policy.** Assuming that a city sewer line is economically justifiable, this extension is not possible unless Pigeon Forge is willing to annex the development site or make an exception to city policy. One source explained:

> The municipal sewer from the City of Pigeon Forge will not be extended beyond their corporate limits. Period. That has been their policy. Now they may change it at some point, but to this point in time, historically they have never allowed public sewer beyond their corporate limits.

*Curtis: Do you think that has had impact on the use of these systems?*

I know damn well it has. . . . That is exactly why all of these systems are in existence. This one right here would have been an excellent candidate for municipal sewer. . . . They would not annex it. Now they [may] have considered [annexing] it if they [had] 100 percent of the property owners . . . agree to the annexation, but they did not.

(Source C24a 2007)

Sources indicated that annexation was increasingly unlikely unless the development site was contiguous to the existing corporate limits because residents outside of Pigeon Forge often have a strong aversion to being annexed (Ownby 2007; Source D6b 2007).

The problem with annexing is you have to almost be touching the city limits or have property owners that do not mind being included in an annexation. . . . If you have one person that [objects, they] could stop the whole project. (Source C22b 2007)

The spatial liberation, which decentralized wastewater systems afford, becomes increasingly important in such cases. This technology allows dense development to occur without requiring sewer connection and allows developers to avoid the political
challenge of securing annexation. These two realities—the demand for intense resort development in mountainous terrain and the inability to secure sewer service without annexation—have created the desire to use decentralized wastewater systems.

**Extraterritorial Planning Regulation.** For environment- and health-based reasons, subdivision regulations often allow smaller lots when served by sewers. An important advantage of using a decentralized wastewater system depends on whether a planning commission allows reduced lot sizes—and thus greater densities—for developments decentralized systems support. Pigeon Forge and the Sevier County Regional Planning Commission are illustrative. Whereas the county recognizes decentralized wastewater systems as “public sanitary sewers” and allow the smaller lot size this recognition affords, Pigeon Forge took the step to allow the smaller lot sizes only when a development is served by the municipal sewer system.

This difference has influenced the use of decentralized wastewater systems in the county. Figures 9.5 and 9.6 reveal that, although the area near Pigeon Forge was the site of the initial concentration of development using decentralized systems, this area has seen fewer decentralized developments since the city amended its subdivision regulations in 2003. Development on decentralized systems has moved outside the city’s extraterritorial planning region. When asked whether the change to the regulations had an influence, one source related:

> Definitely. Yes. I know it was related . . . Because [of] what happened. All of a sudden you did not see any rental cabins on those high density developments within their planning area, but you saw them outside of it—where you could still get that [density] advantage. (Source C24a 2007)
Figure 9.6   Pigeon Forge’s former and current planning-region boundaries.

Rather than contest the city’s change to their subdivision regulations, the developers have, in large part, moved farther out into the county beyond the control of Pigeon Forge. When asked what caused the change, Michael Hines, who is largely responsible for Tennessee Wastewater Systems, Inc. operations in East Tennessee, described the cause and effect of the change to Pigeon Forge’s regulations as

Well, because of us. . . . It says: “If you are going to use Hines, you are going to have a big lot.” And that coupled with the general attitude [of Pigeon Forge] on water and everything else, the developers said “We do not need to build in the planning district; there are a lot of other places we can build.” And that is what they are doing. (Hines 2007)

Because the change in the city’s subdivision regulations was not to prevent the use of these systems—as was the case of Lebanon and Mt. Juliet in Wilson County—it has not precluded their use. It simply removed the density advantage afforded to sites using a decentralized wastewater system. Further, this change may not be the sole cause for the technology’s diminished use. The Director of Community Development for Pigeon Forge felt that the decline in use resulted from a weakening of cabin demand and saturation of this market (Jagger 2007).

It is not possible to say conclusively whether the decline in the use of decentralized systems in Pigeon Forge’s region resulted from the weakening of demand for rental cabins or from the change to the planning commission’s subdivision regulations. It is likely that both contributed. However, because development using these systems has occurred in the county beyond Pigeon Forge’s control indicates that the regulation change and jurisdiction did influence their use.
Northern Scarcity

Only a single system has been used within the extraterritorial planning region of Sevierville (Figure 9.7). This paucity of use is attributable to two factors. First, the greater availability of sewer has reduced the need for decentralized wastewater systems in this area. The second factor relates to development occurring in this northern third of the county.

The availability of sewer outside of Sevierville is the product of both the city’s physical setting and its public policy. Because the terrain in this area is flatter, extending sewer lines has been easier. The city’s physical setting alone does not explain the extended sewer network because ultimately it was the city’s policies that permitted the extraterritorial extension of sewer lines. Officials with Sevierville’s utility department did not respond to requests for interviews. However, members of the planning and engineering communities confirmed what Figure 9.7 suggests, that the city’s policy toward extraterritorial extension has been different from that of Pigeon Forge and Gatlinburg (Hose 2007; Source C17b 2007; Source D19a 2007). This willingness to extend lines beyond the city likely resulted from the government structure in place in Sevierville until 2005. Prior to this time, the city’s water and wastewater utilities were under the direction of the Sevierville Board of Waterworks and Sewerage Advisory Commissioners rather than the Sevierville Board of Mayor and Aldermen. In May of 2005, the Waterworks and Sewerage Board was abolished, and its responsibilities shifted to the Board of Mayor and Aldermen (City of Sevierville 2005). The Waterworks and Sewerage Commissioners were appointed rather than elected officials. Because this appointed body was more isolated from political influence, it extended lines based on
Figure 9.7 Extraterritorial sewer lines. Sevierville, Tennessee.

efficiency and practicality rather than politics. One source explained:

The utilities board makes decisions on a business basis. Well, some of them do it politically as well, but they should do it on a business basis. The city board—as elected officials—is more prone to do it on a political basis. So these political boundaries mean something to them; these city limit lines mean something to the elected officials. They do not mean anything from a utility business perspective because it is all about customers and revenue and cost. I think a lot of [the reason that Sevierville extended sewer beyond its limits relates to its] topography and geography but I also think [it was due to a] political structure that has a different mindset.
(Source D19a 2007)

The greater availability of sewers in the northern area of the county diminished the need for decentralized wastewater systems in this area. The possibility of connecting to sewers outside of Sevierville stands in stark contrast to the conditions existing outside of Pigeon Forge. Much of the developed land in the north is located in the area with sewer. Much of the more rugged terrain due west of Sevierville has yet to be intensely developed due to limited demand for development in this area.

The second factor influencing the use of decentralized wastewater systems in the northern part of the county relates to the nature of demand and the type of developers operating there. Whereas the tourist trade drives demand in the areas outside Pigeon Forge and Gatlinburg, development to the north of Sevierville is oriented more to single-family residential development (Hose 2007; Source D7a 2007). The intense resort developments that have driven the use of decentralized wastewater systems in Sevier County are simply not occurring outside Sevierville at the scale they are in the central and southern parts of the county. The more limited instances of single-family development in the north are oriented to permanent residents and do not occur at the
density of the tourist resorts. Thus, here residential development has less need for alternative means of wastewater disposal. In addition to often being able to use a conventional sewer, these developments are more likely to be able to use conventional septic systems because they occur at lower densities and have a greater likelihood of using septic systems. High land costs resulting from the intense demand for rental resorts in other parts of the county preclude development at lower densities.

The Gatlinburg Region

Like Sevierville, Gatlinburg has also had fewer decentralized wastewater systems used in its extraterritorial planning region than has Pigeon Forge. This is attributable to the nature of demand in the city’s planning region during the period since 2000. Although closer to the Great Smoky Mountains National Park, the demand for intense development has occurred chiefly in the city and has not been as pronounced in Gatlinburg’s planning region. This is largely attributable to the extreme topography and more limited road network in the area (Hose 2007; Source H24b 2007; Source D6b 2007). Therefore, only a few decentralized systems have been used in the city’s planning region. The few sites where decentralized systems have been used are located in some of the most accessible areas of the planning region.

Public policy in Gatlinburg’s land-use regulation may also have played a role, although how much is not known. Because Gatlinburg’s zoning ordinance allows a minimum lot size of 20,000 square feet regardless of means of wastewater disposal, there is less incentive to use a decentralized wastewater system in this area. This may have contributed to the reduced use of decentralized systems. Although the ordinance grants no reduction of lot size for “sewered” sites, there still exists a somewhat reduced
incentive to use a decentralized system. Due to the area’s rugged terrain, it can often be
difficult to site a septic system on a 20,000 square foot lot. Thus, the use of a
decentralized system allows development to occur at the 20,000 square foot mark
whereas it might have to occur on larger lots otherwise.

In [Gatlinburg’s] planning region, you are allowed to have a 20,000 square foot lot,
provided you can get Health Department approval [if you are proposing to use
conventional septic systems]. . . . Now, what we have traditionally seen in that
region is that they do not [typically] get 20,000 [square feet]; they have to bump
that [lot size] up to meet Health Department [regulations]. (Source H24b 2007)

Therefore, although Gatlinburg’s land-use regulations offer no lot reduction
incentive to use a decentralized system, the health department regulations and the area’s
terrain create a condition whereby only through use of a decentralized system can
developments be created with 20,000 square feet lots. As sites most attractive or less
challenging to development—such as those to the east of Pigeon Forge—are increasingly
developed, demand for resorts will likely increase in the Gatlinburg region. Largely
within the jurisdiction of the Sevier County Regional Planning Commission, a shift in
demand toward Gatlinburg and Pittman Center is already apparent. If demand for intense
rental resorts increases in the area outside of Gatlinburg, greater use of decentralized
wastewater systems will probably result.

OBSERVATIONS

A Different Trend: Public Water

Due to the availability of public water in many areas of the state (See Figure 2.2),
decentralized systems support more developments served by public water than not. At
least 228 (86%) of the decentralized systems in the state are in an area with access to public water. However, this trend is reversed for the developments in Sevier County, where the majority of systems serve developments without a public water supply: 19 of the 34 systems (56%) in the county. A large expanse of Sevier County lacks access to a public water supply; in 2005, it was estimated that 251 square miles (61%) of the county did not have public water service. This area represents 61 percent of the area located outside the national park with 49 percent of the county’s population (McGill Associates 2005). Nevertheless, the lack of public water has not been a major constraint to the use of decentralized wastewater systems. This situation is in stark contrast with Wilson, where public water availability was a necessary precondition for use of a decentralized system. An explanation for this difference may be found in a variation between the land-use regulations in these counties.

In the area of Sevier County under the jurisdiction of the County Planning Commission, the county’s subdivision regulations are in effect. These regulations allow various densities, depending on the type of utilities available (Figure 9.3). However, unlike the unincorporated areas of Wilson County where the minimum lot size is reduced to 25,000 square feet in the R-1 District when served by both public water and sewer, the subdivision regulations in Sevier County allow smaller lot sizes—and thus greater densities—for sites served by either public water or sewer. Therefore, in Wilson County one must have water and sewer to have the reduced lot size, whereas in Sevier, one must only have one or the other and decentralized systems qualify under the county regulations as public sewer.
The Drive for Density

An Economic Requirement. As we saw in Wilson County and Rutherford County, the demand for intense development in areas constrained by conventional means of wastewater disposal is at the heart of the push to use decentralized wastewater systems in Sevier County. Taylor related this as the driving force behind the use of these systems:

That is how the whole thing started. [It] was because of the lack of infrastructure in place, not only the lack that was in place but the inability to get infrastructure in those areas and . . . the desire for the developers to get the [most] density [possible] in the mountainous areas. (Taylor 2007)

While some of the developments supported by decentralized systems might have taken place without the technology, they would have been at lower densities. The desire for higher densities in areas not served by city sewers has been a factor driving the use of decentralized systems. Because disposing of wastewater through septic systems would reduce the number of units possible on a site, decentralized systems not only changed the number of units that could be developed on a property but altered a project’s economic viability. This has occurred because the high demand for tourist developments has increased land costs to a point that septic systems are often incapable of supporting the scale and density of development required (Blazer 2007). However, the density justifies the added expense of a decentralized wastewater system.

Planning Policy. Decentralized systems were encouraged by the county’s subdivision regulations. For the non-horizontal property regime developments that were approved by the Sevier County Regional Planning Commission, the subdivision regulations offered an incentive to use the technology to obtain higher densities for sites served by a public sewerage system (Source C24a 2007; Source D6d 2007). Because the county’s
subdivision regulations afforded smaller lot sizes—and thus greater densities—when “public sewer” was available and because the investor-owned systems were recognized as such, an incentive existed to use this technology. As one source explained:

I think the use in Sevier County really is a result of the way the subdivision and zoning regulations are written, being that if you can qualify [as] a municipal sewer or a public sewer then your density within a particular tract of land is higher. So, to a developer you get more of a return. There were a couple of folks [who] went out to the TRA and [became] qualified as “public utilities,” and they have gone into the sewer business. . . . [The planning commissions have] been using lack of sewer to control the density of development for years in this county. [Then] all of a sudden that just went away. Within a week it just disappeared. So here they are facing all these new high density developments using these systems [over which] they really have no control. (Source C24a 2007)

CONCLUSIONS

Since 2000, Sevier County has experienced a pronounced increase in the use of decentralized wastewater systems. Currently, Sevier County is second only to Rutherford in the number of systems in the state. Although the factors affecting the use of decentralized wastewater systems in Sevier County are numerous and their influence is complicated, their use has been driven by the high demand for intense development in peripheral, mountainous areas. As might have been expected, factors such as location of tourist attractions, presence of scenic vistas, and road access were important factors determining where decentralized systems have been used. But other factors, such as an uncoordinated mix of utility extension policies, municipal annexation policies, land-use regulations, and planning jurisdictions, were also important.
One of the greatest responsibilities of planning is to ensure growth occurs in an orderly, coordinated, and efficient manner. The importance of orderly development is embedded in the objectives of Tennessee’s comprehensive growth policy, a policy which identifies the need to encourage patterns of compact and contiguous high density development and to minimize sprawl. However, this study found that planning authorities in the three Tennessee case studies failed to direct the use of decentralized wastewater systems to this end. Rather, individuals seeking their own goals were found to determine the shape of development resulting from the use of these systems. Further, the statewide relation of these systems to the county growth plans suggests that the use of this technology has not support the goals of the state’s comprehensive growth policy. While the developments served by decentralized wastewater systems are compact, they are not contiguous with other developed areas. In fact, their use has actually compounded the problem of sprawl. This is not, however, the fault of the technology but rather has resulted because the development interests in these communities were more successful in adapting to challenges and opportunities brought about by this technology than were planning authorities, and this was because there is no public agency to articulate public concerns about growth management.

Popper (1981) recognized the responsibility of planning authorities to guide the use of advanced wastewater systems and asserted that, for the technology to produce desirable benefits, it would require active land-use planning and regulation by state and
local governments. However, development interests—land-owners, developers, and the providers of infrastructure—have often usurped the role of planning agencies in determining the development of a community. Thus, considering the power and political structure operating in peripheral areas, this outcome is not wholly surprising. Nonetheless, if infrastructure and technology—particularly such liberating ones as decentralized wastewater systems—are to be harnessed to achieve the goals of the larger public it is critical to understand the decisions of all parties regarding their use. This was pointed out by Pinkham, Magliaro, and Kinsley (2004), who recognized that, while the impact of wastewater infrastructure in promoting or directing growth is a key issue in many communities, it is not well understood how concerns for growth influence local decisions regarding such infrastructure. This is particularly true of new and alternative types of wastewater treatment.

An understanding of these decisions and factors is missing from the literature. Popper (1981) identified possible outcomes which might result from the introduction of these systems while Hanson and Jacobs (1989) and LaGro (1998) offered initial—and limited—empirical evidence as to which of the outcomes were occurring in Wisconsin. Hoover (2001) contributed to this literature by identifying—and advocating—the strategies for harnessing decentralized system to support smart growth objectives. Similarly, Schiffman, Johns, and Banathy (2003) identified these systems as a tool to preserve agricultural lands. However, to no significant degree have these works examined the decisions made at the state and local level about these systems. Likewise, it is ill understood how such decisions get born out on the landscape through this new technology.
Because this study has identified these decisions in Tennessee its findings have specific applicability to planning in the state. However, it is unlikely that Tennessee is so unique that similar observations could not also be made elsewhere. Thus, while many of the observations in this conclusion are specific to Tennessee, it is important to recognize their ability to inform us about larger processes determining growth at the periphery of the expanding American city. Many of these observations have been alluded to above, but only in retrospect can we more clearly identify the influence of these factors and decisions in shaping the use of decentralized systems and, thus, their significance for development and settlement patterns.

FINDINGS

Before we turn our attention to these decisions and factors, we should consider the outcomes observed in light of those anticipated in Wisconsin nearly two decades ago (Hanson and Jacobs 1989). First, in each of the case study counties the technology was found to lead to increased rural development by the opening of lands unsuited to more conventional infrastructure. Without these systems, development in these counties might soon have exhausted the capacity of soils suitable for septic systems. This could have resulted in growth occurring in a more contiguous manner at the margins of cities where sewers were available or could be viably extended. This might have resulted in a more orderly and efficient pattern of growth. Another outcome would have been the dispersal of this growth to neighboring counties. If soils were more suitable in those counties some of this growth might have been served by septic systems while some might have concentrated in those local cities where sewer was available. However, this did not occur
and due to the availability of decentralized systems, a greater out-migration of residents into the urban periphery occurred in these counties than otherwise would have been possible. While to date only a small proportion of Tennesseans are served by decentralized systems, recognizing the outcomes resulting from their use is critical because they point to a developing trend, one that might still be managed. Secondly, in Rutherford County—if not elsewhere—these systems led to the development of prime agricultural lands as entire farms were sold and developed. Although proponents of the alternative technologies in Wisconsin asserted that the technologies would reduce pressure on agricultural lands, evidence of this was not observed in the case studies.

Other than the advantages of density and improved design which decentralized wastewater systems make possible, the positive outcomes foreseen by proponents of alternative technologies in Wisconsin were not found to occur in Tennessee. Evidence of a more compact rural land-use pattern, which they asserted would result, was not found to occur. Indeed, in Wilson County I found that in response to uncoordinated positions of local planning authorities the systems had actually resulted in a greater dispersion of growth. Finally, while these systems may have reduced the expense of providing wastewater service to peripheral areas—as Wisconsin advocates asserted—this does not consider other costs to service this dispersed population. It is reasonable to assume that the dispersed development pattern enabled by this technology would increase the expense of providing schools and roads as well as fire and police protection.

General Principles Drawn From the Case Studies

Despite the variation observed in each of the case studies, some decisions and factors influencing decisions were common to all. The greatest commonality is that
planning authorities failed to manage the development this technology unleashed. This failure occurred because the power of those interested in the unhindered use of these systems was not balanced against an educated, concerned, or even aware public to advocate their use otherwise. Despite the fact that plans had been developed in two of the three case study counties for an orderly landscape, this desire of the public was never translated into the necessary tools to implement these plans. Ultimately, the technology could have been managed as Popper recognized to achieve orderly growth. It was not; rather, it was mobilized to serve the interest of the individual consumer, developer, or landowner and the utilities operating the systems.

This has occurred because people, while conflicted between their ideal for an orderly landscape and their personal desires for a suburban lifestyle, have made personal consumption choices that fueled a development process creating a dispersed landscape. This process has not been guided by the larger ideals for orderly growth. Why this was allowed to occur is the second reason for this mobilization: individual interests count for more than the interest of the larger public in the political process. This occurred in part because the general public is unaware of and uninterested in the nuts and bolts of managing growth. This is clearly observed in their lack of interest in managing wastewater infrastructure to guide growth in their community. The land-use plan developed by the citizens of Wilson County offers a prime example of this lack of consideration. Despite the fact that decentralized wastewater systems had—by removing the local constraint of wastewater disposal—altered the development possibilities in the county, these systems were not addressed to any considerable degree in the 2006 plan. In each of the case studies, decisions about how these facilities were used and thus the
resulting nature of the community were made by the select few who understood the inner workings of the development process, the limitations and opportunities of infrastructure, and regulatory land-use controls. So while the general public may desire a landscape of distinct cities and rural countryside, this landscape is not being created because the public does not require that it be created.

The causes for the lack of articulation of the public will in land-use regulations are complex. However, these relate to the fact that the desire of developers to pursue opportunities is not balanced against the interests of the general public for rational growth in regulatory instruments. This is nothing new. Disorderly growth has long been a tendency of urban expansion, but one influenced by infrastructure. Originally constrained by limits of transportation and later by limits of conventional means of wastewater disposal, growth patterns have been shaped by the forces that controlled these elements of public infrastructure. However, as interstate highways provided larger areas with improved access in the later half of the last century, sewers—in those areas where septic systems were most limited—increased in importance. Yet, even the influence of sewers has been reduced through the introduction of systems using alternative wastewater technologies. Thus, these systems are important in and of themselves because they loosen a longstanding constraint that the public may not desire to be loosened.

Examination of these systems is important in a more general sense because they also reveal the workings of the development process—and the associated power structure—at work in the periphery of American cities.

This power structure can be observed in the failure of planning authorities—including both planning commissions and legislative bodies—to respond to the changed
development opportunities brought about by this technology in a positive way. This is a very different response and outcome than was advocated by authors such as Hoover (2001). While many responses from planning authorities were identified in the cases, not one involved use of the technology to achieve orderly growth. Rather, some have responded as did Mt. Juliet, Lebanon, and Pigeon Forge in a way to slow or stop development on these systems while others took no action. Even Rutherford County, which some might argue took a proactive role, did not develop regulations to guide the growth that this technology unleashed. Consequently, land-use regulations have failed to guide the use of decentralized systems in Tennessee. This was apparent in the case study counties but was revealed also through the statewide comparison of decentralized wastewater systems to the counties’ growth plans. It is important to understand why planning authorities in these counties responded in this way.

Influences on the Planning Authority

A variety of factors contributed to this lack of proactive action by planning authorities. The most fundamental relates to the fact that planning authorities had long been able to avoid difficult growth management decisions because constraints to wastewater disposal had kept development in check. Conditioned to rely on concerns for public health and the environment to limit intense development, planning authorities in these counties were not prepared to make proactive policy decisions and implement the necessary regulations. However, other reasons for this stem from the two types of individuals common to planning authorities in Tennessee. The first are individuals with a background in land development, real estate, civil engineering, or land surveying or are landowners. They benefit the community because they understand the development
process and the regulations better than ordinary citizens who are not trained, experienced, or concerned with these issues for their livelihood. However, the former are typically inclined to regulations favorable to development, not necessarily for direct personal gain although some of that undoubtedly occurs. Rather, it is simply due to their perspective. A second general type of decision maker is ordinary citizens who serve out of a concern for the betterment of their community. While bringing a larger, more holistic perspective to these authorities, this type of individual may not be as aware of implications and interconnections of all issues and often relies on professional planners and experienced members of the commission for guidance.

This second type of decision maker often lacks the awareness and vision to recognize fully the importance of decentralized wastewater systems. Kenney (1964) and Hirst and Hirst (1975) recognized some time ago that the general public had little regard for issues pertaining to wastewater. This disregard was found still to be true of citizens but also of many members of planning commissions. Consequently, this lack of awareness of the implications for wastewater infrastructure explains the ignorance and neglect of public policies to manage the use of these systems. Many of those interviewed related that, in hindsight, they did not appreciate all the implications of these technologies but saw them at the time as a solution to problems they were facing with septic systems.

While many decision makers in local planning authorities did not recognize the potential of these systems, others did know. They were members of the development community who saw ways to use the technology in the regulatory environment to create developments in areas and densities that were desired by the market but were previously not realistic to pursue. These individuals were aware of the importance of these systems;
indeed, these were often the individuals who were promoting the use of decentralized systems. Thus, their objective was to convince other members of the planning authority to accept the use of these systems. As their goals could often be accomplished within the existing regulations, they gave little consideration to altering the regulations.

Both types of planning-authority decision makers often share—or at least appreciate—the pervasive perspective in rural areas of Tennessee that landowners should be free to do what they will with their property. This perspective has both a theoretical dimension pertaining to individual rights and also a practical, financial one. More than once, farms in Rutherford County were described as being the land-owner’s retirement plan or 401k. Additionally, this predisposition not to question a landowner’s right to sell or develop property is also rooted in a deep interest in fostering growth, something viewed inherently as good.

This pro-development and land-rights perspective also influenced the view and role of certain professional planners working in these communities. One planner indicated a strong bent toward this perspective by both himself and other planners and local decision makers.

The elected officials here, the planning commissioners here, [and] the planners I think even—for the most part—have . . . taken a developer’s rights stance more than a regulatory, prohibition strict-control stance. If you look at land law throughout the United States, Tennessee is one of the [states] that is typically considered a “developer’s rights” state because of the way the enabling legislation is written and what has happened with local legislation. That has always been my stance. That is how I [have] felt. As a planner, I am going to help you do what you want to do with your land and meet the regulations. Not, “I’m going to develop some regulations so that you develop the land the way I want you to.” I’ve always been on that side of,
“I’m here to help you.” You know, this is about you and your land. It is our land as a county, but you own it. (Source D13a 2007)

Other planners indicated an awareness of this pro-land-rights perspective among not only decision makers but also the community in general. John Davis’ comments in Chapter Eight about the lack of support in the local community for altering Rutherford County’s blanket R-15 zoning illustrates how, even if planning staff were not necessarily pro-development, they were dealing with decision makers and a community that were largely in favor of rights of the property owner, thereby limiting what they could do as professional planners to shape the use of this technology. The pro-land-rights stance is a substantial reason for the limits on the planning authorities in Tennessee to use this technology as a tool to achieve orderly growth. Comprised of land-owners, members of the development community, and people sensitive to the land-rights perspective of the local community, these planning authorities have favored a predominantly pro-land rights stance and have been hesitant to designate certain areas for development and restrict development in others.

Because the planning authorities regardless of the reason were not more proactive, they often failed to adjust their regulations to the new development realities brought about by this technology. Therefore, when presented with development proposals using decentralized systems, they had to allow the development to occur as required under their existing regulations. People knowledgeable of the potential of these systems and the nuances of the regulations were able to work them to accomplish their goals.

The paramount example of this is how they attained the higher densities that the land-use regulations allowed for sites served by public utilities. Local planning and land-
use regulations in Tennessee are often based on a “zoning-by-septic” premise. Thus, it is common for these regulations to allow greater densities for sites served by public water or public sewer. Properties that have both are allowed to develop at higher densities than properties with one or the other. Sites that have neither must be developed in larger lots and at lower densities. Because governmental utilities and investor-owned utilities could claim the status of a “public utility” under these regulations, the developments they served could be developed at the higher densities that the land-use regulations afforded when so served. Whether they should recognize investor-owned utilities as “public utilities” was a point considered by many planning commissions. Using Blount County as an example, this situation was explained by Hines:

When we did the very first one [in Blount County it] took me a year [with the planning commission] saying, “Well I do not know about this. This is not what we normally do with public utilities. We are just not sure we are going to approve you to be a public utility.” And I finally had to say, “Guys you do not get to vote. If this project satisfies your subdivision regulations you have to approve it. You do not regulate me. [The environmental health department] does not regulate me. Only the state regulates me. TRA and TDEC, so you do not get to vote whether I am a public utility and you do not get to vote on whether you are going to approve the system. All you get to decide is does the subdivision satisfy your requirements.” (Hines 2007)

When the regulations were written, the term “public utility” or “public sewer” could only mean a central sewer system, one almost always operated by a city. As such, the writers of these regulations focused on the “public” nature of the operating entity, despite the fact that it was the infrastructure—central sewers versus septic systems—that was important to protecting the public health. However, often the intent of such
regulations was two fold, for in addition to the goal of protecting public health and the environment, these regulations had the indirect benefit of limiting intense development to areas with better developed roads, schools, and other elements of infrastructure because these areas often coincided with the densely developed areas served by sewers. However, the introduction of decentralized systems altered this situation, both technically and practically. Under the regulations as they were written, developers could claim the higher densities that were provided for sites served by “public sewer” because they were operated by a “public utility,” a term not often defined in the zoning ordinance or subdivision regulations. However, the decentralized systems had also removed—from a public health and environment perspective—the practical need for large lots and low densities when served by septic systems. Because these systems could be located in dispersed locations, the old benefit of indirectly tying intensity of growth to sewers was no longer assured. However, the lack of proactive action by planning authorities or guidance by a state planning office resulted in a fragmented response; one that frequently left the regulations unchanged.

Basing density on the type of wastewater provider—whether public or private—or the type infrastructure is no longer a viable way to control the intensity or location of growth. Rather, planning regulations through zoning must designate the areas in which high densities will be allowed and require those densities be served by a wastewater system and utility operator capable of providing the service. Areas to be preserved and not developed at the present time should be designated for lower densities and served by a wastewater system capable of serving this lower density. Health- and environment-based land-use regulations placed the cart before the horse in many ways and permitted
concerns for the public health and environment to determine the development pattern. Planning authorities were therefore unprepared to develop plans and implement regulations to guide the use of decentralized systems to achieve community goals. However, such implementation would also have required support by a majority of the members of the planning authorities. This implementation is not likely to happen without public pressure from the public, who are not concerned with or even aware of this issue.

The Articulated Interests

In each case, we observed the weakening of conventional de facto constraints to development and the inability or unwillingness of planning authorities to manage the consequences. The growth liberated by these technologies was not guided by planning regulations because the public’s desire for an orderly landscape was not articulated through the political system, in large part because the necessary instruments—principally zoning and subdivision regulations—have been vulnerable to local political pressures. As witnessed in these case study counties, the public’s interest in orderly growth cannot be left solely to the locality.

The development of a community is a gradual process, and it demands constant attention. While concerned members of the general public may rally to develop a plan that expresses the vision for their community, they often fade away after it is completed and do not remain engaged in the daily process of building their community. They do not have the financial interest in development that landowners, developers, or realtors do. Thus, members of the development and land-owning community have a more constant interest in ensuring that they have as many options as possible for development. As decentralized wastewater systems open vast areas to development, they offer developers
greater options and more workable deals. Daily engaged in this pursuit, these individuals are better organized and more articulate, and have a sharp interest in ensuring that land-use regulations do not limit their use of decentralized systems. The interest in preserving agricultural lands or in fostering development in village clusters such as expressed in the Wilson and Rutherford county plans is general and has a less articulate or organized advocate base in non-urban areas. As such, these goals get lost in the development process because politically articulated values count for more than nonarticulated values; sharp interest counts for more than general or vague interest.

However, it would be faulty to place this entirely at the feet of the development and landowning communities without acknowledging the simple fact that many residents of developing areas adhere to the strong pro-property-rights position previously mentioned. Because these residents are the constituents and the people to whom the local politicians answer, their pro-growth and anti-regulation values are reflected in the local decision-making bodies. However, the constituents of these areas are only a fraction of the general population. This raises a fundamental question of who should determine the plan for an area: should it be only those who currently reside in these areas, or should it be determined by a larger constituency, one that considers the rights of all Tennesseans, including future generations? Furthermore, do the citizens of a city have a right to a voice in how the countryside around them develops? Or rather, is such development only to be determined by those currently residing in the area? If they are to be made by and for a larger constituency, then local decisions must be checked by an authority representing the desires of a larger public. Such an authority might be one with statewide purview. It would be better capable of balancing the relative power of local interests
against the interests of the larger public.

It is for this reason that the absence of a state planning office weakened the local response by planning authorities to this technology. As a countervailing force, a statewide planning authority would have been a bulwark against local entrenched local power and would have been positioned to speak for the will of the larger population, including its future citizens. However, in the absence of such an authority, the local planning authorities were left on their own to interpret what this technology meant for their community and to stand against local interests concerned with using the technology to their own advantage.

The Role the State Played

The absence of a state planning role in growth management was magnified by the other roles the state did play in environmental protection and utility regulation. Through these roles the state was often seen as overriding the local regulations. Informants often held that the local planning commission had no choice but to allow the use of decentralized systems because they were “approved by the state.” This was approval by the Tennessee Department of Environment and Conservation and the Tennessee Regulatory Authority. However, the independence of local planning regulations from such approval was not well recognized. This was evident in numerous interviews. One informant stated:

Well the planning commissions, I think, would like to control it. But they have no regulatory ability to control it because, if you go [with a decentralized system] and you get a permit, [then] it is not under the planning commission; it is [under] TDEC. So the developer says “Okay, I have a TDEC permit, I am going to do on-site sewer so I meet the requirements of the local planning commission to get a density of three
units per acre or four units per acre” [because that is the density allowed on “public sewer”]. (Source D7a 2007)

While the local planning commissions could not preclude the use of decentralized wastewater systems, they did have the right—even if not recognized—to determine the timing of development and densities allowed in their communities. Had the local commissions desired to integrate these systems into their planning goals and regulations, it was certainly possible. However, these systems were often trumpeted as “approved by the state,” and thus, advocates for the systems asserted, had to be allowed. While this assertion was true in a sense, it confuses the purpose of this state approval for environmental protection or utility regulation with that of planning policy and regulation. A state office of planning might have explained to local planning authorities the role and responsibility of the Department of Environment and Conservation or the Tennessee Regulatory Authority and the relationship of their approvals to planning regulations. However, this explanation has not been made, so these two agencies of state government have exerted the state’s influence over the use of decentralized wastewater systems.

The Department of Environment and Conservation played a fundamental role in the use of these systems because, without the department’s willingness to permit them, these systems would not have become a reality. Although the environmental permitting process might have impeded the implementation of these systems—Noss (2005) reports this happening in Ohio—it has not precluded their use in Tennessee. Rather, due to the actions of department employees, the promotion of these systems by utility operators and engineers, and the solutions these systems offered to the problems with package plants and septic systems, the department was willing to issue permits for their use. Further,
because the technology was placed under the regulatory purview of the Division of Water Pollution Control, these systems were subject to performance standards rather than prescriptive-based criteria of the Division of Ground Water Protection. This allowed the technology to evolve and better accommodate wastewater disposal on a variety of sites. Due to technological advancement, decentralized wastewater systems were described by sources as being capable of serving most sites. Even if a particular site was so severely constrained that a system could not be accommodated, a developer could possibly purchase a small portion of nearby property where the system could be designed to work. If the densities were high enough and the demand great enough, the purchase of additional land or the design of a complex system could be economically justified. Furthermore, because these systems were placed under the Division of Water Pollution Control, the requirements for the disposal field were less than they would have been had they been regulated by the Division of Groundwater Protection. Due to this, less land was lost to the drip or spray disposal field, thereby altering the economics of developing a site. It is important to note that decisions unrelated to growth management by the state—such as which division regulated these systems—had an impact on the use and viability of decentralized wastewater systems, and thus on the development patterns that resulted from this use.

In certain areas the approvals required by the Department of Environment and Conservation and the Tennessee Regulatory Authority were a critical regulatory influence—and sometimes the only influence—over these systems. As such, the department’s operating permit became the focus of concerned citizens, and the Division of Water Pollution Control often became a forum for public concern regarding
controversial developments, despite the fact that it lacked purview over issues regarding
growth and timing of development. Tennessee Regulatory Authority was less often the
focus of such public concern, possibly because the authority is more obscure and not as
widely understood by the public.

Nonetheless, through the granting of certificates of convenience and necessity by
the Tennessee Regulatory Authority, the state has played a more direct role in
determining the growth patterns resulting from the use of decentralized systems. Despite
this fact, the authority does not directly consider planning documents, growth concerns,
or the timing of development in the granting of the certificates. Rather, the primary
concern of the authority has been to ensure that the utilities under its regulatory purview
provide continuous and reliable service to customers at a reasonable rate. That is, the
authority did not take it upon itself to consult the county growth plan or local land-use
plans in determining the public need for the service at the site. Rather, the authority
chose to recognize the intent of a developer to construct a project in need of the requested
wastewater service as constituting the necessary public need.

This research found that the granting of the service territories was almost a
foregone conclusion as long as a developer submitted a letter requesting it and the utility
could demonstrate the necessary managerial competence and that no other entity
intervened to contest the granting of the territory. This illustrates the fundamental lack of
coordination between the local and state governments in the realm of land-use planning
as well as with the state’s comprehensive growth policy under Public Chapter 1101. The
use of the county growth plan to aid in the determination of public need would have been
a logical extension of the growth plan and would have provided the Tennessee
Regulatory Authority with a valuable resource upon which to base its decisions.

However, consulting a local plan was not done because it was not specifically required of the authority by either Public Chapter 1101 or the authority’s enabling legislation. Thus, in Tennessee, and likely other states, consideration must be given to growth management laws to ensure the appropriate coordination of all relevant players. However, this coordination must be required to ensure that it occurs.

Although some would undoubtedly argue that it is not the Tennessee Regulatory Authority’s role to do long-range planning—an assertion that is technically true—such planning is, nonetheless, being done by the authority by default in its granting of service territories. In this way, the authority has assumed at least a portion of the role of the local planning commission, i.e. planning for the extension of services and the timing of development. However, it must also be recognized that this occurred because the local planning authorities failed to change their regulations to guide the development these systems enabled. If regulations were in place, developers would petition the authority only for service areas where they knew the local regulations would permit the type development they desired. As an example, service territories would not be requested in areas of Sevier County where dense cabin developments were not permitted by planning regulations. Through regulations to better guide development, local planning authorities can take back the role of planning assumed by the Tennessee Regulatory Authority. Such a move would place the authority back in the role of utility regulator that it was designed for.

The general roles and influence of such agencies are also broadly applicable. It should be recognized that similar agencies likely exist in other states and would be susceptible to the same institutional mentalities and narrow focuses that these agencies
were. As such, state authorities with regulatory concerns other than the timing and location of development should be considered in examining the decision makers who can influence the use of similar technologies. Indeed, Hanson and Jacobs (1989) recognized that the influence of environmental regulations may be among the forces most likely to shape the development resulting from the use of these systems. Thus, such agencies deserve the attention of growth management initiatives.

THE FUTURE: WHERE WE GO FROM HERE

What the Technology Could Mean for Community Development

Decentralized wastewater systems offer numerous advantages to the development of local communities because they can provide safe disposal of wastewater to far more sites than central sewers and in a better way than through septic systems. Thus, this technology makes possible the plans and visions many communities have for their orderly development, plans long frustrated by constraints to conventional means of wastewater disposal.

Additionally, as recognized in a 2004 study by the Rocky Mountain Institute, the use of decentralized wastewater systems offers financial advantages for wastewater provision in sparsely populated and developing areas (Hamilton, Pinkham, Hurley, and Watkins 2004). More flexible in scale and installation, these systems allow infrastructure to match closely the timing of actual growth, offering several potential economic benefits. Building new decentralized systems—or expanding existing systems—on demand allows the capital expenditure for portions of the system that are unneeded at the present to be postponed. Distributing capital costs over time enables a community to
incur less debt. Additionally, if population projections are not realized, the community has avoided unnecessary investments and the accompanying debt that must be borne by a smaller-than-projected population base. Installation over time also permits the integration of future advancements in the technology.

These technologies also offer advantages in the realm of landscape design and efficiencies. As Noss (2005) and others have recognized, decentralized wastewater systems are uniquely suited to achieving the improved layouts available in the planned unit developments (PUDs) or cluster/conservation designs. These design mechanisms promote the clustering of homes or a mix of homes and other uses in concentrated areas while leaving the remaining areas of the development as open space. In many such designs, the gross density of a development is unchanged although densities, particularly in PUDs, can be increased in exchange for amenities constructed by the developer. Such designs create high quality open space and community amenities such as walking trails. They are also attractive to developers because the infrastructure for roads and utilities can be concentrated, thus permitting the same number of units with lower infrastructure expense. Such designs are also recognized for their environmental benefits. For example, fewer miles of streets and disturbed area translate into less storm-water runoff.

It is, however, important to recognize that these advantages are largely improvements to the site design and are limited to the bounds of the development. If there is no larger coordination of these developments, then site and design advantages are comparatively small in the grand scheme of the county’s overall development and will not further the overall orderly growth of the community. If a dispersed development pattern is allowed to result—as has generally occurred in Tennessee—the community’s
ability to provide necessary services and infrastructure through schools, roads, fire and police protection, or medical services will be more difficult. Thus, while decentralized systems may make possible improved site designs and reduce the expense of providing wastewater disposal to developing areas, if these developments are not coordinated, they also may allow population growth to disperse over a larger area, thus increasing the expense in providing other services. As observed in this study, the site-design advantages this technology offers are likely to result regardless of regulatory influences because developers see them as a means of improving the product marketed to the homebuyer. However, larger coordination of the developments was not found to result when left to the actions of individuals and will, therefore, require proactive action by planning authorities.

A Changed Paradigm: The Need to Plan

If the potential negative impacts for dispersed growth enabled by this technology are to be minimized, then it is essential that planning authorities implement the regulations necessary to ensure this result. However, this may be difficult because it contravenes the longstanding tradition of allowing concerns for the public health and environment to determine densities. It requires that planners establish and hold firm to reasons other than “sanitation” to justify planning policies and regulations. The power to use these systems to implement plans for orderly growth requires a powerful commitment by the planning authorities and a populace that recognizes the need to use planning regulations to coordinate infrastructure—particularly decentralized wastewater systems—with the proper timing of development.

Ensuring that the beneficial outcomes of these technologies result while
minimizing their negative impacts will require that planning authorities implement regulations to establish where intense development will be permitted. It will also require the designation of areas not suitable for development at the present time. These are hard decisions. They create winners and losers among landowners. However, this problem is not new, for as Branch (1983) recognized, planning always operates to someone’s disadvantage; there are no plans that benefit everyone equally. Nonetheless, these decisions are all the more difficult because they had previously been made for these authorities through concerns about “sanitation.” This is no longer the case. However, implementing regulations to manage growth is made more difficult because they have very focused and specific costs while their benefits are more universal. While everyone benefits from an orderly landscape, we do so in an ill-defined and general way. Conversely, the costs of this benefit are extremely focused. It means that a developer cannot develop a particular property or a farmer cannot sell a particular farm at a high price for development. However, it is easier to mobilize well defined interests, such as those of developers, than it is to mobilize broader interests in support of growth management.

For all the advantages that orderly growth affords in the timing of development and efficiencies of land-use, the designation of certain areas for future growth or preservation will result in the loss of property values. For such growth management policies to be supported by local residents, this potential loss would likely need to be compensated for through mechanisms such as transferring or purchasing of property rights. However, in developing areas of Tennessee, such mechanisms are difficult to implement and are likely to be resisted locally. Thus, the designation of areas for growth
and others for preservation is unlikely. While decentralized wastewater systems are only a piece of this larger issue, they are important piece, both in their own right and in the fact that they illuminate these larger realities. In their own right, these technologies are an increasingly important element of infrastructure and one that must be managed by planning authorities if they are to be used to achieve the goals of the general public rather than allowing infrastructure provision to determine land use and growth patterns.

*How Regulated Development Might Have Looked*

If planning authorities had implemented land-use regulations to manage the growth liberated by decentralized wastewater systems, the pattern of the technology’s use would be very different. In such a scenario we might see the advantages offered by this technology realized in a setting where the developments they enable are coordinated in a larger sense. At the state scale we might expect decentralized systems to have their greatest use in planned growth areas rather than the designated rural areas. This does not now occur despite the fact that the growth anticipated for planned growth areas was likely to need an alternative to conventional disposal. Thus, under a coordinated planning regime, greater use of decentralized systems would have occurred in the planned growth areas as growth was encouraged here and in need of the technology. Under such a regime, we might expect decentralized systems to have their next largest use inside the urban growth boundaries, where alternative technologies and conventional sewers were used in tandem. We would expect rural areas to be among the areas with the least use of these systems.

Wilson and Rutherford counties offer prime examples of how this growth might have looked at the county scale. First, had greater cooperation existed between the cities,
the county, and the Wastewater Authority in Wilson County we would not see
decentralized wastewater systems used as a means of exiting from the constraints
imposed by Lebanon and Mt. Juliet. Such coordination would have allowed the use of
these systems to support growth inside each city and at its outer edge rather than in a
widely dispersed manner. Depending on the situation, these systems may have offered a
better means of providing wastewater services to these sites than through conventional
means. Second, we might see the systems serving concentrations of development in the
county’s identified gateways, locations where growth was desired but difficult to achieve
without some alternative to conventional wastewater disposal. Concentrating growth in
gateway areas would have produced a more compact and contiguous development pattern
in the county. Similar outcomes can be envisioned for Rutherford County where
decentralized systems might have supported concentrations of development around the
historic communities. While this technology has supported a few developments in
historic communities, this has been the exception rather than the rule. Had the
technology been used in the manner envisioned in the 1998 Community Strategic Plan,
historic communities would have served as the foci for growth where other elements of
infrastructure, such as schools, and services could be efficiently provided.

Due to the national significance of Sevier County’s scenic beauty, growth here
might have simply been best to occur in and at the edge of the existing cities. Thus,
coordinated efforts by state and local governments here could have prohibited the use of
decentralized systems in areas desired for preservation. However, the technology could
have been used to serve areas where the extension of conventional sewers is desired but
difficult due to the challenging terrain. Their use in this manner would have offered an
alternative to sewer extension and would have aided the development of sites inside and contiguous with existing development. Beyond this area of contiguous development, growth to any considerable density could have been limited. In such a scenario, we would see concentrated clusters of decentralized system in those areas at the edge of cities where they were advantageous to the commonly held land use goals of the community.

*How To Achieve the Benefits and Diminish the Costs of the Technology*

This situation raises questions of what actions should be taken or policies developed to ensure this technology is guided by the will of the larger public. The first among these may simply be cultivating the proper understanding of the responsibility, role, and purview of planning authorities. Many planning authorities lost sight of the fact that it was their responsibility and within their purview to designate areas for growth and areas for preservation. Focusing on the custom of basing lot size on available utility service, many planning authorities failed to recognize that their responsibility goes beyond ensuring that the public health and environment are protected. What local planning authorities have often failed to realize is that although rural sanitation no longer requires low densities, intense development is not appropriate in all areas.

Realizing a more complete and holistic view of the role of planning authorities will however be difficult. Comprehensive planning requires energy and courage. It is harder to be pro-active than it is to continue in the existing condition and planning has a longstanding custom to base density on sanitation concerns. Thus, it is easier to allow *de facto* constraints to control density and development and to blame the technology for loosening this constraint than to replace it with regulations. This recognition of the
challenges to proactive planning is a critical first step.

We must also recognize the power of the development community to influence local land-use regulations. Similarly, we must recognize the nature of decision makers serving on these local planning authorities and their susceptibility to the desires of their constituents. As we found in this study the developers work within the rules, regulations, and laws in place. This is not to say that they do not use such laws to their advantage—as they did with the Horizontal Property Act in Sevier County. Thus, it is important to acknowledge that the root of this problem rests not with these people operating outside the regulations, but rather with the susceptibility of local planning authorities to their influence. This has been a strong influence determining the weak, reactive response which this technology elicited from the planning authorities. Thus, decisions about growth cannot be left solely to the locality. There must be some check of these decisions by an entity with a wider purview and base. One way in which the public will for orderly growth might be better articulated would be through a statewide planning authority.

There are a number of both regulatory and non-regulatory roles that a state planning authority might assume. This authority and its staff could promote research and help local planning authorities better understand the issues they face. In the case of decentralized wastewater systems, such an authority could have educated local decision makers about this technology, what it meant or could mean for the future development of their community and how it was being used and integrated into planning regulations throughout the nation and other parts of the state. In this role, the authority could also have explained the role and responsibilities of both the Department of Environment and Conservation and the Tennessee Regulatory Authority. As a state agency, this authority
would have possessed the same status as these agencies, and this status would have placed planning’s voice on the same plane as that of environmental protection and utility competence. Furthermore, this would not have left such critical explanations to the utilities or developers. My advocating for such a statewide agency of planning must not be confused with the state’s current Local Planning Assistance Office, which provides contract planning services to certain cities and counties in the state. The staff of that office, while employed by the state government, serves only the communities that contract for its service and only in ways determined by the locale.

In order for the public will for orderly growth to be articulated, a statewide planning authority must do more than promote research and educate; it must also have regulatory powers. One power and responsibility of such an authority would be to ensure coordination of the actions of local planning authorities with those of state government. Although the state adopted landmark growth management legislation in Public Chapter 1101, each county was empowered to establish its own growth plan. There was no substantial evaluation of this plan by the state to ensure that it would result in the orderly growth of the community. Although the plan had to be approved by the Local Government Planning Advisory Committee, this was a hollow formality because the approval was automatic if the cities and the county agreed on the plan. Thus, there is no entity of state government charged with managing growth under Public Chapter 1101 or even with ensuring that the actions of state agencies—such as the granting of certificates by the Tennessee Regulatory Authority—support these growth plans. The lack of state coordination can be observed in the use of the systems considered in this research.

Another potential regulatory power of a statewide planning authority would be to
coordinate between local planning authorities. As development has been freed from the spatial constraints of sewers and the limitations to septic systems, the local perspective and authority of planning commissions has proven too limited. In Wilson and Sevier counties, the spatially constrained and fragmented jurisdictions encouraged the dispersion of growth on decentralized systems. Owing to its wider perspective, a statewide planning authority could have better coordinated the response of these local planning authorities. This would also have strengthened the county growth plans. Furthermore, resting a part of the authority for determining growth patterns in a larger planning authority would have insulated these decisions somewhat from local politics. While planning must still occur at a local level, a statewide planning authority could be empowered to evaluate the local plans and require regulations be adopted to ensure the plans are implemented. This is not to argue for the complete transfer of planning authority from local communities to the state. Rather, the point is that a statewide planning authority would have the ability to better coordinate the overall actions of local authorities and to guarantee that the interests of citizens of the state are protected from the local drift of politics.

Future Implications

As technologies make land development possible in previously constrained areas, the importance of land-use planning and regulation to ensure the management of a community’s development is heightened. As LaGro (1998) recognized, such land-use changes are a direct result of the technologies, institutions, and values of people, and as such, their effects may persist indefinitely. The use of these technologies has both positive and negative possibilities, but which will result will depend—as Popper recognized—on assertive and active land-use planning by state and local governments.
The public’s ignorance of this issue will exact a high price unless growth is directed by planning policies and regulations into an orderly form.

The alternative wastewater technologies employed in decentralized systems are likely to be followed by many such technologies. If they are to be managed for the benefit of the public, now is the time to identify and evaluate the forces determining their use and outcomes. We must understand that we face a wave of technological liberation and that the appropriate policy and regulatory structures must be created and implemented if we are to ensure that the public good determines the use of such technology. If preparation is not done, planning authorities will be caught flat footed and powerless. Now is the time to regulate this technology and get ready to manage the next that comes along. This will not happen unless a mechanism for the articulation of the public’s desire for a coherent landscape is established. It is indisputable that decentralized wastewater systems and similar technologies are going to experience widespread use. The question is how planning authorities and the general public will respond.


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To protect the identity of key informants who did not grant permission for the author to identify them by position, employer, or name, they have been assigned a confidential code. At the author’s discretion, a confidential code has also been assigned to certain informants who may have granted permission to be identified by their position, employer, or name. This was done to protect the sources because they might still have been more easily identified than they anticipated. In cases where such a source made a potentially controversial statement, the author has erred on the side of completely protecting the source’s identity.


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Source D18b [conf. code]. 2007. Interview by Kendrick Curtis, Digital audio recording, June 18, Williamson County, TN.


Source D20a [conf. code]. 2007. Interview by Kendrick Curtis, Digital audio recording, June 20, Knoxville, TN.

Source D28b [conf. code]. 2007. Interview by Kendrick Curtis, Digital audio recording, June 29, Williamson County, TN.


Source D29a [conf. code]. 2007. Interview by Kendrick Curtis, Digital audio recording, June 29, Williamson County, TN.

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DATA SOURCES


TENNESSEE REGULATORY AUTHORITY DOCKETS REFERENCED

Below is a list of the dockets before the Tennessee Regulatory Authority referenced in the text. Digital copies of dockets are available from the authority’s website.
(http://www.state.tn.us/tra/indexes/docketregular.htm accessed last by K. Curtis on November 1, 2008)

90-04334; 95-03948; 97-01394; 99-00393; 99-00485; 00-00667; 01-00229; 03-00329; 03-00467; 03-00544; 04-00045; 05-00042; 05-00162; 06-00005; 06-00187; 06-00176; 06-00277; 07-00090
STATE OPERATING PERMIT APPLICATION FILES REVIEWED

The list below reflects the state operating permit application files that were reviewed in the conducting of this research. This review was conducted in the Tennessee Department of Environment and Conservation’s central office in Nashville, Tennessee on October 10-12, 2006 and January 8-9, 2007.

Permit Record Number:

Applied for in 2006:
- 06001
- 06002
- 06003
- 06005
- 06007
- 06008
- 06014
- 06017
- 06018
- 06019
- 06022
- 06023
- 06025
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- 06042
- 06043
- 06045
- 06046
- 06050
- 06053
- 06055
- 06057
- 06058
- 06059
- 06066

Applied for in 2005:
- 05002
- 05004
- 05007
- 05008
- 05011
- 05013
- 05018
- 05019
- 05022
- 05025
- 05030
- 05032

Applied for in 2004:
- 04004
- 04005
- 04007
- 04008
- 04009
- 04012

Applied for in 2003:
- 03002
- 03004
- 03005
- 03007
- 03008
- 03009
- 03010
- 03015
- 03018
- 03022
- 03026
- 03031
- 03032
- 03034
- 03035
- 03038
- 03042
- 03043
- 03047
- 03050
- 03053
- 03054
- 03056

Applied for in 2002:
- 02003
- 02010
- 02011
- 02014
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APPENDIX I:
DETAIL ON SELECT DATA SOURCES
AND RESEARCH PROCEDURE
DETAILED EXPLANATION OF SELECT DATA SOURCES

Several data sets were collected and/or integrated into a collection of files for use in a geographic information system (GIS). A detailed description of select data sources is presented in this appendix. A complete list of data sources is provided in the bibliography.

State Operating Permit Records

State Operating Permit records are contained in the permit database maintained by the Tennessee Department of Environment and Conservation Division of Water Pollution Control (WPC). This is a part of the larger permit database which contains other permits administered by this division. A digital copy of this permit database was obtained on December 7, 2006 and an updated version on January 11, 2008. As an operating permit is required for systems which do not discharge directly to surface or subsurface waters and as decentralized systems are defined in this research as non-discharging systems, this database offers the only statewide data source for systems meeting this definition. Records in this database which did not meet this research’s definition of “decentralized systems” were removed from consideration. Systems removed included pump and haul systems, municipal sewage collection systems discharging into the collection system of another entity, manufacturing activities generating wastewater not discharged to a surface water body, pressure washing operations such as mobile car washes, and pump stations. Three permits were added to the database to reflect the expansion of a previously permitted system. As an additional permit, hence an additional record, did not exist to reflect the date or scale of the expansion, additional records were necessary to reflect these changes.
The essential elements contained in the permit database include: the permit number; flow rate; permittee/applicant name; site name; site owner; site location; a description of the activity permitted and treatment method employed; the site’s latitude and longitude; the status of permitting action, an issuance date, and an effective date. Constrained in detail to material submitted on the application, descriptive variables such as “site description” ranged from very descriptive to very vague. This database was supplemented by inspection of permit file records in the Department of Environment and Conservation’s Nashville office during October of 2006 and January of 2007 (See the bibliography for a complete list of the permit files examined in person.)

Public Chapter 1101 Growth Plans

A digital GIS shapefile of each county’s originally adopted Public Chapter 1101 Growth Plan was obtained from the Department of Economic and Community Development’s Local Planning Assistance Office. This shapefile had been created in 2003. Census Topologically Integrated Geographic Encoding and Referencing (TIGER) lines files had been used as the base for this file. Corporate limits were corrected as necessary to coincide with the corporate limits as designated on the adopted county growth plan. Urban Areas, Planned Growth Areas, and Rural Areas were digitized based on inspection of each county’s adopted growth plan on file with the Local Government Planning Advisory Committee.

The Tennessee Base Mapping Program Database

The Tennessee Base Mapping Program (BMP) is an undertaking by state government to develop a comprehensive spatial database for use by state and county
agencies. The Office of Information Resources in the Department of Finance and Administration is responsible for program oversight and administration. This office authorized use of BMP data for my dissertation research. Consisting of a foundation of digital orthoimagery and a seamless cadastral layer, the Base Mapping database provided the basic geographic framework for this research. This dataset was available for 70 of Tennessee’s 95 counties. Base Mapping data was obtained through the Department of Economic and Community Development’s Local Planning Assistance Office in May 2006 and November 2007.

Rutherford County Geographic Information System Database

The Rutherford County Office of Information Technology maintains a comprehensive GIS database of digital orthoimagery and a seamless cadastral layer. County Mayor Nancy Allen authorized use of this data for this research. Versions of this database were obtained from OIT in June and December of 2006 and April of 2007.

Computer-Aided Assessment System Database

The Tennessee Office of the Comptroller of the Treasury maintains property assessment attribute data in the Computer-Aided Assessment System (CAAS) database. The CAAS database is used in 90 of Tennessee’s 95 counties for property assessment. The Tennessee Office of the Comptroller of the Treasury authorized use of the CAAS database for this research. This dataset was obtained through the Department of Economic and Community Development’s Local Planning Assistance Office in July of 2006 and September of 2007.

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61 http://gis.state.tn.us/mapping.html
62 http://170.142.31.248/
Maps contained in 2005 Tennessee Rural Water Needs Report

Maps showing areas of each Tennessee county which lack a public water supply were obtained from Department of Environment and Conservation’s *Tennessee Rural Water Needs Report* (2005). Based on a review of public water system inventory data this report, published in January of 2005, presents a county-by-county review of areas which were not served by a public water system. Maps from this report were imported and georeferenced in ArcGIS to enable a comparison with the location of decentralized systems.

Tennessee Regulatory Authority Certificates of Convenience and Necessity Dockets

The Tennessee Regulatory Authority requires private utility companies providing wastewater service apply for a Certificate of Convenience and Necessity. Although the level of description varies, certificates are usually extensive and offer valuable insight into attributes of the development, its location, and extent of potential service area. The majority of certificates were available on the authority’s website, although several from the late 1990s required inspection in the authority’s state office. As the Tennessee Regulatory Authority does not regulate decentralized developments owned by a public utility (utility districts or municipalities), this dataset did not apply to all decentralized developments.
RESEARCH PROCEDURE

*Identification of Decentralized Wastewater Systems*

Identifying decentralized systems and the developments they service was the first requirement of this research. This was accomplished through use of the permit application database maintained by the Department of Environment and Conservation. Copies of this database were obtained in December of 2006 and January of 2008. The 2006 version of the database contained 771 records. Of these records, 316 were identified as decentralized systems. Of these, 261 had either been issued a permit or remained open. Two applications had been denied, and 53 applications were classified as “inactive”. Of the 53 records classified as “inactive”, the permit application database contained a flow rate value for 25 of these. The total flow rate for these 25 systems was 526,600 gallons per day. Based on an assumed 300 gallons generated per dwelling unit, these systems could support 1,755 additional residential units. Assuming three occupants per unit, an additional 5,266 people could be supported by these 25 inactive systems.

*Location Verification of Decentralized Wastewater Systems*

Decentralized systems were located based on the latitude and longitude coordinates contained in the permit application database. As the location of systems and the areas they serve was critical to further analysis, the location of each system was verified against supplemental materials. Through individual inspection, it was determined that errors existed with the latitude and longitude placement of certain

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63 Of the 53 records classified as “inactive”, the permit application database contained a flow rate value for 25 of these. The total flow rate for these 25 systems was 526,600 gallons per day. Based on an assumed 300 gallons generated per dwelling unit, these systems could support 1,755 additional residential units. Assuming three occupants per unit, an additional 5,266 people could be supported by these 25 inactive systems.

64 Supplemental materials included location maps, engineering designs/reports, facility/site design layouts, and subdivision plats contained in SOP and CCN application files; parcel data from the BMP; the CAAS database and website; real estate agency websites; websites for specific developments; and online planning documents.
systems. While the coordinates for 144 systems (55%) were confirmed to be accurate, 51 systems (19%) were found to be inaccurate, 65 systems (25%) were found to be slightly inaccurate, and three records were added to reflect the expansion of a system. A system was considered inaccurate if its placement was far removed from where supplemental materials indicated the system is located. A system was considered slightly inaccurate if it was adjacent or in close proximity but did not coincide with the spatial extent of a development. Inaccurate and slightly inaccurate records were relocated based on supplemental materials.

Relation of Decentralized Developments to Public Chapter 1101 Growth Plans

A digital GIS shapefile of each county’s originally adopted Public Chapter 1101 Growth Plan was obtained from the Department of Economic and Community Development’s Local Planning Assistance Office. As of August 2006, seven counties in the state (Anderson, Carroll, Coffee, Decatur, Hamblen, Lake, and Marion) had amended their growth plan. Therefore, an updated growth plan shapefile was created for these seven counties through inspection of the amended growth plans. The location of the area(s) served by each system was compared against growth plans as originally adopted and as amended through August 2006. Each record was assigned its corresponding growth plan designation: Municipal, Metropolitan County, UGB, PGA, or RA. Five decentralized systems were identified as providing wastewater service to an area which extended across multiple growth plan areas. No decentralized systems were identified as serving developments located in an area whose growth plan designation was altered by amendments to the seven amended growth plans.
Assessment of Public Water Supply Availability

The availability of a public water supply was assessed by comparing the location of decentralized systems to maps available in the *Tennessee Rural Water Needs Report* (TDEC DWS 2005). CAAS data for a parcel’s water service was also consulted. Information regarding water supply for certain systems was also obtained from operating permit records on file with the Tennessee Department of Environment and Conservation.

Determination of Land Use / Nature of Development

To gauge the nature of development supported by decentralized systems, the type land use(s) supported by each system was incorporated into the database. Land use types were determined from descriptive information in the December 2006 permit application database or obtained from supplemental materials used to confirm a development’s location.

Estimation of Possible Residential Units and Residential Population

Determining the number of dwelling units and the residential population projected for each decentralized system was essential to this research. As the number of units is not directly contained in the permit application database, approximate unit counts were either derived from a system’s flow rate or, when possible, retrieved from the permit application file record. The design capacity for each system is recorded in the database as the volume of flow (measured in gallons per day) for which the system is approved or for which it applied. Of the 195 systems which serve residential developments, the number of units to be served was retrieved from the permit file record for 113 systems (58%). For the 82 remaining residential systems (42%), residential units were calculated

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by dividing the system’s flow rate by 300 gallons. The 300 gallons per day standard
assumes an occupancy rate of three persons per unit who each generate 100 gallons of
wastewater per day. Three persons per unit is a general assumption made by TDEC for
estimating potential populations to be supported. While not all systems are sized based
on the 300 gallons per day standard, many systems are. A further explanation of this data
limitation and assumptions made is presented in Appendix II.
APPENDIX II:

METHODOLOGICAL CONSTRAINTS
DEPARTMENT OF ENVIRONMENT AND CONSERVATION’S PERMIT APPLICATION DATABASE

Permit Issuance Dates.

State operating permits are issued for a period of up to five years. Prior to expiration the permit is reapplied for and may be reissued. The permit application database does not maintain the date of original issuance. When a permit is reissued, the issuance date is updated to reflect the reissued rather than original date. As the original date is lost for reissued permits, this research reports the year in which an application was originally submitted to the Division of Water Pollution Control. While the year of application was not directly contained in the permit application database, it could be derived from a permit’s number. The first two digits of the permit number correspond to the year in which the application was first submitted. A permit may have been issued during that same year, yet a permit delayed in its review or submitted near the end of a year would likely be issued in a later year.

Change to SOP Application Form

The application form used by the Division of Water Pollution Control for a state operating permit was altered in August of 2005. The change of this form had two impacts on this research. First, the form currently used requests information on the type entity supported by the treatment facility and the number of units for which the system was designed. The previous application form did not request such information. Therefore, descriptive information regarding the type development and units supported was available from the most recent applications. However, neither the entity type nor number of units is maintained in the database and was only available through application
inspection. Secondly, while not always provided, the application in use before August 24, 2005 did request information on the nature of water supply. However, the permit database does not maintain this information. Therefore, the nature of water service was only available for applications submitted prior to August 2005 through inspection of SOP permit file records. The name of the water provider was generally listed on applications indicating access to a public water supply, although several only indicated public water was available without naming the supplier. More recent permit applications do not request information on water supply.

Number of Possible Residential Units and Residential Population

The design capacity for each decentralized system is recorded in the permit application database as the volume of flow (measured in gallons per day) for which it was approved or applied. This database does not directly maintain the number of units or people the system can support. The residential population supported is therefore an estimate based on the number of residential units a system can support and an assumed occupancy rate of three persons. An approximate unit count for each system was either derived from a system’s flow rate or, when possible, retrieved from the permit file record. The current application form does record the number of units for which the system is designed, however, the application form used before August 24, 2005 did not. Of the 195 systems identified as serving residential developments, the number of dwelling units was retrieved from the permit file record for 113 systems (58%). For the 82 remaining residential systems (42%), dwelling units were calculated by dividing the flow rate by 300 gallons.

Per the Design Criteria for Sewage Works, 100 gallons per day is the standard
volume of wastewater expected to be generated for each person in a residential dwelling (Tennessee Department of Health and Environment 1989, Appendix 2C). While it became evident through inspection of permit file records that not all systems were sized based on the 300 gallons per day standard, many systems were. Flow rates for inspected applications generally ranged from 200 and 250 gallons per day to 350 gallons per day. Various factors can account for this range of flow rates, although the first reason is likely paramount. First, the recommended 300 gallons per day takes into account normal inflow and infiltration of groundwater. The watertight nature of the alternative collection systems prevents such infiltration. Therefore, the 300 gallons per day overcompensates for flow rates and results in a conservative design (SOP file 06057). Second, a range of residential developments are supported by decentralized systems. All were not designed for an occupancy rate of three persons or for 100 percent occupancy at all times. Despite this recognized variation, an assumed flow volume per dwelling unit was necessary to derive an approximate number of dwelling units for the 81 systems for which a unit count was unknown. A flow rate of 300 gallons per day was assumed for these systems for two reasons. First, this is the recommended flow rate in department’s design manual and is a common assumption for general calculations (Tennessee Department of Health and Environment 1989, Appendix 2C). Second, as systems were identified as having flow rates both above and below 300 gallons per day, 300 would provide a reasonable middle value to mitigate this variation.

Twenty-three systems were proposed to serve a mix of land use types. While the nature of the connections was obtained for nine mixed-use systems, it was unknown or unreported for the other 14 systems. As these systems are generally constructed to
service an extended but yet undeveloped area, the mix of eventual land uses to be supported was often only estimated at the time the application was made. Of these 14 systems, the number of projected units was reported for six, yet the mix of uses was not. For these six, all units were assumed to be residential. For the remaining eight, the flow rate was divided by 300 to derive the number of possible residential units. Admittedly, these assumptions result in higher than probable residential populations for these systems. However, as the eventual mix of land uses supported is unknown and as it is possible that all connections could ultimately be to residential units, these variables are reported as “Possible Residential Units” and “Possible Residential Population”.
APPENDIX III:

HUMAN SUBJECTS FORMS
STUDY INFORMATION SHEET

THE SHAPE OF GROWTH:
DEVELOPMENT BEYOND CONVENTIONAL WASTEWATER INFRASTRUCTURE

You are invited to participate in a research study. The purpose of this study is to evaluate the use and regulation of decentralized wastewater systems in Tennessee. Decentralized systems are sometimes known as “on-site” or “alternative” systems since they incorporate alternative technologies (such as a recirculating sand filter) to treat wastewater onsite.

As interviews with key informants are essential to understanding the use and regulation of this technology, this study involves human research. Your involvement in the research project would consist of an interview of less than one hour. Should further research raise additional questions you may be contacted for a brief follow-up interview. The interview will either be in person or over the telephone and will be at your convenience.

Understanding the use and regulation of decentralized wastewater systems is of benefit to those involved with growth and development in Tennessee. This research will contribute to our understanding of how public policy, the development community, utility infrastructure, and technology interact to shape land use and development patterns. No potential or foreseeable risk, stress, or discomfort is anticipated.

With your consent the interview may be audio recorded. Audio recordings will ensure your statements are accurately recorded. The study records and audio files of interviews will be stored securely in the Burchfield Geography Building at the University of Tennessee. Other than members of my dissertation committee, no other researcher will have access to interview records or audio files. The study records will be kept confidential and no reference will be made in oral or written reports which could link you to the study unless you specifically give permission in writing to do otherwise.

As your interview will possibly have future benefit to related research, I may, with your permission, retain these recordings until they are destroyed at some undetermined future date. Should I utilize information from the audio file of your interview in oral or written reports beyond the scope of my dissertation or articles, reports, or presentations which relate directly to my dissertation research, I will contact you in writing to obtain your consent for those uses.

If you have questions at any time about the study or the procedures, you may contact the researcher, Kendrick J. Curtis, at 419 Burchfield Geography Building, University of Tennessee, Knoxville, Tennessee 37996-0925, or (865) 974-3465 or biewson@utk.edu.

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.
INFORMED CONSENT STATEMENT
THE SHAPE OF GROWTH:
DEVELOPMENT BEYOND CONVENTIONAL WASTEWATER INFRASTRUCTURE

You are invited to participate in a research study. The purpose of this study is to evaluate the use and regulation of decentralized wastewater systems in Tennessee. Decentralized systems are sometimes known as "on-site" or "alternative" systems since they incorporate alternative technologies (such as a recirculating sand filter) to treat wastewater onsite.

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With your consent the interview may be audio recorded. Audio recordings will ensure your statements are accurately recorded. The study records and audio files of interviews will be stored securely in the Burchfiel Geography Building at the University of Tennessee. Other than members of my dissertation committee, no other researcher will have access to interview records or audio files. The study records will be kept confidential and no reference will be made in oral or written reports which could link you to the study unless you specifically give permission in writing to do otherwise.

As your interview will possibly have future benefit to related research, I may, with your permission, retain these recordings until they are destroyed at some undetermined future date. Should I utilize information from the audio file of your interview in oral or written reports beyond the scope of my dissertation or articles, reports, or presentations which relate directly to my dissertation research, I will contact you in writing to obtain your consent for those uses.

If you have questions at any time about the study or the procedures, you may contact the researcher, Kendrick J. Curtis, at 419 Burchfiel Geography Building, University of Tennessee, Knoxville, Tennessee 37996-0925, or . If you have questions about your rights as a participant, contact the Office of Research Compliance Officer at (865) 974-3466 or plawson@utk.edu.

Your participation in this study is voluntary; you may decline to participate without penalty. If you decide to participate, you may withdraw from the study at anytime without penalty and without loss of benefits to which you are otherwise entitled. If you withdraw from the study before data collection is completed your data will be returned to you or destroyed.

I have read the above information. I have received a copy of this form. I agree to participate in this study.

Participant's signature ____________________________ Date ____________

Investigator's signature ____________________________ Date ____________

Continued
Continued: INFORMED CONSENT STATEMENT
THE SHAPE OF GROWTH:
DEVELOPMENT BEYOND CONVENTIONAL WASTEWATER INFRASTRUCTURE

DESIRE FOR IDENTITY TO REMAIN CONFIDENTIAL:
I DO NOT GRANT permission to be identified by name, position, or employer. It is my desire that my identity and remarks remain confidential such that no reference may be made in oral or written reports which could link me to this study.

Participant’s signature ___________________________ Date __________

PERMISSION TO BE IDENTIFIED:
I HEREBY GRANT permission to be identified by name, position, or employer. I acknowledge that my name and identity may be made known through oral or written reports linking me to this study.

Participant’s signature ___________________________ Date __________
APPENDIX IV:

BRIEF HISTORY OF INVESTOR-OWNED UTILITIES
Cartwright Creek (First certificate: 1975 – Williamson County)

On March 7, 1975 the Tennessee Public Service Commission—predecessor of the TRA—granted Cartwright Utility Company a CCN authorizing it to provide wastewater service. Since 1975, Cartwright Utility Company has operated a wastewater treatment facility in the Seventh Civil District of Williamson County. In November of 2004 the TRA approved Cartwright Utility Company to transfer its authority to provide wastewater service to another company—Cartwright Creek, LLC. In July of 2005 the TRA approved a petition by Cartwright Creek to expand its service area to include “Planned Growth Area 5” of Williamson County. In July of 2007 Cartwright Creek petitioned the TRA to extend this service area to the south to include an area referenced as “Stillwater Development”. It is important to note that Cartwright Creek has long operated a conventional wastewater treatment facility which discharges into the Harpeth River under an NPDES permit. However, in 2004 this utility received a SOP to operate a decentralized system to service the Waterbridge Development (Smith, Seckman, Reid, Inc. 2003). The Waterbridge system is located in the utility’s “Planned Growth Area 5” service area. This system meets the definition of ‘decentralized systems’ in this study however their larger plant does not. The Waterbridge system was the only one of the 264 decentralized systems in the Division’s permit application database operated by Cartwright Creek. While Cartwright Creek plans to service their expanded service area through this and possibly other decentralized systems, the number of customers reflected

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65 Neither Cartwright Utility Company nor the TRA were able to locate copies of this document when Cartwright Utility Company requested the TRA approve the transfer of authority to provide wastewater service to Cartwright Creek, LLC in 2004. However, a map of the utility’s service area boundary was contained in a 1996 rate increase petition.

66 The list of active individual NPDES (IND) permits available on the TDEC website in October of 2007 was only current through August 1, 2003.
in Table 5.3 is misleading as it also includes those served by the conventional wastewater system.

*Aqua Utilities Company (First certificate: 1990 – Hardin County)*

Aqua Utilities Company provides both water and wastewater utility service to a 3,000 acre development known as the “Points of Pickwick” on the northern bank of the Tennessee River in Hardin County. This development is approximately seven miles south of Savannah, Tennessee. The SOP for a wastewater system for this development was applied for in 1992 (SOP file 92082). Aqua Utilities operates under a CCN which the Tennessee Public Service Commission granted to “Benard Blasingame d/b/a [doing business as] Aqua Utilities Company” in August of 1990 (TRA Docket 90-04334). This utility was created solely to operate a community water distribution system and a sewage collection and treatment system for the “Points of Pickwick” being developed by Mr. Blasingame. The original petition stated that the area was in the “midst of an influx of development” and Mr. Blasingame demonstrated that there would be the need for an additional 3,000 primary and secondary homes in the area (TRA Docket 90-04334). Due to this perceived demand, Mr. Blasingame sought a solution to the limitations and expense associated with septic systems and individual water systems through establishing and operating a public utility for this development. The size of the anticipated development—he projected 300 customers in Phase I and the possibility of eventually serving 1,600 customers—no doubt provided the incentive to pursue this option. This option would not likely have been perceived as viable at that time for a smaller scale

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67 The SOP for this system indicated grinder pumps at sources, an aerated lagoon, and spray irrigation.
68 Mr. Blasingame applied for a CCN in the name of Aqua Enterprises of which he was the proprietor. In the original filings and at the hearing the applicant was referred to as Aqua Utilities Company.
development. These projections have yet to be reached. Records on file with the TRA indicate that Aqua Utilities currently serves approximately 240 residential customers (TRA Docket 06-00187).

*Tennessee Wastewater Systems (First certificate: 1994 – Multiple Service Territories)*

On April 4, 1994 the Tennessee Public Service Commission issued a CCN to On-site System, Inc (TRA Docket 97-01394). This was the original certificate issued to the company that would become Tennessee Wastewater Systems, Inc. This certificate authorized the company to provide wastewater service to a residential subdivision—Oakwood Subdivision—in Maury County. Since this time, Tennessee Wastewater Systems, Inc. has expanded the number and extent of the areas for which they are authorized to provide wastewater service. The model pioneered by the Pickneys was unique in Tennessee. Prior to the establishment of On-Site Systems, investor-owned utilities had been established really to serve a single development. The Pickneys, desired to operate a statewide utility to provide service to entities seeking to develop property that other wastewater providers either cannot or will not service (TRA Docket 03-00329 / 04-00045). The Pickney’s were unique in their pioneering use of dispersed service territories. Explaining that they are different from conventional utilities which may sever these 80 square miles or these 10 square miles, “ours is this spot, this spot, this spot, that spot. And so we didn’t fit any of the TRA’s models. We had to start from scratch, and we had to learn together because we didn’t know either” (Pickney 2007).

Tennessee Wastewater Systems, Inc. is the largest and most prominent of the privately-owned public wastewater utilities and operates decentralized systems in multiple service territories across the state. Records on file with the TRA in December of
2006 indicated that Tennessee Wastewater Systems, Inc had 59 existing or pending CCNs for wastewater systems serving commercial customers. This record indicated 84 CCNs for wastewater systems serving residential customers (TRA Docket 06-00277). Eighty-four (32%) of the 264 permits identified in the SOP application file were either applied for or were identified as being operated by Tennessee Wastewater Systems, Inc..

Shiloh Falls Utilities (First certificate: 1996 – Hardin County)

Similar to Aqua Utilities Company, Shiloh Falls Utilities operates a small wastewater system in Hardin County. Shiloh Falls Utilities was originally granted a CCN from the Tennessee Public Service Commission in June of 1996. This CCN granted the utility the authority to provide wastewater service to an area on the southern bank of the Tennessee River (TRA Docket 95-03948). In 1994 Shiloh Falls Utilities applied for and received a SOP to operate this wastewater system. Similar to Aqua, this utility operates a system of grinder pumps, a lagoon and sand filter treatment system, and discharges through spray irrigation. In 2001 the utility requested and received a five acre extension of their service area to include an adjacent commercial retail shopping center. Currently, Shiloh Falls Utilities provides wastewater service to approximately 166 customers (Shiloh Falls Utilities 2006 Annual Report).

Hickory Star Water Company (First certificate: 1999 – Union County)

The Hickory Star Water Company is both a water and wastewater utility provider operating in Union County. In 1999 Hickory Star received a CCN to provide these services to an area along the southern shore of Norris Lake. The major development

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69 As some systems provide service to both residential and commercial customers, the system would be included in both counts.
within this area is a marina and campground facility. The marina had previously provided water service to roughly 50 residential customers in this area. Sewer service had been provided by septic systems. However in 1997, the Tennessee Department of Environment and Conservation notified Hickory Star that the water system was in violation of water quality standards. Hickory Star requested the City of Maynardville provide water service but the city declined to do so. However, an agreement was reached whereby Hickory Star would purchase water from Maynardville and distribute it within its service area. Hickory Star desired to provide sewer service and made this a part of their request for a CCN. In 2005 Hickory Star applied for a SOP to operate a decentralized wastewater system utilizing septic tanks, an ‘AdvanTex’ recirculating filter treatment system, and drip irrigation for discharge. This SOP was issued in May of 2005. Hickory Star currently provides service to approximately 49 wastewater customers and 109 water customers (TRA Docket 99-00485; TRA Docket 06-00176).

Integrated Resource Management, Inc. (First certificate: 2004 – Multiple Service Areas)

Integrated Resource Management, Inc. (IRM) first applied for a Certificate of Convenience and Necessity to service two customers in August of 2003 (TRA Docket 03-00467). These two customers—a realty company’s office and an Exxon service station—are located in Sevier County. The authority issued an order approving this petition in March of 2004. Like Tennessee Wastewater Systems, Inc., Integrated Resource Management, Inc. operates in a number of separate service territories. However, unlike Tennessee Wastewater, Integrated Resource Management only operates in East Tennessee. Six of IRM’s systems are located in Sevier County with others are located in Campbell, Union, and Blount counties (TRA Docket 07-00090). Records on
file with the Tennessee Regulatory Authority in June of 2007 indicate that IRM has nine existing and one pending wastewater systems in separate service territories. Of the 264 decentralized systems identified in TDEC’s permit application database, nine were proposed by or operated by IRM. IRM’s 2006 Annual Report indicates 18 existing customers in 2006.

King’s Chapel Capacity (First certificate: 2006 – Williamson County)

King’s Chapel Capacity, LLC provides wastewater service to the Ashby Communities Development—also known as the “King’s Chapel” subdivision—in Williamson County. In October of 2004 King’s Chapel Capacity filed a petition requesting a CCN to provide wastewater service to this portion of the county. Later that month Tennessee Wastewater Systems, Inc. intervened in this petition. For nearly a year these two entities contested the authority of the other to provide wastewater service to this development. Ultimately in August of 2005 Tennessee Wastewater Systems, Inc. withdrew from the docket and in January of 2006 the TRA granted King’s Chapel Capacity a CCN for a service area of approximately 345 acres. The 2006 annual report for King’s Chapel Capacity reports an estimated 230 possible residential customers on their existing system. This report states that 15 customers were added during 2006 and projects 50 customers to be added each year (King’s Chapel Capacity, LLC 2006 Annual Report).

HC Sewerage, LLC (Hampton Carter) was granted a CCN in 2002 to provide wastewater service to a six-acre commercial center in Hampton, Tennessee. Hampton is a small unincorporated east Tennessee community located in Carter County (TRA Docket 00-00667f). Although the order granting the CCN indicated use of a recirculating
sand filter no record of this system was contained in the SOP application database. Other records indicated that the applicant proposed and was granted a NPDES permit for a surface water discharge for a 12,000 gallon per day system (TRA Docket 00-00667). This would explain the absence of this system from the SOP database.
APPENDIX V:
MEMORANDUM OF UNDERSTANDING BETWEEN THE
TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
AND THE TENNESSEE REGULATORY AUTHORITY
MEMORANDUM OF UNDERSTANDING
BETWEEN
THE TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION
AND
THE TENNESSEE REGULATORY AUTHORITY
REGARDING
TRA-REGULATED WASTEWATER UTILITIES

A. Statement of Purpose

1. Both the Tennessee Department of Environment and Conservation (TDEC) and the Tennessee Regulatory Authority (TRA) have a mutual desire to improve service to their respective constituencies, to ensure adequate wastewater treatment from TRA-regulated wastewater utilities and to ensure the protection of Tennessee’s natural resources.

TDEC and TRA agree that environmental quality and protection of water resources are of significant importance. The TDEC and TRA further agree that factors relevant to maintaining utility compliance with the Tennessee Water Quality Control Act, the federal Clean Water Act, and the regulations promulgated thereunder must be considered and coordinated by both agencies in making decisions regarding the long-term viability of TRA-regulated wastewater utilities. TDEC and TRA also recognize that it is important to promote the public interest by balancing the interests of utility consumers and providers while facilitating the transition to a more competitive environment.

3. This Memorandum of Understanding (MOU) is intended to foster inter-agency communication, cooperation and coordination, as well as achievement of the goals, missions and objectives of both agencies.

B. Responsibilities of the TRA

1. When evaluating rate increase requests submitted by TRA-regulated wastewater utilities, TRA will consider recommending rate increases sufficient to provide the operating revenues necessary for adequate system operation and maintenance and to maintain compliance with applicable laws and regulations.

2. TRA will provide TDEC with a list of TRA-regulated wastewater utilities and will provide
updates as the list is modified.

3. TRA will inform TDEC and provide a TRA docket number of any complaints against a TRA-regulated wastewater utility, where such complaints may involve issues relating to compliance with state or federal water quality requirements.

4. TRA will inform TDEC and provide a TRA docket number of all applications filed with the TRA that seek the issuance of or amendment to a Certificate of Public Convenience and Necessity (Certificate) involving wastewater utilities.

TRA will inform TDEC and provide a TRA docket number regarding the issuance of or amendment to a Certificate involving wastewater utilities.

6. Upon receipt of an administrative order or a court order from TDEC, where such order is directed to a TRA-regulated utility, TRA will consider initiating formal complaint action against the affected utility. If TRA elects not to initiate a formal complaint action, it will notify TDEC as appropriate. In situations involving chronic noncompliance with, or disregard for, the Water Quality Control Act or the regulations promulgated thereunder, TRA may request revocation of the affected utility's Certificate as a part of any formal complaint actions it initiates.

7. TRA will notify TDEC of the issuance of notices of rulemaking hearings in regard to regulations that apply to TRA-regulated wastewater utilities.

C. Responsibilities of the TDEC

1. TDEC will email the TRA Chief of the Utilities Division with agenda notices for all monthly meetings of the Water Quality Control Board.

2. TDEC will initiate and pursue enforcement actions against TRA-regulated wastewater utilities, as appropriate, to attain compliance with the Water Quality Control Act and the regulations promulgated thereunder, and will notify TRA of the issuance of administrative orders and the filing of actions in court against such utilities.

3. TDEC will notify TRA of the issuance of notices of rulemaking hearings in regard to regulations that apply to TRA-regulated wastewater utilities.

4. TDEC will notify TRA when permit applications are submitted by wastewater utilities under TRA jurisdiction. TDEC will also send TRA a copy of all public notices or actions on such permit applications.

5. TDEC will participate in TRA-sponsored forums pertaining to the wastewater industries, as requested and deemed appropriate.
D. Joint Agency Responsibilities

1. TDEC and TRA will work together to enhance the overall viability of TRA-regulated wastewater utilities. This may include rate structure analysis, managerial analysis, operational technical assistance or other actions that might result in the enhancement of the overall viability of any given utility.

   TDEC and TRA will keep each other informed of actions taken to obtain compliance with both agencies' statutes and regulations by TRA-regulated wastewater utilities.

   TDEC and TRA will meet at least semiannually, and at other times as necessary, to discuss the status of the actions that each is undertaking and if necessary to review and modify this MOU, or to develop, review or modify any other agreements between the agencies. Joint meetings of the staffs from both agencies may also be held as deemed appropriate.

4. TDEC and TRA will each provide training sessions to each other's respective staffs regarding what authority their respective agencies have and how that authority is carried out in the oversight of TRA-regulated wastewater utilities.

5. TDEC and TRA will work towards maximizing interagency cooperation, coordination and communication. Both agencies will identify points of contact for communication between the agencies. As either agency becomes aware of the need for changes to policies, regulations, or statutes to effectuate the goals set forth in this MOU, it will inform the other agency and keep the other agency informed as changes are made.

E. Changes to the MOU

Changes to this MOU will be made only by written approval of both agencies and will become effective no less than thirty (30) days after approval.

F. Termination of the MOU

Either agency may initiate a request to terminate this MOU. The request must be made in writing to the other agency. The other agency must respond in writing to such a request within thirty (30) days of receipt. If no response is made, the agreement will be terminated at the end of the thirty-day period. If a response is made, the agencies will mutually agree upon the termination date and conditions.

G. Duration of the MOU

This MOU will be in effect for a period of three (3) years from the effective date of execution. The MOU will be renewed for subsequent three-year periods upon mutual consent of both agencies.
H. Effective Date of the MOU

This MOU will become effective upon the signatures by the representatives of both agencies as denoted below.

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

By: [Signature]
Betsy Child, Commissioner
Date: 4/5/05

TENNESSEE REGULATORY AUTHORITY

By: [Signature]
Pat Miller, Chairman
Date: 4/5/05
APPENDIX VI:

TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION:

PERMITTING PROCESS FOR STATE OPERATING PERMITS
APPENDIX VII:

DEPARTMENT OF ENVIRONMENT AND CONSERVATION:

MEMORANDUM OF AGREEMENT

Agreement between the Division of Water Pollution Control and the Division of Ground Waster Protection regarding the regulation of each Division’s responsibility as it pertained to “large septic tank effluent pump/gravity sewage disposal systems”.
MEMORANDUM OF AGREEMENT

July 21, 1997

This agreement is entered into by the Division of Ground Water Protection and the Division of Water Pollution Control in an effort to facilitate the review and approval of large septic tank effluent pump/gravity sewage disposal systems. The Division of Water Pollution Control will review and approve those systems, other than conventional or alternative systems regulated by the Division of Ground Water Protection, that are designed to be installed at a depth of seven (7) inches or less. The Division of Ground Water Protection will provide technical assistance upon request, particularly regarding suitability of the soil.

Kent D. Taylor, Director
Division of Ground Water Protection
7-21-97

Paul E. Davis, Director
Division of Water Pollution Control
7-21-97
Kendrick James Curtis was born January 17, 1978 in Montgomery, Alabama. The youngest child of Bert and Ruth Curtis, his childhood was spent on his family’s peanut and cattle farm in southeast Alabama. In the fall of 1996 he enrolled in Troy State University where he studied for two years, after which he transferred to the University of North Alabama. In the spring of 2000, Kendrick graduated summa cum laude with a Bachelor of Science, major in Geography, from the University of North Alabama. Upon graduation Kendrick spent the summer of 2000 as a Pioneer Farm Intern at George Washington’s Historic Mount Vernon. In August he moved to Knoxville, Tennessee where he enrolled in the University of Tennessee. Upon completion of his course work in rural geography, urban geography and geographic information systems, Kendrick was hired as a Community Planner by the Tennessee Department of Economic and Community Development’s Local Planning Assistance Office. In December 2003 he graduated from UT with a Master of Science, majoring in geography. In the fall of 2004 he returned to the University of Tennessee in pursuit of his doctorate. In December of 2004, he married Kathy Presley, previously of Bristol, Tennessee. In July of 2007, having completed his coursework and passed his exams, Kendrick was once again hired by the Local Planning Assistance Office, this time as its GIS manager. Kendrick currently lives in Knoxville with his wife Kathy and daughter Margaret.