Public management of on-site wastewater treatment systems in Iowa

Karen Marie Mancl

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PUBLIC MANAGEMENT OF ON-SITE WASTEWATER TREATMENT SYSTEMS IN IOWA

Iowa State University

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Public management of on-site wastewater treatment systems in Iowa

by

Karen Marie Mancl

A Dissertation Submitted to the Graduate Faculty in Partial Fulfillment of The Requirements for the Degree of DOCTOR OF PHILOSOPHY

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## TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>INTRODUCTION</td>
<td>1a</td>
</tr>
<tr>
<td>LITERATURE REVIEW</td>
<td>2</td>
</tr>
<tr>
<td>Consideration of Wastewater Treatment Alternatives</td>
<td>2</td>
</tr>
<tr>
<td>Advantages and Disadvantages of Management</td>
<td>4</td>
</tr>
<tr>
<td>Authority Needed for Management</td>
<td>9</td>
</tr>
<tr>
<td>Examples of Management</td>
<td>11</td>
</tr>
<tr>
<td>LEGISLATIVE REVIEW</td>
<td>15</td>
</tr>
<tr>
<td>Federal Legislation</td>
<td>15</td>
</tr>
<tr>
<td>State Legislation</td>
<td>17</td>
</tr>
<tr>
<td>County Legislation</td>
<td>19</td>
</tr>
<tr>
<td>DEVELOPMENT OF STATE BILL</td>
<td>22</td>
</tr>
<tr>
<td>DEVELOPMENT OF MODEL ORDINANCE</td>
<td>30</td>
</tr>
<tr>
<td>APPLICATION OF MODEL ORDINANCE</td>
<td>36</td>
</tr>
<tr>
<td>Lake Panorama</td>
<td></td>
</tr>
<tr>
<td>Wastewater treatment</td>
<td>36</td>
</tr>
<tr>
<td>Development at Lake Panorama</td>
<td>37</td>
</tr>
<tr>
<td>Soils</td>
<td>42</td>
</tr>
<tr>
<td>Local government</td>
<td>42</td>
</tr>
<tr>
<td>Formation of Management District</td>
<td>44</td>
</tr>
<tr>
<td>Administrative committee</td>
<td>48</td>
</tr>
<tr>
<td>Rules and regulations</td>
<td>49</td>
</tr>
<tr>
<td>Administrative rules</td>
<td>50</td>
</tr>
<tr>
<td>Construction rules</td>
<td>51</td>
</tr>
<tr>
<td>Operation, maintenance, and repair rules</td>
<td>54</td>
</tr>
<tr>
<td>Contractor comments on rules and regulations</td>
<td>59</td>
</tr>
<tr>
<td>Rule violation policies</td>
<td>62</td>
</tr>
<tr>
<td>Section</td>
<td>Page</td>
</tr>
<tr>
<td>----------------------------------------------</td>
<td>------</td>
</tr>
<tr>
<td>Activities of the Management District</td>
<td>64</td>
</tr>
<tr>
<td>Cluster system</td>
<td>64</td>
</tr>
<tr>
<td>Legal concerns</td>
<td>65</td>
</tr>
<tr>
<td>Failing systems</td>
<td>66</td>
</tr>
<tr>
<td>Future Activities of the Management District</td>
<td>70</td>
</tr>
<tr>
<td>Other Applications of Management</td>
<td>73</td>
</tr>
<tr>
<td>Johnston</td>
<td>74</td>
</tr>
<tr>
<td>Menlo</td>
<td>77</td>
</tr>
<tr>
<td>CONCLUSIONS</td>
<td>79</td>
</tr>
<tr>
<td>RECOMMENDATIONS FOR FUTURE RESEARCH</td>
<td>82</td>
</tr>
<tr>
<td>BIBLIOGRAPHY</td>
<td>83</td>
</tr>
<tr>
<td>Published Documents</td>
<td>83</td>
</tr>
<tr>
<td>Unpublished Documents</td>
<td>88</td>
</tr>
<tr>
<td>ACKNOWLEDGMENTS</td>
<td>91</td>
</tr>
<tr>
<td>APPENDIX A</td>
<td>92</td>
</tr>
<tr>
<td>Legislative Proposal</td>
<td>93</td>
</tr>
<tr>
<td>Working Document</td>
<td>97</td>
</tr>
<tr>
<td>APPENDIX B</td>
<td>109</td>
</tr>
<tr>
<td>Draft of Model Ordinance</td>
<td>110</td>
</tr>
<tr>
<td>Explanation Document</td>
<td>114</td>
</tr>
</tbody>
</table>
## LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Figure 1</td>
<td>Development at Lake Panorama</td>
<td>39</td>
</tr>
<tr>
<td>Figure 2</td>
<td>Histogram of Guthrie County Health Department wastewater treatment system permits issued for Lake Panorama</td>
<td>40</td>
</tr>
<tr>
<td>Figure 3</td>
<td>Location of Lake Panorama in Iowa</td>
<td>41</td>
</tr>
<tr>
<td>Figure 4</td>
<td>Surficial geology map of Guthrie County After: Shive-Hattery &amp; Associates, 1977</td>
<td>43</td>
</tr>
<tr>
<td>Figure 5</td>
<td>Questionnaire: Contractors working in the Lake Panorama On-site Wastewater Management District</td>
<td>60</td>
</tr>
<tr>
<td>Figure 6</td>
<td>Development in Johnston, Iowa</td>
<td>75</td>
</tr>
</tbody>
</table>
INTRODUCTION

Public management of on-site wastewater treatment systems is not a new concept. It has been practiced in other states with the most notable examples being in California. Public management is, however, a new concept for Iowa. Because Iowa's state statutes, constitution, and regulatory authority are distinctly different from other states now utilizing on-site wastewater management, the development of such a program in Iowa can be considered a unique problem. The purpose of this study is to show that public management of on-site wastewater treatment systems is a workable plan for rural Iowa.

In Iowa, unincorporated areas are under the jurisdiction of the county. Therefore in order to develop a public management program for rural areas, it was necessary to carefully examine the state constitution and statutes as they pertain to county powers and wastewater treatment. It was then necessary to prepare the appropriate legal documents which would allow counties to manage on-site systems. Cities in Iowa may also manage on-site systems within their corporate limits, but the statutory authority for cities is different than for county governments. The documents developed as a part of this project apply to unincorporated areas which are under the jurisdiction of the county. After these documents were developed, they and other information on on-site wastewater management had to be distributed to local decision makers. In this way they could examine their current
and future wastewater treatment problems and decide if public management of on-site systems would be feasible. Once a county decided to establish a management district, information on development and assistance with special problems was provided to aid county officials. Finally the actual development of a management district was documented to aid other counties in developing a similar program. No attempt was made in this study to examine the various technical and engineering approaches to on-site wastewater treatment. It was assumed that on-site systems will adequately treat wastewater.

Due to the nature of this work, it is at times, difficult to determine the role of the individual. The author's involvement in the development process was in the areas of document preparation, extension, and liaison. The literature and state statutes were examined for information on public management and county powers. The documents which were prepared by the author as a part of the development process are included in Appendices A and B. It was also necessary to work closely with public agencies such as the Iowa State Legislative Service Bureau and the Iowa State Association of Counties in the preparation of the legal documents in their final form. Information on on-site wastewater management was prepared and presented to groups of sanitarians, contractors, boards of health, and city councils as a part of the information dissemination process. A news release and extension bulletin were also prepared on on-site wastewater management in cooperation with the Iowa State Information Service and Iowa State Agricultural Engineering Extension. As
local governments became interested in public management of on-site systems, technical information was provided and assistance was given in reviewing documents. Specific questions on the regulations were researched and operational problems were discussed. Throughout the development of a management program, however, it was very important that the author not interfere with local decision making. Every attempt was made to provide information to policy makers and to document the management process for future reference. The author was not acting as a consultant who would be retained to set up a management program.
LITERATURE REVIEW

On-site wastewater management is defined as central management of a non-central system (Winneberger and Burgel, 1977). The wastewater treatment systems are on individual lots but the operation of these systems would be the responsibility of a central authority. This differs from a conventional sewer system and sewage treatment plant. Goldstein and Moberg (1973) described conventional collection and central treatment as simple in concept while complex in hardware. They contrasted this to on-site treatment which is more complex in concept but with simple hardware.

Consideration of Wastewater Treatment Alternatives

The collection and central treatment system is usually preferred by decision makers for several reasons as discussed by Otis (1977). Sewer systems are proven and there is greater confidence in their operation. A sewer system can also be more cost effective because of economies of scale. Finally, central treatment readily allows for central management. This takes the responsibility for the proper treatment of wastewater from the homeowner.

Wilson, et al. (1979) noted several reasons why on-site wastewater management alternatives are not considered. They mentioned a lack of objective documentation on the performance and reliability of on-site systems. A second reason was inadequate design codes which do not reflect site conditions or user attitudes. Their third point cited a lack of criteria for cost-effectiveness evaluation of on-site
options. Finally, these evaluations are time consuming and costly.

In a Comptroller General's report (1978), several comments were made on the policies and attitudes of government officials and consulting engineers concerning alternative wastewater treatment and septic systems. This report stated that these negative attitudes are vested in the belief that septic systems are difficult to manage and are temporary and unreliable. Also, the belief that septic systems are only suitable until the population density becomes high enough to justify a sewer system has inhibited the use of septic systems. These negative attitudes, the report points out, are reflected in such policies as grant eligibility requirements. The Comptroller General's report went on to cite examples of the policy decisions that had been made before sewer projects were constructed. One example was for Raynham, Massachusetts. In this case, the primary purpose for constructing sewers was to stimulate economic development, not to improve water quality. In the State of Louisiana, the state board of health adopted a policy discouraging the use of individual sewage facilities unless their use is temporary and will be replaced by a "proper community-type facility."

These types of attitudes and policies were well-described in a 1958 report of the Committee on Public Health Activities of the Sanitary Engineering Division of ASCE. The committee found septic tanks to be a poor temporary treatment option because all systems do not fail at the same time. This makes it difficult to get homeowners with operating systems to support the construction of sewers, because
there is often resistance to bond issues and raising taxes to construct sewers later. Also, later construction includes the expense of digging up streets and lawns. Finally, some homeowners do not want to admit their system is failing for fear it will reduce their property value. The committee, therefore, recommended better planning and zoning to keep new development within close proximity of sewer service. They also recommended regional management of small community plants until they can be included into the central treatment facility.

Goldstein (1973), however, pointed out that constructing sewers in newly developing areas is too expensive. Providing sewer service for sparsely populated areas is costly because of the dominate costs of the sewer lines themselves. The author suggested that the key to effective wastewater treatment was not central facilities, but rather central management of the facilities which will best serve the community.

In an effort to provide the most cost effective wastewater treatment system, Otis (1977) proposed a system between the two extremes of all on-site treatment and all collection with central treatment. The final system would be based on considerations of economies of scale and site conditions. The Comptroller General's report (1978) also proposed a combination of alternatives rather than the conventional sewer system with central treatment for rural areas.

Advantages and Disadvantages of Management

Many authors have discussed the advantages of on-site wastewater management. These advantages range from lower costs to environmental
and developmental benefits. The reduced cost in rural areas seems to be the major advantage presented (US EPA, 1977; Comptroller General of the US, 1978; Krishnan, 1979; Otis, 1977; Humenik, 1979). All of these authors point out that on-site wastewater management would eliminate the expense of a costly collection system. This also eliminates the need to abandon existing facilities, some of which are functioning and others which may only require minor repair.

Pate (1977) indicates that the costs of abandoning on-site treatment include the construction of new interceptor sewers, rehabilitating old sewers, upgrading or constructing secondary facilities, sludge handling facilities, and increased energy costs. Murphy (1974) found, in general, that without unusual water quality concerns, collection and central treatment exceeds the cost of individual subsurface disposal by a factor of two. This factor could range from 1.5 to 3.5.

Examples of the high cost of collection and central treatment in small communities and rural areas have been presented by many authors. The federal government has found that projects costing homeowners hundreds of dollars a year are not unusual (Dearth, 1978). There are several cases where the cost of a treatment facility exceeded the total assessed evaluation of the community. Some examples of these expensive sewer systems include a system designed to serve 150 homes in West Virginia at $8,000 per household (Waldorf, 1977b). Waldorf also cited two other examples. One system built in Garrett County, Maryland cost $8,500 per house. Another collection and treatment system built in Monroe County, Pennsylvania had tap-on fees set at
$500 and service charges of $20 per month. A very extensive system constructed to serve a 50 square mile area in rural western Minnesota cost $18,900,000 (Sullivan, 1977). The 75 miles of sanitary sewers, 48 major lift stations, and tertiary wastewater treatment plant cost $1,900 per house in special assessments, $7 a month service charge, and a 7% tax increase. The cost of a $9 million facility for the 3744 people of Walton, New York is presented by Newman (1977), and a discussion of a facility for Whitestown, Indiana which cost in excess of the assessed value of the entire community is presented by Gamble (1977). The Comptroller General of the US (1980) presented nine case studies of the high costs of sewer construction in small rural communities. Connection costs for these nine communities ranged from $2,308 to $8,989, and annual sewer fees ranged from $30 to $125. The report also cited inadequate project justification as a major problem when considering sewer systems in rural areas. Some of the facility plans referred to failing septic systems and threats to public health, but they did not identify water pollution problems, examine wastewater treatment alternatives or select the most cost-effective and environmentally sound alternative.

A second advantage of on-site systems proposed by several authors was that they can be more ecologically sound than central collection and treatment (US EPA, 1977; Krishnan, 1979; Comptroller General of the US, 1978; Otis, 1977). This is because the waste is disposed of over a wider area, and the environment can more readily assimilate it. Segall (1976) found in a study on the impacts of wastewater treatment
practices on the water resources in national forests that sewers and secondary treatment presented the most serious threat to the environment. Failing on-site systems are a problem but the problem is localized. A failure in a wastewater treatment plant serving a large number of persons presents a hazard of a much greater magnitude.

A third commonly expressed advantage is the effect on community development. Utilizing on-site treatment in rural areas can prevent "strip development" that tends to occur along sewer extensions (US EPA, 1977; Krishman, 1979; Otis, 1977). Twichell and Davis (1978) pointed out that wastewater treatment facilities do not only dispose of wastewater, but they are also a deciding factor as to whether or not houses can be built. Klein (1977) discussed the problem of connecting small communities by an interceptor sewer. This practice opens undeveloped land for development which may not have been considered in a development plan. This can cause problems providing services to these areas. A Des Moines Register editorial (Soth, 1981) discussed some of these development problems. The editorial cited small-scale sewage systems as helpful in rational rural development.

Along with these three major advantages, many authors have proposed other advantages to on-site wastewater management. Klein (1977) and Alford (1977) noted a tendency to overdesign sewer systems in rural areas to provide reserve capacity. These costs could be reduced if the life of on-site systems could be extended. Public management can be used to delay construction of sewers until there are enough
people to pay for them (US EPA, 1977; Otis, 1977). This would eliminate the need for idle investment in sewers for unimproved lots (Murphy, 1974). Proper management could also eliminate some of the overdesign now placed in the rules for on-site systems (Winneberger and Burgel, 1977). Many of the design standards are based on the prospects of long term neglect.

Other advantages presented in the literature discuss the treatment of the wastewater. On-site treatment with subsurface disposal can serve to recharge the groundwater (Comptroller General of the US, 1978). The Comptroller General's report also noted that on-site systems can use less electricity than mechanical treatment. If the domestic waste is treated on-site, Klein (1977) pointed out that the contamination of domestic wastes with industrial wastes can be eliminated. Management of on-site systems would also permit the use of high maintenance systems where site conditions are not suitable for conventional subsurface disposal (Middendorf, 1977; Krishnan, 1979).

One important advantage of management was presented by Goldstein and Moberg (1973). A public management program can provide for local control and utilize local perception. This can be more important in a rural area than a large, engineered, and federally funded treatment facility.

Several authors have presented some disadvantages to on-site wastewater management. Otis and Stewart (1976) pointed out that even though construction costs may be lower for on-site systems, operation and maintenance costs can be higher. This is due to the non-central
nature of these facilities. They also stated that public confidence in small systems can sometimes be low and public management of these systems is a fairly new and untried concept.

Another disadvantage is the land required for on-site treatment (Troyan and Norris, 1977). Twichell and Davis (1978) looked at the effect of on-site wastewater treatment on development and found three consequences to their use. First, the larger parcels of land cost more. Second, these larger lots lead to larger homes. Finally, these larger lots lead to exclusionary development practices. They also found that on-site treatment would not control growth, because it allows development anywhere as long as the site is suitable.

Troyan and Norris (1977) warned of some environmental concerns. Subsurface disposal of wastewater may contribute to nitrate pollution of the groundwater. Some types of on-site systems may also present some negative visual impacts.

Hansel and Machmeier (1980) were not in favor of public management. They felt that the homeowner was best prepared to provide any needed maintenance. The only public involvement should be in the areas of site and construction inspections, record keeping, sanitary ordinances, education, and reminders to the homeowner to maintain their system.

Authority Needed for Management

In order to establish a wastewater management program, a legal entity has to be created which will be responsible for duties historically left to the health department and the homeowner (Goldstein and Moberg, 1973; Anderman, 1976). These responsibilities lie in the areas
of design, installation, operation, maintenance, and problem correction.

The legal entity would need several powers to insure proper design of on-site systems. The right to enter private property to make site evaluations would be needed (Comptroller General of the US, 1978). The legal entity should be able to retain the services of consultants to aid with special problems (Goldstein and Moberg, 1973; Anderman, 1976). The management authority must also have the power to set design standards and review all designs (Comptroller General of the US, 1978).

When systems are being installed, it is necessary for the management authority to develop inspection criteria to inspect system installations, to stop installations, and to demand correction of faulty construction (Comptroller General of the US, 1978). It is also important to keep records of each new system (Goldstein and Moberg, 1973; Anderman, 1976).

The authority to enter onto property to conduct routine inspections of existing on-site systems is needed if the legal entity is responsible for proper operation. If the system needs correction, the legal entity can either require and enforce repair requirements or perform the necessary repairs (Comptroller General of the US, 1978; US EPA, 1977). Waldorf (1977a) pointed out that if the management authority was repairing systems, it would need the ability to stock tools and spare parts and provide a service vehicle.

Stewart (1977) discussed the techniques that a legal entity could use to assure the proper operation of on-site systems. These three
techniques include:

1. Direct controls over the on-site system

2. Controls upon actors

3. General or indirect controls.

Direct controls would include setting standards, plan review and approval, inspections, permits, and monitoring. Controls upon actors, such as contractors and pumpers, could include licensure or registration. Indirect controls over the use of on-site systems would involve such things as zoning and land use policies and other public policies.

Depending upon the statutory or constitutional requirements in a given state, the responsibility for on-site wastewater treatment can be delegated to one or more units of government (Stewart, 1977). When establishing a new management entity, a number of government units could assume this responsibility. Municipalities, counties, and townships could act as the legal entity. Special purpose districts, private non-profit corporations or profit-making businesses could also take on management responsibilities (Otis and Stewart, 1976). Such a legal entity can enter into contracts or debt obligations and can sue and be sued. They can also collect revenue and accept loans and grants (US EPA, 1977).

Examples of Management

On-site wastewater management has been applied in several states. Washington state requires developers to provide management services through a public entity or a management corporation (Flews, 1977). If a management corporation is formed, it must be backed by a branch of
government through a third party trust. In Vermont, the White River Natural Resources Conservation District was formed to assist towns which were having problems with on-site systems (Stryker and Steele, 1976). Most of the effort has been to insure proper installation of systems with periodic system monitoring. Pennsylvania has established a public information program which uses television announcements and pamphlets to inform homeowners about the operation and problems encountered with on-site wastewater treatment (Middendorf, 1977).

Two states which have been very active in the development of public management of on-site systems are Wisconsin and California. The most notable example of wastewater management in Wisconsin is in the town of Westboro (O' Kis, 1978). The population of Westboro was about 200 people with 69 occupied buildings in 1976. Eighty percent of the existing septic tank systems were discharging wastes to the surface of the ground. A conventional collection system for Westboro with an extended aeration package plant or a two-cell lagoon was estimated to cost from $350,000 to $380,000. There also seemed to be little chance of obtaining federal funding to finance this project. The residents were unable to afford the $3,900 assessment and $450 hookup charge. The alternative selected for the community was a small-diameter effluent sewer system with a large subsurface disposal field. The septic tanks on each lot were maintained as the primary settling units. Management of the septic tanks, the cluster system and the individual systems in the town are the responsibility of the Westboro Town Sanitary District. The present worth cost of this alternative was $266,000. Homeowners
were assessed a $100 hookup fee and a $200 fee was assessed if a new septic tank had to be installed. User charges were set at $8.75 a month.

Several counties in California have shown interest in on-site wastewater management. Santa Cruz, Kern, and Ventura counties, have all prepared the necessary legal documents to form a management district (Santa Cruz Board of Supervisors, 1976; Kern County Board of Supervisors, 1973; Ventura County Environmental Health, 1976). A number of management districts have also been established in California which take advantage of the legal authority granted public agencies by state and local legislation. Districts have been formed in Merced and El Dorado Counties to manage the wastewater treatment systems installed in new subdivisions. The district in Merced County is responsible for the wastewater treatment systems in five subdivisions totalling 126 lots (Palsgaard, 1981). In El Dorado County, the wastewater treatment systems in the Auburn Lake Trails subdivision are managed by the Georgetown Divide Public Utility District (El Dorado County Health Department, et al., 1977). The Auburn Lake Trails subdivision covers 2800 acres and is being developed with mostly second homes and has a buildout rate of approximately 3 percent per year. In both counties, the management district was created before development began.

A well-documented example of a management district developed for an existing community is in Stinson Beach, California. As a result of a state health department study which found high coliform counts in the neighboring bay, the community was issued an order to abandon
on-site wastewater treatment (URS Company, 1977). Collection and central treatment was proposed but was rejected by the residents because of the high cost. A house-to-house survey of the 500 homes in the community was performed, and it was found that only 10% of the existing systems were failing. Many of these systems required only minor repairs (Wilson, et al., 1979). Approximately 4% required major repair or replacement. The district is administered by the Stinson Beach County Water District which has prepared a set of rules and regulations and hired the necessary personnel. The fee schedule for Stinson Beach was set at $25 per inspection which is performed regularly every two years (Stinson Beach County Water District, 1977). The cost of design, installation, and repairs are the responsibility of the homeowner.
LEGISLATIVE REVIEW

The interest in on-site wastewater treatment extends across all levels of government from the US Congress and Environmental Protection Agency to county boards of supervisors and boards of health. Policy, design, and standards are presented at both the state and federal level, but the ultimate regulatory authority lies with the county and financing is left to the homeowner. This philosophy began to change with the 1977 amendments to the Clean Water Act. Construction grant funding was set aside for rural areas, and alternatives to conventional sewers with central treatment were encouraged. Changes were also occurring at the state level. An amendment to the Iowa State Constitution in 1978 gave home rule authority to counties. This would allow a county to utilize alternatives to conventional sewers with central treatment without having to request an enabling statute from the legislature.

Federal Legislation

In the 1972 Federal Water Pollution Control Act, the US Congress declared a national goal to be achieved by July 1, 1983. The act specified water quality which will support the propagation of fish and wildlife, and provide for recreation will be achieved (Section 101(a)(2)). In order to attain this "swimmable-fishable" goal, the Congress set effluent limitations based upon secondary treatment (Section 301(b)(1)(B)) and provided funds for the planning and construction of publicly owned treatment works (Title II). The federal government would provide 75 percent of the construction costs for a
treatment works (Section 202(a)) not including the sewage collection system (Section 211). These funds are also made available on a priority basis as determined by the state (Section 204(3)).

These objectives were well-suited for larger municipalities who needed to upgrade their present wastewater treatment facilities. For small rural communities and subdivisions, however, the objectives represented a tremendous financial burden. For communities which do not have a sanitary sewer system, over 60 percent of the total cost of a treatment system is for construction of the collection system (Smith and Eilers, 1970). The construction of sewers along with the operation and maintenance of the plant are not eligible for federal funding.

Sloggett and Badger (1975) looked at the per capita costs of construction of wastewater facilities for 16 small communities in Oklahoma. Their study showed the impact of population size on per capita costs. For communities with less than 100 connections, the costs were nearly double the cost for communities with 300 to 400 customers. The economies of scale are not present in these small communities. A Controller General’s report (1980) looked into the impact of the federal pollution control requirements on small communities and found that a severe burden was being placed on low-income residents.

The 1977 amendments to the Clean Water Act addressed the economic problem for small communities and rural areas. Four percent of a rural state’s construction grant funding is set aside to be used to fund alternatives to conventional treatment works in small communities and rural areas (Section 205(h)). Also, to encourage the use of innovative
and alternative treatment systems the federal contribution was increased 10 percent to provide 85 percent of the total grant eligible costs (Section 202(a)(2)). In addition to the increased grants, Congress provides 100 percent funding for modification or replacement if the facility should fail (Section 202(a)(3)). These alternative systems include septic tanks and subsurface treatment systems, other on-site and cluster systems, and pressure and vacuum sewers (Federal Register, September 27, 1978). Congress dictated in the 1977 amendments that the cost effectiveness of alternatives must be presented in the grant application. Alternative systems may be funded even if they exceed conventional treatment costs by 15 percent (Section 201(j)). Privately owned on-site systems are eligible for federal funding if certain conditions are met. A public body must have the systems physically inspected every three years and monitor for possible aquifer contamination. If these systems are privately owned, however, they are not eligible for the 15 percent cost preference (Rhett, 1979).

State Legislation

In some states, special-purpose districts for on-site wastewater management cannot be formed at the local level without an enabling state statute. California and Illinois are two states which have passed legislation permitting formation of wastewater disposal zones. California Senate Bill 430 (1977) allows certain public agencies to administer an on-site wastewater disposal zone in rural areas of California. This public agency would be responsible for the treatment of sewage within the zone, the adoption and enforcement of rules
and regulations, and the assessment for benefits received. An Illinois bill (House Bill 2928, 1978) also allows for the formation of on-site wastewater disposal zones. This bill is almost identical to California Senate Bill 430 except that it only allows for the formation of these zones within municipalities.

In 1977, research was begun to develop enabling legislation to provide for districts in Iowa. At that time county powers were restricted by the 1868 court decision known as the Dillon Rule (Miller and Hagen, 1979). County governments were considered political subdivisions of the state. Legislative authority was required before a county could act on local problems. One example of an enabling statute in the area of wastewater treatment is Iowa Code Chapter 358 (1977) which pertains to sanitary districts. This chapter enables counties to establish sanitary districts to construct, maintain, and operate a trunk sewer system and sewage treatment plant.

The status of counties changed, however, with the adoption of the County Home Rule Amendment to the Iowa Constitution in November 1978 (Iowa Official Register, 1979). Counties are now granted home rule powers under the amendment subject to the following four limitations:

1. Counties cannot levy taxes without the authorization of the General Assembly.

2. A municipal corporation prevails over a county corporation in its jurisdiction.

3. County powers exercised under home rule cannot be inconsistent with the laws of the General Assembly.
4. Home rule power is limited to local affairs.

In order to clarify what powers the counties gained with home rule, Representatives Danker, Binneboese, Hullinger, and Hansen requested an Attorney General's opinion on county home rule. This opinion (Miller and Hagen, 1979) stated that:

1. Counties have immediate and broad power to determine their local affairs, subject to the limitations of the amendment.

2. The only legislative actions necessary are in the areas of tax levying and those areas where the legislature has retained jurisdiction.

3. Counties can take action in an area that is not specifically addressed in the code, as long as it does not involve a tax.

4. Unless the code expressly states that a county must use a specific procedure the county is not limited to what is prescribed in the code.

5. Counties may immediately utilize the provisions of home rule to the maximum extent subject to the four limitations of the amendment.

With the adoption of the County Home Rule Amendment the legislature began consolidating and reevaluating the sections of the Iowa Code pertaining to counties. The outcome of this was a 256 page act (Iowa Senate File 130, 1981) which recodifies the statutes relating to counties. This recodification addresses such items as county legislation (Section 301), county powers and limitations related to services (Section 381), county finance (Division IV) and penalties for ordinance violations (Section 301.2).
County Legislation

Before the adoption of the County Home Rule Amendment, wastewater treatment in rural areas was the responsibility of either a sanitary district formed under the provisions of Iowa Code Chapter 358 (1977) or the county board of health (Iowa Code Chapter 137, 1977). The local boards of health were to enforce the rules of the state health department and could adopt additional rules and regulations not inconsistent with state law (Section 137.6). The state health department rules and regulations dealing with on-site sewage treatment requires permits for system installations, specifies percolation test, establishes construction and maintenance requirements, and prohibits discharge of sewage to the surface of the ground (Iowa Administrative Code, 1975). Penalty for a violation of one of these rules or regulations was set as a simple misdemeanor (Iowa Code Chapter 137, 1977).

With passage of the County Home Rule Amendment, counties gained greater authority over their own affairs including wastewater treatment. In Chapter 332, of the Iowa Code (1977) it is stated that the board of supervisors may make public improvements for the collection, treatment, and disposal of sewage (Section 52). This shows the legislature's intent to set wastewater treatment as a local affair. In the recodification (Iowa Senate File 130, 1981) this section is expanded to include the spirit of home rule. Section 381 states that counties may follow the procedures specified for sanitary districts, Chapter 358, or may exercise similar powers under its home rule authority. These improvements can be financed as provided by Division IV of Senate File 130.
by general obligation bonds or revenue bonds.

The penalties for violations of ordinances under county home rule were assumed to be limited to simple misdemeanors. However, in an attorney general's opinion on County Home Rule: Criminal Law it was determined that counties cannot levy fines or other penalties for violations of ordinances because this matter is preempted by the state (Fortney, 1981). Therefore in the recodification, the legislature set penalties for violations of county ordinances at no more than a one hundred dollar fine or thirty days imprisonment (Section 301.2).

In order to assist counties in exercising their home rule powers, the Iowa State Association of Counties (ISAC) began preparing model county ordinances. The first model ordinance (ISAC, 1979) set an ordinance adoption procedure for counties. The association of counties encouraged counties to adopt the procedure ordinance before it adopted any other ordinances to prevent new county legislation from being questioned on the manner of its adoption. The ordinance adoption procedure was later included in the recodification (Iowa Senate File 130, 1981) as Section 301, so this procedure is now required for all counties.
DEVELOPMENT OF STATE BILL

When research on on-site wastewater management for Iowa began in the fall of 1978, county powers were limited by the 1868 Iowa court decision known as the Dillon Rule (Miller and Hagen, 1979). Therefore, before counties could establish on-site wastewater management districts, enabling legislation had to be prepared. The concept of on-site wastewater management was first introduced to the Iowa Legislature in September 1978 at an interim meeting of the joint natural resources subcommittee on water laws. A bill was then prepared by the Iowa State Legislative Service Bureau and this bill was filed in the Iowa House during the 1979 session (HF 264). This bill, however, was not acted on during the 1979 legislative session.

One important change in Iowa law occurred during this period, however, which affected the status of counties. In November 1978 an amendment was made to the Iowa State Constitution granting counties home rule (Iowa Official Register, 1979). With this new authority counties no longer needed enabling legislation to form on-site wastewater management districts. Therefore, after the 1979 legislative session the state bill was abandoned and a county ordinance developed. Even though the state bill was abandoned, it did represent considerable effort. More importantly through its development, the attitudes of different public agencies about management were defined and the problems with development of districts in Iowa were researched. The development of this state document was also very helpful in the preparation of a model county ordinance. The account of the development
of the state bill is included here to illustrate these points.

The concept of on-site wastewater management was first presented to the water laws subcommittee of the Iowa Legislature in September 1978. The proposal presented at that meeting is included in Appendix A. In this proposal the concept of management was discussed and the need for a management program presented. The subcommittee felt the proposal had merit and instructed the Iowa State Legislative Service Bureau to begin preparing the necessary code language.

After this meeting of the water laws subcommittee, preparation of suggested legislation began. A draft of this suggested legislation was prepared incorporating the concepts of California Senate Bill 430, entitled Onsite Wastewater Disposal Zones and the Iowa Code Chapter 358, Sanitary Districts. Some unique sections were also included. It was from this "working document" that the bill prepared by the legislative service bureau was derived. The working document (Appendix A) outlined the avenues of formation of a district, public hearing requirements, selection of the administration and specified the powers and duties of the administration.

Section 1 of the working document contains the definitions of the county board of supervisors, public agency, on-site wastewater treatment system and real property. In the definition of on-site wastewater treatment system, both individual and cluster systems are included. This provided more efficient use of resources in establishing a district. Section 3 specifies some of the rationale for forming a district which is to protect the public health and to
achieve water quality objectives.

Sections 2, 3, 4, 6 and 7 present the procedure for calling for formation of a district. The initiation of an action could result from a petition from 10% of the property owners in the proposed district, a petition from a public agency or from the initiative of the board of supervisors. This concept differs from the formation procedure discussed in Chapter 358 of the Iowa Code, and California Senate Bill 430. In Chapter 358, a sanitary district could only be formed after a petition of 25% or more of the eligible elector residents of the proposed district was filed. California Senate Bill 430 states that a zone may only be proposed by the board of directors of a public agency or petition of more than 10% of the voters or property owners in the proposed zone. California does not restrict the formation of a zone as being the responsibility of the board of supervisors.

In Section 4, the elements of a resolution to form a district are listed and are similar to those specified in California Senate Bill 430. They are more comprehensive than the petition requirements of Chapter 358 and include the boundaries of the district, the benefits as required for sanitary districts, the number of users, and the proposed means of financing.

Similar to the requirements for sanitary districts in Iowa, Sections 8-13 present the requirements for public hearings. Section 8 specifies that the hearing notice be printed in a newspaper of record and sent to all property owners within the proposed district. This is to insure that all property owners have an opportunity to
respond. Section 11 directs the board of supervisors to hear and receive reports from the county board of health, from other public agencies, and statements, protests and objections from interested persons.

Sections 13-17 enumerate the required course of action for the board of supervisors at the close of the hearing. The board is to respond to the number of written protests on file. If they represent less than 35 percent of the landowners in the proposed district, the district shall be formed. If they represent greater than 50 percent, the district will not be formed. If they are between 35 and 50 percent, the question of formation is subject to an election with simple majority deciding the outcome. These percentages and procedures are similar to those stated in California Senate Bill 430. This procedure would eliminate the need for a costly election when there is a consensus for or against the formation of a district.

The remainder of the working document describes the formation of the district. Section 18 delegates the administration of the district to the county board of health. If the county board of health does not have jurisdiction or does not choose to administer the district, another public agency may accept the responsibility. If the board of supervisors or other public agency does not choose to administer the district, then a board of trustees would be elected. This differs from both California Senate Bill 430 and Chapter 358. In California, these districts are to be administered by a public agency. In Iowa, sanitary districts are to be administered by a board of trustees. This proposal for management districts would
permit the board of a public agency the opportunity to take on additional responsibility or allow for the election of a new board by the eligible voters.

In Section 23, the administration is then directed to develop a management plan and submit it for approval to the state board of health and to the department of environmental quality. This insures that water quality is being protected and keeps these agencies informed of activities at the local level. In Section 24, the powers of the district are presented and include the power to manage wastewater within the district, design, own, operate, and monitor treatment systems. In order to exercise this authority, the district can adopt and enforce reasonable rules and regulations and employ individuals to operate and maintain the management program.

The remaining sections, 25-28, cover inspections, financing and rule violations. The right of entry for inspections is limited in Section 25 by requiring written permission of the landowner or occupant or upon obtaining an inspection warrant. This would be appropriate for an administrative inspection and is similar to the right of entry provisions in California Senate Bill 430. The sanitary districts did not need this authority because their facilities are on public easements.

Financing of the district was intended to come directly from those benefited. Section 26 states that costs for the ordinary operation of the district were to be derived exclusively from the landowners in the district. Because of the taxing limitations placed on counties
by the Dillon Rule, any taxing authority would have to be specified by the legislature. In Chapter 358, sanitary districts are given limited taxing authority. They can establish rental and utility charges and set special assessments. Therefore, it would be necessary for the legislature to set the extent of the financing authority. In Section 26, two methods of financing were recommended. The first is a service fee schedule which, if unpaid, would constitute a lien upon the property benefited. The second would include the costs as a part of the annual property tax assessment.

In California Senate Bill 430, a violation of a rule or regulation of the district is to be abated as a public nuisance with the costs of abatement assessed to the violator. A similar provision was presented in Section 27 and a procedure by which the district will abate such a nuisance was to be established by regulation.

This working document was presented to the legislative service bureau on October 26, 1978. Representatives from the Iowa Natural Resources Council, Iowa Department of Environmental Quality, Iowa State Health Department, and the Iowa Conservation Commission were also invited to comment on the proposed bill. At this meeting the legislative service bureau decided the best procedure was to prepare a new code chapter that would enable counties to establish on-site wastewater management districts. The document prepared by the Iowa Legislative Service Bureau includes code cross-references and the concerns of the public agencies present at the October 26 meeting (Iowa House, 1979).
In the proposed bill, the legislative service bureau reduced the number of definitions to two. Only on-site wastewater treatment system and district were defined. Provisions of Section 3 of the working document stating the rationale of district formation were also excluded. The provisions for the election of trustees in Section 6 of the proposed bill and special assessments in Section 10(2) were listed by cross-reference.

Some additional provisions were included in the proposed bill. Section 5(6) specifies that the cost of giving notice and conducting elections are to be borne by the initiating party if the district is not formed. The statement that the district need not be contiguous was added to Section 12(1).

At the request of the public agencies present at the October 26 meeting, several other sections were included. The Iowa Department of Environmental Quality wanted sanitary districts to have the authority to exercise the powers of a district within its boundaries (Section 12(4)). The Iowa State Department of Health wanted districts to have the authority to inspect and monitor private wells (Section 8(6)). Both agencies wanted Section 5(4) to be included which compels the board of supervisors to form a district if certain conditions exist. If the state board of health, department of environmental quality and the county board of health all notify the board of supervisors of an actual or potential pollution that endangers the public health or water quality, a district must be formed.

This bill was first filed in the Iowa House of Representatives in February 1979 by Representative Perkins. It was, however, never
acted upon that year. After the legislature had adjourned in July 1979, a meeting was called to discuss the fate of the bill. This meeting was attended by Representative Perkins, Senator Schwengles and representatives from Iowa State University, Iowa Department of Environmental Quality and the Iowa State Health Department. At this meeting, concern was expressed over possible conflicts of interest, if the county board of health administers the district. The definition section was discussed and those present felt it should be expanded. There were also questions about annexation and jurisdiction of municipalities in planning beyond city limits. Senator Schwengels had no problem with the bill and planned to file it in the senate. He wanted the public agencies involved to work out their problems, however, before it was acted on. A major obstacle was resolving these problems with the state agencies.

After the July meeting, the whole approach to the legislature was reevaluated with particular attention paid to county powers. Between the time the project began and the end of the legislative session, an amendment was made to the Iowa State Constitution granting counties home rule (Iowa Official Register, 1979). It now appeared that a change in the Iowa Code was no longer necessary for counties to set up on-site wastewater management districts. Since working at the county level seemed to have more potential for success than resolving the problems with state agencies, the state bill was set aside for a time and the new county authority was examined.
After the lack of success with the Iowa Legislature in adopting the on-site wastewater management district bill, the need for such legislation was reexamined. A major change in Iowa law which had occurred since the legislation was first proposed was the adoption of the County Home Rule Amendment to the state constitution in November, 1978. This amendment now grants counties the power to exercise authority over their own affairs, subject to some restrictions. The county may not exercise powers inconsistent with state law, may not conflict with municipal corporations and may not tax without authorization by the general assembly (Miller and Hagen, 1979). The disposal and treatment of wastewater can be considered a local affair, and in Section 52, of Chapter 332 of the Iowa Code (1977), this responsibility is clearly delegated to the counties. Under Section 52 the general assembly has directed counties to "plan, establish, own, lease, sell, construct, reconstruct, extend, remodel, improve, repair, equip, maintain, operate, issue bonds or otherwise finance works and facilities useful for the collection, treatment and disposal of sewage and industrial waste in a sanitary manner." These improvements are not to be financed by special assessment, but in the same manner as cities as specified in Chapter 384 (Iowa Code, 1977) with general obligation bonds or revenue financing.

With the County Home Rule Amendment and the delegation of authority in Section 332.52 of the Iowa Code, a state bill was no longer needed and wastewater management could be established at the county level. On
August 6, 1979, the concept of on-site wastewater management was presented to Don Cleveland, director of the Iowa State Association of Counties (ISAC). He agreed that wastewater management is needed for some counties in Iowa and asked that the concept be presented to the Energy and Environment steering committee of ISAC on August 15. At that meeting the work done so far on the state bill was explained along with the need for management of on-site systems and the possibility of establishing these districts under county home rule. The committee requested that a draft of a county ordinance be prepared for their review.

On September 12, 1979, the first draft of a county ordinance to establish on-site wastewater management districts (Appendix B) was presented to the Energy and Environment steering committee of ISAC. The draft ordinance included some of the elements of the draft legislation with the section on district formation omitted.

The draft ordinance contained 12 sections and was prepared in a style similar to other model ordinances distributed by ISAC. Some of the more important sections of the model ordinance described the purpose of the district, definitions, establishing and extending district boundaries, establishing the administration, delegation of authority to the administration, and specified financing and enforcement procedures.

Section 3 presents the two major purposes of the management district. The first is to "insure the proper operation of on-site wastewater treatment systems in order to protect the public health, water quality and the environment." The second allows for "the use of more
high maintenance, innovative or alternative on-site systems where 'conventional' on-site systems are not appropriate." This section of the ordinance is particularly important in directing the administration in development of rules, regulations, and policies. It is also important if any aspect of this ordinance were challenged in the courts. It would be helpful to show the intent of the board of supervisors when they established the district.

Two definitions are included in Section 4. On-site wastewater treatment systems were defined as they were in the state bill. This definition includes both individual and cluster systems. A "conventional wastewater treatment system" was defined as a septic tank with a non-pressurized soil absorption field. This was to set these systems apart from more high maintenance, innovative, or alternative systems.

Sections 5 and 6 deal with the district boundaries. In Section 5, the board of supervisors may set aside all or a portion of the county as a management district. Any future extension of the district is addressed in Section 6 which simply required an amendment of Section 5 to extend the district boundaries.

The administration of the district is established in Section 7. In this draft, the county board of health was delegated the responsibility of administration. The board of supervisors could, however, specify themselves, another public agency, or a board of trustees as the administrative body.

As in the state bill, the administration is directed in Section 8 to establish a management program for the district and adopt reasonable rules and regulations. In Section 9, the administration is delegated a
similar set of powers and duties as was specified in the state bill. They are given the power to handle wastewater, the responsibility for all on-site systems in the district, and the authority to retain those employees necessary to manage the program.

The last three sections deal with inspections, costs and enforcement and are written substantially the same as the corresponding sections in the proposed state bill.

This draft ordinance was presented to ISAC in September 1979 and distributed to other interested parties for comment. The most helpful comments came from the Story County Attorney, Polk County Attorney, and an Assistant Iowa Attorney General. The Story County Attorney (Mary Richards, personal communication) suggested several editorial changes. She also recommended that a list of possible administrative alternatives be presented in the model ordinance. A thirteenth section was added to include a severability clause (James Sarcone, Polk County Attorney, personal communication). This declared that if any portion of the ordinance was found to be invalid the rest of the ordinance would still stand. He also felt it was more appropriate to declare a violation of a rule a simple misdemeanor rather than a public nuisance. The Iowa State Attorney General's Office was helpful in expanding Section 10 on inspection (Cliff Peterson, Assistant Attorney General, personal communication). The section requires permission of the owner or occupant of any premises in the district or a warrant before conducting an inspec-
The wording suggested was more in line with other administrative inspection procedures specified in the Iowa Code.

After incorporating all the editorial and section changes, the model ordinance was presented to the Home Rule steering committee of ISAC. It was officially adopted as an ISAC model ordinance on February 13, 1980. At that meeting the committee added a sentence to Section 6 on district extensions. It stated that an extension need not be contiguous to the existing district. Also added, was a part D under Section 9 on Powers and Duties. The addition gave the district administration the power to make assessments for improvements and incur indebtedness.

This model ordinance was distributed by the association of counties to all 99 Iowa counties. Prepared to accompany this ISAC model ordinance no. 3 was an explanation document (Appendix B). This explanation document was meant to help supervisors decide if on-site wastewater management would be useful in their county. It briefly explained how on-site wastewater treatment systems work and what kinds of problems can occur in their operation. A diagram of an on-site wastewater treatment system was included. It presented some of the problems counties have with wastewater treatment in rural areas and listed what their options were. The concept, advantages, and disadvantages of wastewater management were discussed. A discussion of how the model ordinance would allow a county to establish a management district and a set of examples of how rural wastewater has been handled in other areas of the country were also included. The first two examples were of management districts
in California (Stinson Beach and Auburn Lake Trails subdivision) and the third was an example of a rural sewer extension along Finger Road in Green Bay, Wisconsin.

In addition to the materials distributed by ISAC, information on public management was prepared and distributed by the Iowa State University Information Service and Iowa State Agricultural Engineering Extension. A news release was prepared by the Iowa State University Information Service (1980) which presented the problems with rural wastewater treatment, the new authority granted counties under county home rule, the potential of public management, and the office to contact for more information. Iowa State Agricultural Engineering Extension released a bulletin on wastewater management districts in Iowa (Glanville and Mancl, 1981). It presented public management of on-site systems as a "new approach to a costly, difficult problem in rural communities."
APPLICATION OF MODEL ORDINANCE

To date, only one county in Iowa has adopted an ordinance to form an on-site wastewater management district. This district was formed in Guthrie County for the subdivision surrounding Lake Panorama. Two other municipalities are currently considering on-site wastewater management. They are the City of Johnston, which is a suburb of Des Moines, and a small rural community in Guthrie County.

Lake Panorama

Lake Panorama is a subdivision in Guthrie County, Iowa, just north of the City of Panora on the Middle Raccoon River. Development of the area began in the middle 1960s by the Mid-Iowa Lakes Corporation. The corporation built a dam on the Middle Raccoon River to create a lake and sold lots surrounding the lake. The roads, water system, and recreational facilities were all built by Mid-Iowa Lakes. Despite good lot sales the corporation was unable to remain solvent and declared bankruptcy in 1976 (Jim Smith, manager Lake Panorama Association, personal communication). The Central Iowa Power Cooperative (CIPCO) purchased the corporation's assets out of bankruptcy in 1978. CIPCO plans to utilize the water in the lake for makeup cooling water for an electrical generating plant to be built in Panora.

Wastewater treatment

Wastewater in the subdivision at Lake Panorama was to be treated on site using an aerated tank and subsurface disposal (Guthrie County Board of Health, 1976). The exact rationale for requiring aerated
tanks is unclear. In a letter from the Iowa State Health Department, it was stated that the Guthrie County sanitarian and the Jet Aeration Company had requested advice on the use of aeration systems (Choquette, 1980). The state health department acknowledged some advantages to the aerated unit, but there was no suggestion that these units could be used without subsurface disposal. Consequently, the county required aerobic units for all construction at Lake Panorama.

**Development at Lake Panorama**

The subdivision at Lake Panorama has 3665 platted lots. There are approximately 320 homes in the development scattered around the lake (Figure 1). Fifty-six percent of the homes are part-time residences while the remaining forty-four percent are occupied full time. A histogram of the health department wastewater treatment system permits over the life of the development is shown in Figure 2. This indicates the pattern of house construction at Lake Panorama. Over 60 percent of the existing homes were built in the early 1970s with the rate dropping significantly in the mid 1970s and into the 1980s. The average lot size at Lake Panorama is 20,300 square feet with 16,000 square feet being the most common lot size. Three hundred lots are smaller than 16,000 square feet. Twenty-three percent of the lots have lake frontage.

The area is located close to large cities which encourages development (Figure 3). Des Moines with its nearly 200,000 people is 40 miles away and Omaha with 570,000 is 90 miles away (Bureau of Census, 1981). In the feasibility study prepared in 1966 (Tweet), it was noted
Figure 1. Development at Lake Panorama
HOMES AT LAKE PANORAMA 7/21/81
Figure 2. Histogram of Guthrie County Health Department wastewater treatment system permits issued for Lake Panorama.
Figure 3. Location of Lake Panorama in Iowa
that no other private lakes of comparable size were within a 100 mile radius of Lake Panorama. The area is also accessible by good highways which makes commuting easier.

Soils

The soils that are the secondary treatment system at Lake Panorama are variable and require careful evaluation before designing a subsurface disposal system. Because the subdivision is located on either side of the Middle Raccoon River, there are areas of alluvial soils. The area was also glaciated with the river separating the Kansan drift from the more recent Wisconsin drift (Figure 4). The topography of the area has also been affected by these pre-historical geological events, with the southwest side of the lake composed of eroded loess topped hills and the northeast side made up of glacial moraine material.

Local government

Because Lake Panorama is in an unincorporated area, it is under the jurisdiction of the Guthrie County Board of Supervisors. The board of supervisors is a five member board representing districts of the county. All supervisors are elected at-large. The board of supervisors has appointed a five member board of health. This board is, therefore, responsible for protecting the public health in rural areas of Guthrie County. The county sanitarian who is responsible for issuing permits for the construction of on-site wastewater treatment systems reports to the board of health.

The Lake Panorama Association (LPA) is the homeowners association
Figure 4. Surficial geology map of Guthrie County

After: Shive-Hattery & Associates, 1977
at Lake Panorama. The association board is made up of seven members elected by the homeowners. A staff of individuals responsible for the roads, recreation areas, and water system work under the direction of the board. Revenue for the LPA is generated through water and membership fees.

Formation of Management District

The Lake Panorama On-site Wastewater Management District (LPOSWMD) was formed in October 1980 with the adoption of a county ordinance (Guthrie County Board of Supervisors, 1980). The steps which led to its formation, however, took nearly a year. The county sanitarian first learned of the concept of management at a meeting of sanitarians at the state health department in December 1979. At this meeting applications of on-site wastewater management were discussed, and copies of the model ordinance were distributed to the sanitarians. The Guthrie County sanitarian expressed interest in management at the meeting and followed up with a phone call on January 2, 1980 (Stephen Patterson, personal communication). He felt that on-site wastewater management would benefit Lake Panorama and requested assistance in establishing such a program.

On January 31, 1980 the sanitarian, two individuals from the LPA and a Guthrie County supervisor came to Iowa State University to discuss with the researchers the potential of wastewater management. At this meeting the special needs and problems at Lake Panorama were presented. Also discussed was the procedure of establishing a district, and its necessary authority was outlined. The sanitarian pointed out that
some lots at Lake Panorama are unsuitable for conventional on-site treatment systems because of poor soil or topography. Some of the existing systems are in need of repair, and homeowners must be educated of maintenance requirements. There was also the potential for utilizing cluster systems for multi-family units or groupings of lots with unsuitable soils. If a district was formed, it was felt it would need to set standards, inspect installations and monitor the operation of systems. The district could also keep accurate records of the systems operation.

Before a district could be formed the board of supervisors would need to pass an ordinance to permit adoption of subsequent ordinances (Iowa State Association of Counties, 1979). The on-site management district could then be formed with the desired features. The group to administer the district would have to be selected, the boundaries of the district set, and the responsibilities and authorities of the district agreed upon. What was most attractive to the group from Guthrie County was that Lake Panorama could be set apart from the rest of the county and treated as a special case. The other farm and rural residents need not operate under the same provisions.

The sanitarian prepared a preliminary report on the status of on-site wastewater treatment at Lake Panorama. This enabled the LPA, county board of health, and board of supervisors to make a decision as to the need for public management. This report (Patterson, 1980) presented the problems with on-site wastewater treatment at Lake Panorama and gave examples of specific lots experiencing these prob-
lems. Small and odd shaped lots are one problem. In these cases, careful home placement is needed to allow enough room for the wastewater treatment system. A number of lots have limiting topographic features which also make placement of the wastewater treatment system a problem. Ravines and steep slopes can cause accelerated bleed-outs and erosion if the system is not properly sited and designed. Also noted was one lot which was experiencing slumping problems due to unstable ground. Because this area had been glaciated, there is great variation in soil types. Alternative systems are available for lots with percolation rates of greater than 60 minutes/inch, but these systems require close attention and maintenance. Other lots are unsuitable because of high water tables. This can be corrected but may require the cooperation of surrounding landowners.

Another set of problems was related to the use of lots and homeowner attitudes. The development of townhouses at the lake, for example, would require the use of a cluster system. These large systems would need to be monitored carefully to avoid public health problems. A number of lots were noted which had made improvements, such as landscaping and driveway construction, which damaged or covered the lateral field. These costly errors could be avoided by detailed mapping of the site and prior approval for improvements from a management authority. The final set of problems was attributed to user attitudes. The report cited, "Part-time residences, frequent owner changes, and urban attitudes cause problems." All of the on-site systems at Lake Panorama have aerators and many have pumps. In most cases, the homeowner is not
prepared to provide the needed maintenance.

The preliminary report was presented to the LPA board of directors on April 24, 1980 (meeting minutes). The board considered the proposal and preliminary report, but no action was taken at that meeting. The sanitarian then arranged a field-trip to view a failing system. The LPA board members and researchers from Iowa State University were invited to investigate a system with surfacing effluent. Only one board member was present, but the effect was quite dramatic. Seeing the surfacing effluent and listening to the comments of the disgusted homeowner had more impact than any report. This board member prepared a letter urging the LPA to support the establishment of a management district (LPA Board of Directors meeting minutes, May 22, 1980). At the May 22 meeting, the LPA board appointed a committee to prepare a proposed ordinance and gave its approval to the ordinance on July 24, 1980 (meeting minutes). In the minutes of the July 24 meeting, two points were noted:

1. We need some modern technique to watchdog us to keep from lake pollution and
2. we need some use of tax money generated from the Lake Panorama area. Setting up an operational budget for a district within the Health Department budget might be one way [sic].

At the August 20, 1980 Guthrie County Board of Health meeting, the board also gave its support to the management district (meeting minutes). The sanitarian pointed out to the board that it will entail more responsibilities and some expense. The board felt the plan would benefit the lake and recommended that the board of supervisors adopt the ordinance.
On October 14, 1980 the Lake Panorama On-site Management District Ordinance passed its final reading by the board of supervisors (Guthrie County Board of Health meeting minutes, October 15, 1980). Upon subsequent publication in the newspaper of record, it became law.

The ordinance adopted by the Guthrie County Board of Supervisors (1980) was almost identical to the ISAC model ordinance no. 3 (ISAC, 1980). It established the boundaries of the district within the Lake Panorama Development. The district is to be administered by a five member administrative committee. The committee is appointed by the board of health, with three of the members recommended by the LPA. The administrative committee is to operate the district within the board of health guidelines, and the sanitarian is to act as the secretary for the committee. The only major change made in the ordinance was the deletion of one line from Section 11. The statement, "The cost of serving particular properties shall be paid by the owners of those properties benefitted," was not included.

Administrative committee

As was specified in the management district ordinance, the administrative committee is made up of five members with the county sanitarian acting as the secretary. All of the members were appointed by the county board of health, however, three members were selected from a list provided by the LPA. The committee members include a county board of health member, an engineer with Northern Natural Gas, and a medical doctor. The committee immediately began preparing a set of rules and regulations for the district and a budget to be submitted to the county board of health.
The budget request for the first year was small and included the following items (Administrative Committee meeting minutes, December 29, 1980)

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<td>150</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$3850</strong></td>
</tr>
</tbody>
</table>

At the request of the committee, a water quality monitoring program was outlined for Lake Panorama. This program was divided into three parts: testing for fecal contamination, sampling direct wastewater outfalls, and dye tracing of problem systems. It was hoped that some of the expenses of this water quality testing program could be covered by the City of Panora, the LPA, CIPCO, and Iowa State University.

The management district budget was to be incorporated into the county health department budget. In order to offset some of this appropriation, percolation test and permit fees for the management district were to be raised from $25 to $50, respectively. It was noted in the minutes of the May 19, 1981 meeting of the administrative committee that because of funding cuts, Iowa State University would not be able to participate in a water quality study at this time.

Rules and regulations

Development of a set of rules and regulations for the management district began immediately after the district was formed. At a meeting held on October 30, 1980 (Administrative Committee meeting minutes),
the decision was reached to develop rules and regulations, and divide them into several chapters. These were enumerated as administrative, construction, and repair and maintenance rules.

The construction rules were considered a high priority, and it was hoped they could be in place for the 1981 building season. The administrative rules were also needed to clarify how the committee intended to operate. Because of budget restrictions for hiring inspection personnel, the repair and maintenance rules were developed last. Chapter I (Administrative Rules) and Chapter II (Construction Rules) were in effect in July 1981. Chapter III (Operation, Maintenance, and Repair Rules) were in effect in September 1981 (LPOSWMN, 1981c). All rules were subject to review of the county board of health and were approved by resolution by the county board of supervisors. They went into effect upon publication in the newspaper of record.

Researchers at Iowa State University provided assistance in developing the rules outlined above. They provided information on specific items such as aeration, disinfection, restricting construction because of soil moisture, and setting up a lake water quality monitoring program. When each chapter of rules and regulations was being developed, a group from the administrative committee would meet with individuals from Iowa State University for some initial input. Once the rules were developed they were sent to Iowa State for comment. They were also taken to the state attorney general's office for informal comment and to keep that office informed on the application of public management.
Administrative rules  The administrative rules for the Lake Panorama On-site Wastewater Management District (1981c) contain the membership requirements, meeting and voting stipulations, and budgeting procedures. The terms of office for committee members were set at three years (Section 1.1(1)). The committee is to select a chairperson and vice-chairperson at the first meeting of each calendar year and the secretary for the district is to be the county sanitarian (Section 1.1(3)). Appointments to the committee are limited to Guthrie County residents or property owners within the management district.

The administrative committee is to meet at least once per calendar quarter (Section 1.1(4)). A quorum for these meetings was set at three members and all motions of the committee shall pass on a simple majority of those members present (Section 1.1(7) and (8)). If a member does not attend two consecutive regular meetings or displays improper conduct, the administrative committee may recommend to the board of health that the member be removed (Section 1.1(9)).

The administrative committee acting under the board of health must submit its budget and all rules and regulations to them for approval (Section 1.1(5) and (6)). All these are ultimately subject to approval by the board of supervisors. The administrative committee may also prepare policies for the day-to-day operation of the district. These policies may, however, be revoked by the board of health (Section 1.1(11)).

Construction rules  The construction rules apply to all systems constructed within the Lake Panorama On-site Wastewater Management
District. They contain specifications for the septic tank, the subsurface secondary treatment system, the distribution system, and the percolation test. They also address some unique problems such as site protection, lot improvements, construction restrictions when the soil is wet, and inspection ports on the tank and lines.

No wastewater system can be installed or altered within the district until a permit is issued (Section 2.1(2)). Prior to issuing a permit, a site evaluation and percolation test is required (Section 2.4 and 2.4(4)). In the site evaluation, such things as landscape position, slope, flooding potential, evidence of unstable ground, and available area are assessed. Soil samples are also taken for a depth of at least three feet to determine soil texture, thickness, color, depth to high groundwater table, and depth to bedrock. A diagram of the lot is also to be prepared indicating all permanent structures and proposed improvements (Section 2.4(5)). The administrative committee may then design the wastewater system or approve a design submitted by a contractor (Section 2.4(5)).

Once the site for the lateral field is determined, it is to be protected. The area is to be fenced or barricaded to prevent compaction of the soil (Section 2.11(1)c). It was also the intent of the administrative committee to restrict construction when the soil is too wet. This was to limit compaction of the soil and reduce smearing of the trench side-walls. An experiment is currently underway at Lake Panorama to set acceptable levels of soil moisture for construction. Steve Patterson, the county sanitarian in cooperation with Dr. Gerald
Miller, Iowa State Agronomy Extension are collecting soil moisture data and relating it to soil type and smearing. Until this information can be incorporated into the rules, a statement was included on weather conditions. Construction of lateral fields is not allowed when soil conditions are adverse due to wetness (Section 2.12(1)f).

When all systems are installed, they are to include inspection ports on the tank and on the lateral lines (Section 2.10(1)e and 2.12(2)r). This provides easier access for periodic inspections and also aids in system location. Before the constructed system is covered it must undergo a final inspection (Section 2.8d-f). This insures that all the construction rules have been followed and permits preparation of a diagram of the final system. After the system is buried, there is no construction permitted on any portion of the lateral field or septic tank (Section 2.10(4)g and 2.12(1)e). This provides access for inspection and maintenance and protects the lateral field from damage and compaction.

Several requirements related to percolation rate are included in the chapter on construction rules. If the percolation rate is 20-60 minutes per inch, a split field is required (Section 2.12(2)s). On lots with percolation rates of 20-60 minutes per inch, the lateral lines may also be reduced by 18 percent if 24 inches of rock is used in the trenches (Section 2.12(2)d.l). Dosing is recommended for all systems, and it is required on systems with more than 500 feet of lateral line (Section 2.14(1)a).
The administrative committee upon reviewing the requirements for aerated tanks at Lake Panorama felt that their expense was unnecessary (meeting minutes, Dec. 4, 1980). Therefore, on the premise that septic tanks would be used in the future, requirements for septic tanks were included (Section 2.10). For those who wished to purchase and maintain an aerobic unit, requirements for these units were also included as a part of the construction rules.

The only alternative system included in the construction rules is the mound system. All other alternative systems would have to be approved on a case-by-case basis. The specific construction requirements for the mound system are made by reference (Section 2.13). This was done to minimize the length of the rules. Contractors are to follow the procedures specified by James Converse et al. (1975).

Operation, maintenance, and repair rules In May 1981, the administrative committee began developing the third chapter of rules (LPOSWM, 1981c). These rules cover system inspections, conversions from aerobic to anaerobic tanks, equipment maintenance, surface discharges, and system rehabilitation. In preparing these rules, the committee included concepts presented in a draft of the Ten State Standards for Correcting System Failures (Stephen Patterson, Guthrie County Sanitarian, personal communication). They also utilized some of the most recent design recommendations presented by the US EPA (1980).

This chapter of rules is prefaced with two policy statements (Section 3.0(1)): 
1. The purpose of this chapter of rules is to extend and maintain the useful life of all existing on-site wastewater treatment systems within the district without causing undue cost or hardship to the owner.

2. The district shall make every attempt to utilize subsurface disposal of wastewater. Surface disposal is considered temporary and as a last resort.

The above shows the intent of the committee in preparing these rules if an occasion arises where they are questioned in court. The final draft also included a statement of rationale on individual requirements. This was recommended to help illustrate the need for the regulation and to protect the management district from accusations that their rules are arbitrary. For example, Section 3.8(1)c under general requirements for observation wells states that data may be collected as long as deemed necessary by the administrative committee before accepting a permit application for installation of a system. Since the previous statement sets no definite time limits, the committee needs to be protected from accusations that they are interfering with development. In the final draft the sentence, "Length of testing will be affected by weather conditions, type of results collected, and type of problem studied" was added.

Because of the large number of part-time residences, it was necessary to define part-time and permanent residences in order to set reasonable inspection schedules. Part-time residences are defined as having occupancy less than six months per year (Section 3.0(2)). The permanent residences will have their treatment systems inspected once a year and part-time residence's systems every two years (Section 3.1). The septic tank's condition will be checked on alternate inspections. The manage-
ment district will maintain a permanent file on each system. The items for inspection include sludge and scum levels in the septic tank, condition of the baffles in the septic tank, condition of mechanical equipment such as pumps and aerators, and wetness or erosion in lateral field area.

The operation and maintenance requirements for systems at Lake Panorama (Section 3.2) include pumping the septic tank when scum and sludge levels are too close to the outlet baffle, protection of the system from damage by heavy equipment, replacement of deteriorated components, and maintenance of mechanical equipment. After a septic tank is pumped, the rules require repair or construction of access ports. Five of the operation and maintenance rules (Section 3.2(7)-(11)) refer to specific requirements of management district residents. Residents are encouraged to protect their system from damage, check mechanical equipment periodically, report problems to the administrative committee, remove aerators when the residence is vacant for more than three months, and practice water conservation. These provisions are not enforceable, but they were included to help reinforce the idea that the homeowners are responsible for their own system.

The rules included a separate section (3.6) on septic tank pumping. The rules state that a property owner may not hire a pumper who does not meet specified requirements. These requirements include a current license with the Guthrie County Board of Health, providing 24 hour notice of pumping, uninterrupted cleaning of the tank, proof
of sufficient liability, and proper disposal of septage.

A special set of maintenance rules were specified for split field systems (Section 3.5). The administrative committee has the responsibility for turning the alternating valve. This is to be done each April and October for permanent residences and in April for part-time residences. If this schedule is not satisfactory for an individual system, the alternating schedule can be modified by the committee.

If a system is found to be failing, the rules specify an inspection procedure for a problem system (Section 3.3). The committee is to prepare a report collecting information on type of failure, water usage, historical data, condition of system components, and other observations. Soil tests, percolation tests, and observation wells may also be required. Within 30 days of this inspection, the committee must make its recommendations. Consultants may be called upon by either the management district or the property owner when appropriate. If observation wells are necessary, their requirements are included in Section 2.8. These wells are used to determine the seasonal water table. The number of wells and length of testing will be determined by the administrative committee based on the type of problem, topography, and weather conditions.

With the removal of the aerobic requirement for new systems, homeowners have the option of converting an existing system. Therefore, a special section on system conversions was included in the operation, repair, and maintenance rules (Section 3.4). The home-
owner must make a written application to the committee, and the system will then be reviewed. In converting the system, it must be brought up to standard with inspection ports and dosing chambers upgraded. However, to avoid undue expense the required volume of the dosing chamber is somewhat reduced. Any failing system would have to be corrected before it could be converted.

If a system is in need of repair, the rules present a list of seventeen repair alternatives (Section 3.9). This list is not all inclusive but is meant to point out acceptable alternatives. The list includes:

a. converting gravity systems to dosed systems,
b. converting a single field to a split field,
c. relevelling the distribution box,
d. increasing the dosing chamber size,
e. implementing water conservation practices and installing water conservation devices,
f. installing a second lateral field and developing a split field system,
g. installation of curtain drains, terraces, and other water diversion structures,
h. redirecting runoff and foundation drain water,
i. increasing the lateral field size,
j. installation of a mound system,
k. segregation of blackwater and greywater systems,
l. installation of composting or incinerating toilets,
m. developing a pressurized subsurface absorption system,
n. oxidizing of the clogging mat of the subsurface absorption system,
o. removal of structures affecting the subsurface absorption system,
p. holding tank system,
q. as a last resort, development of a surface discharge as outlined in section 3.7.

All repair work is to be completed within a designated time limit stated on the repair permit issued by the administrative committee.

As was stated in the list of repair alternatives and the initial
purpose statement, surface discharges are considered as a last resort. Section 3.7 presents the disinfection requirements for these discharges. These effluents are to be disinfected using chlorination, iodination, or other approved methods. Iodination is preferred. Discharges from disinfection units are to meet the state health department standards (Iowa Administrative Code, 1975) of 200 fecal coliforms/100 mls and 10 mg/l \( \text{BOD}_5 \). Plans for the disinfection unit are to be approved by the committee to assure it has provided for adequate detention time and insulation. These disinfection units are to be inspected quarterly and an effluent sample collected annually. Whenever an alternative system becomes available at a reasonable cost, surface discharge is to be abandoned within six months notice to the property owner.

**Contractors comments on rules and regulations** In December 1981, three of the four contractors installing wastewater treatment systems at Lake Panorama were contacted by phone and asked to comment on the Lake Panorama On-site Wastewater Management District. A list of questions was mailed to the contractor in advance so, if necessary, the rules and regulations could be reviewed (Figure 5). Two of the contractors responded to the questions and the third indicated he had made all his comments at the March 4, 1981 administrative committee meeting and referred to the meeting minutes.

The comments of Harold McCurdy, which were recorded in the administrative committee meeting minutes (Administrative Committee, March 4, 1981), were prefaced by a statement that he was in favor of
Name:
Address:
Phone:

Do you install septic systems at Lake Panorama?

Have you heard of the Lake Panorama On-site Wastewater Management District?

Are you familiar with the district's rules and regulations?

After reviewing the rules and regulations of the Lake Panorama On-site Wastewater Management District, could you please comment on these specific points.

- Construction inspections (Sec 2.8 d-f)
- Protection of site from compaction (Sec 2.12(1)c)
- Restrictions on working the soil when too wet (Sec 2.12(1)f)
- Management district approval of lot improvements (Sec 2.5, 2.10(4)g, 2.12(1)e)
- Removal of the aerobic tank requirement and tank conversions (Sec 3.4)
- Other comments on the rules and on construction specifications

I would also appreciate any comments you may have on the effectiveness of the management district.

Figure 5. Questionnaire: Contractors working in the Lake Panorama On-site Wastewater Management District
rules which protect the public health. Mr. McCurdy is the mayor of neighboring Panora and the "Jet-Aeration" vendor. Most of his comments dealt with the design and construction requirements for systems at Lake Panorama. He felt that brine from water softeners should be classified as a prohibited waste and be excluded from septic tanks (Section 2.10(1)c). Mr. McCurdy was not sure the alarm system specified in Section 2.11(3) would work properly. The requirements in Section 2.12(3)b allowing manifolds only on dosed systems, and Section 2.24(1)b on dosing chamber size, he felt, were all too restrictive or excessive. He viewed the lateral slope limits (Section 2.12(2)i) as too great and suggested a more restrictive range be set. Mr. McCurdy also expressed concern over the removal of the aerated tank requirement. He felt that these aerated tanks provided better treatment than septic tanks.

Charles Haden is the electro-osmosis vendor in Guthrie County. He stated (personal communication) that the management district was very worthwhile and he will support it. He added that it was a much needed step in the right direction. Mr. Haden had no problem with any of the sections of the rules and regulations referred to in the questionnaire. He did recommend some changes in the design of septic tanks. He also expressed concern over the lack of interest in alternative systems. The electro-osmosis and other alternatives were not being utilized to their full potential.

John Gilson, who is also installing systems at Lake Panorama, thought (personal communication) the management district was a
good idea, but costly. He also had many good things to say about the local sanitarian. He mentioned that the sanitarian was willing to work with the contractors and likes to have him come anytime he is installing a system. Mr. Gilson felt that some of the new regulations were silly or too costly. The site protection provision (Section 2.12(1)c) before construction he said, did not make much sense, and the restrictions on working the soil when too wet (Section 2.12(1)f) were not realistic. He also did not agree with the use of dosing and felt alternating fields would be better. The approval of lot improvements and the removal of the aeration requirement, he felt, were good ideas, and he also liked the use of inspection ports on lateral lines.

**Rule violation policies**    In order to handle rule violations in a consistent manner, the administrative committee developed a policy statement on rule violations (LPOSWMD, 1981a). A rule violation may be reported by the sanitarian, a committee member, or the public. The sanitarian shall observe each reported violation and prepare a report which will become a part of the file on that lot. Each violation will then be classified as requiring immediate or longer term correction.

Violations requiring immediate correction include construction without a permit, serious nuisance conditions, changes in construction plans after issuance of permit, non-conformance to construction and installation specifications, and failure to repair pumps or dosing equipment. If one of these violations is observed, the sanitarian
is to contact the owner and explain the reasons why correction is necessary. If the situation is not resolved immediately the sanitarian will specify a time limit and explain what needs to be done to correct the problem.

A violation is classified as allowing longer term correction if it is a less serious nuisance condition, a failure to file required easements, or a failure to repair an aerator. The sanitarian will contact the owner and explain the need for the correction. If the correction is not made immediately, the sanitarian will set a time limit and explain what needs to be done to correct the problem. If the correction is not made, the sanitarian will have the violation observed by a committee member and the situation scheduled for discussion at a committee meeting. The party affected shall be invited to attend the meeting. If a cooperative agreement cannot be reached, the committee shall set a time limit for the corrective measures.

If the time limits in both classifications of violations are not met, the committee will take legal action in Magistrate's Court. These cases will be taken to court as a general practice unless the district personnel is in error or the committee votes to drop the charge for overriding circumstances. The committee also reserves the right to correct the problem and assess the owner as was provided for in the county ordinance.
Activities of the Management District

In addition to preparing rules and regulations for the management district, the administrative committee was involved in a number of other activities in its first year. These include construction inspections, approving a cluster system for a townhouse development, and providing recommendations for correcting three failing systems. The administrative committee was also concerned about some legal questions, such as gaining permission for lot access for inspections and requiring percolation tests under the new rules for previously tested lots. The only major rule enforcement problem encountered in the first year was with the site protection requirement in the construction rules. Several contractors have failed to fence off the area of the soil absorption field, and there have been cases of vehicles driving over the area and using the area to pile dirt from the basement excavation (Stephen Patterson, Guthrie County Sanitarian, personal communication).

Cluster system

During the Spring of 1981, work began on a system to serve a townhouse development being built on the northeast side of the lake. The original wastewater treatment system proposed for the development was a series of lagoons to be constructed on the neighboring golf course. This was unacceptable because of the high cost. A subsurface disposal system was designed for a flat, grassy area located behind the development with sufficient set back from the lake. The system included 3000 feet of laterals with provisions
for both dosing and alternating, and was approved by the Iowa Department of Environmental Quality. The monitoring of the construction and future operation of this system is the responsibility of the management district. The management district is also responsible for construction inspections of all new systems. This is to assure the system is properly installed with inspection ports, and a diagram can be made of the system as installed.

**Legal concerns**

The administrative committee was concerned about gaining access to systems to conduct regular inspections. Section 10 of the management district ordinance specifies that these inspections may only be made with the consent of the owner or occupant or with a warrant (Guthrie County Board of Supervisors, 1980). Because a large number of these residences are only occupied part-time, the administrative committee felt they may have difficulty obtaining the residents' permission. Therefore, a statement has been included on the management district permit form granting the district permission to enter the property to conduct inspections (LPDSWMD, 1981b). The administrative committee also requested that the LPA include a permission statement on their membership application. This was approved by the LPA Board of Directors (Administrative Committee, meeting minutes, Oct. 26, 1981).

The administrative committee also became concerned about the new percolation test requirements. The committee was not sure if they could require new percolation tests for lots that had been tested.
There was concern that some of these lots might not pass under the new requirements. Therefore, the administrative committee wanted to request a state attorney general's opinion (meeting minutes, March 4, 1981). Such an opinion was not necessary for several reasons (Clifford Peterson, Assistant Iowa State Attorney General, personal communication):

1. It is not appropriate after rules are adopted, only when rules are being prepared.
2. If the opinion is unfavorable, the advocacy of the attorney general's office is lost if the committee needs assistance.
3. The rule has not been challenged.
4. Zoning and similar regulations allow changes as long as a building permit was not issued.

Therefore, the committee decided not to pursue the opinion.

Failing systems

The management district worked to correct three failing systems during the first year of operation. The first failure addressed by the committee was discovered when the sanitarian was performing an aerator inspection (Administrative Committee inspection report, June 23, 1981). The aerator was not working and when turned on it sparked and smoked. A number of dead oak trees in the backyard drew attention to the soil absorption field. The field was placed on a hillside going down to the lake. The bottom lateral line was seeping water along its entire length. The ground was covered by a black material and an odor was observed. Both the middle and top line were also wet.
In preparing the inspection report on the system, the sanitarian checked the original permit, the soil survey map, and performed a site evaluation. The original permit and percolation test were for the frontyard where the treatment system would require a pump. The installer constructed the system in the backyard because there was more room, and it would not require a pump. The Soil Survey of Guthrie County mapped the whole area as Wadena loam and Montrieth loamy sand so there should have been no problem.

The results of the site evaluation and percolation test showed that the area where the soil absorption field was located had a high clay content and showed mottling at 2 feet. This clay soil was not indicated on the soil survey and was confined to the side slope where the soil absorption field had been placed. The rest of the backyard was sandy soil. The report posed two alternatives for correction. The first was to pump the sewage around the house to the frontyard where the system was originally proposed. The second alternative was to place the system in the limited area in the backyard. This would require deeper and wider trenches, dosing and water conservation to keep the lateral length needs as small as possible. The homeowner selected the second alternative because it was less expensive.

Since the aerator was not working, the tank was also converted to a septic tank under the provisions of Chapter III, Section 3.4 of the management district rules and regulations (LPOSWMd, 1981c). This was the first conversion granted by the administrative committee.
The sanitarian noted, however, that the homeowner was complaining of odors from the system (Stephen Patterson, personal communication). It may be necessary for the committee to reevaluate the conversion provisions.

The second failing system examined by the administrative committee had a bleed-out problem. It was brought to the committee's attention, however, because effluent was backing up into the house (Administrative Committee inspection report, July 28, 1981). Two alternatives were considered in this case. Either a new system would have to be constructed or a second alternating field could be placed between the existing trenches. If the site was suitable, the second alternative was preferred because of cost.

The site evaluation and percolation tests indicated that the soil was suitable for a second alternating field. Therefore, the report recommended:

a) conversion of the aerobic tank
b) install inspection ports on the tank
c) install new laterals between existing laterals in all the space available
d) trenches are to be 24 inches wide with as much rock as possible and still maintain a 3 foot maximum depth
e) install new header lines and alternating valve
f) install observation ports on all new and existing lateral lines
g) entire field is to be rototilled to loosen machine packing
h) the property owner is encouraged to practice water conservation

The district will take the responsibility of turning the alternating valve.

Unfortunately, the third failing system examined by the admin-
istrative committee was not so easily repaired. This failure was first brought to the attention of the county health department in February 1974 (meeting minutes, February 19, 1974). The sanitarian was instructed to inspect the system, and he reported sewage on the surface of the ground (Guthrie County Board of Health meeting minutes, April 16, 1974). In August 1974, the county board of health ordered the system to be in compliance within 30 days or the lot would be declared a "health hazard", and the residence could no longer be occupied (meeting minutes, August 20, 1974).

When the Lake Panorama On-site Wastewater Management District was formed in October 1980, the system was still discharging effluent to the surface of the ground. After observing the problem for 8-10 months, the sanitarian sent the homeowner a letter on July 13, 1981 stating that the failure was serious, and the matter would be discussed at the July 21 administrative committee meeting. The homeowner was invited to attend the meeting so the best possible solution could be implemented as soon as possible. The first letter was followed by a great deal of correspondence between the management district and the homeowner. The management district requested a percolation test in order to make a set of recommendations, but the homeowner was reluctant to have the test done. The administrative committee was forced to go to the Guthrie County Magistrates Court for a search warrant to conduct the test. The search warrant was issued on September 29, 1981 and the test was performed on October 1 and 2. The test showed a percolation rate of 167 min./in. which indicated that the lot was not acceptable for subsurface
disposal of wastewater. Part of the homeowner's argument for not needing repairs was based on the purity of the effluent. In a letter dated August 25, 1981 the homeowner indicated that he had collected an effluent sample from his system and attached the results. The water analysis was performed at the X-L Laboratories of Grimes, Iowa and the analysis showed no coliform bacteria present in the effluent. The sanitarian then collected a sample of the surfacing effluent on September 8, 1981 and sent it to the University of Iowa Hygienic Laboratory and this sample showed 3,000,000 fecal coliform bacteria/100 ml.

The homeowner and his attorney were present at the October 26, 1981 administrative committee meeting (meeting minutes) to discuss their options. It was clear that their lot was totally unacceptable for subsurface disposal of effluent. The committee considered two alternatives. The first involved acquiring an easement on a neighboring lot and the second involved pumping the sewage to a lot owned by the LPA. The first alternative would be cheaper, but the neighboring lot is involved in a tax sale which will not be settled for two years. A final decision on these two alternatives cannot be made until a percolation test is run on the two lots.

Future Activities of the Management District

Since the administrative committee has developed a set of rules and regulations under which to operate, they can begin meeting the other directives of the ordinance. The committee needs to develop a fee schedule so that the district can be more financially self-
sufficient. The committee must also begin inspections of existing systems, employ the personnel to carry out these inspections, gather all available historical data on each system for a complete data file, and begin dealing with the identified problem lots and surface discharges.

In order to generate revenue for the district, the administrative committee has set fees for its services. The committee has increased percolation test and construction permit fees by $25 over the fees assessed the rest of the county (meeting minutes, December 29, 1980). This was justified because percolation test and permit needs for Lake Panorama require more time and effort than for the rest of the county. The administrative committee has also set a $25 permit fee for major repairs and system conversions (meeting minutes, July 21, 1981). This was also set because of the time and effort involved in preparing these permits. When regular inspections begin the committee will also have to set an inspection fee to cover the cost of the personnel, mileage, and lab analysis.

In the operation, maintenance, and repair rules for the district (LPOSWMD, 1981c) it states that all systems installed before January 1, 1982 shall be inspected during the first five years after installation (Section 3.1(1)f). These rules also state that all aerators will be inspected quarterly beginning April 1, 1984 (Section 3.1(1)h). Along with regular inspections, the management district is responsible for turning the alternating valve on split field systems (Section 3.5) and conducting new construction inspections and site evaluations.
(Sections 2.4 and 2.8f). The sanitarian alone will not be able to perform all of these inspections and still have time to serve the rest of the county. Therefore, the management district will have to hire some additional personnel. The board of health considered hiring an environmental health intern from Indiana State University (meeting minutes, February 18, 1981), but for the summer of 1981 all the internships had been booked (Administrative Committee meeting minutes, May 16, 1981).

During the winter of 1981 and 1982, the sanitarian will begin compiling historical information on each system (Stephen Patterson, personal communication). An inspection data card was prepared (Administrative Committee meeting minutes, October 26, 1981) which has spaces for information from eleven inspections. Information on the previous ownership, number of bedrooms, and plumbing fixtures in the house are to be recorded. Observations made on number of residents, lot improvements, condition of the tank and disposal area, and the operation of the distribution system and mechanical equipment are all to be recorded at each inspection.

At the administrative committee meeting September 15, 1981 (meeting minutes) the committee expressed concern over the three systems currently allowed to surface discharge directly into the lake and a series of lots on the southeast side of the lake which are having problems. The committee felt that the homeowners with surface discharges should be notified of the testing requirements in the rules and should grant permission to obtain a sample. The
committee also wants to begin exploring the potential for a cluster system for the series of problem lots. One possible alternative would be to use the community area located there and have the system operated by the management district.

Other Applications of Management

Two municipalities in Iowa are considering on-site wastewater management. One is the City of Johnston which is a suburb of Des Moines, and the other is the City of Menlo which is a small rural community in Guthrie County. The authority which municipalities have in this area is under the 1968 amendment to the Iowa Constitution "Municipal Home Rule" (Iowa Official Register, 1979). Similar to the County Home Rule Amendment, municipal home rule grants cities authority over their own affairs subject to a set of restraints. Any local action cannot be inconsistent with state law, and a local government may not tax unless authorized by the legislature. The subsequent recodification of the state statutes which affected municipalities gave cities greater authority than counties, particularly in the area of finance (Iowa Code, Chapter 384, 1977).

Because of this difference in authority, the application of on-site wastewater management in municipalities is somewhat beyond the original scope of this study. It is, however, of interest to take a brief look at the problems encountered in these two cities and how on-site wastewater management might be a solution.
Johnston

Johnston is a suburban community located northwest of Des Moines, Iowa. Its southern boundary begins at the northern boundary of Des Moines, and the incorporated area extends north to the Saylorville Reservoir (Figure 6). The population of Johnston at the 1980 census was 2,617 (Martin 1981a) with the greatest population density in the older central section of the city. Much of the incorporated area is still being farmed with approximately 50 percent in agricultural production and undeveloped area. The planned community, Green Meadows, has its own central collection system and sewage lagoon. The remainder of the community relies on on-site wastewater treatment systems for sewage disposal.

In 1977 a 208 wastewater management plan was developed for Des Moines and surrounding communities (Martin, 1981b). This plan recommended one wastewater treatment facility to service Des Moines and nine other communities including Johnston. A 201 facility plan for this regional system was then prepared as a joint venture by Donahue & Associates and Metcalf & Eddy, consultants for the Integrated Community Area (ICA). The total present worth of this system was estimated at $217,000,000.

In response to the 1977 amendments to the Clean Water Act, the consultants prepared a 208 plan re-evaluation which considered decentralized facilities and on-site treatment (Donahue & Associates and Metcalf & Eddy, 1981). This "Modified 208 Recommended ICA System"
Figure 6. Development in Johnston, Iowa
examined three options for the City of Johnston and presented total present worth estimates for each:

1. Collection system with treatment at Green Meadows $5,700,000
2. Collection system with treatment at Des Moines 4,900,000
3. On-site wastewater treatment systems 2,200,000

In estimating the present worth of on-site treatment, the consultants assumed that 25 percent of the existing on-site systems would be adequate through the planning period. For the other 75 percent and all future installations, it was assumed that half would be conventional on-site systems and half would be mounds. Also included was the cost of operation and maintenance at ten year intervals. Even with these conservative assumptions, the total present worth of the on-site alternative was less than half of the Des Moines main system.

The Johnston City Council first expressed an interest in on-site wastewater management in August 1980. At the August 28, 1980 city council meeting (meeting minutes), the concept of management was presented and alternatives discussed. At that meeting, the council considered holding an informal meeting on general maintenance of septic tanks. This was arranged and held in October 1980 with Iowa State Extension Water Specialist, Tom Glanville presenting the program. A second public meeting was held in January, 1981 on wastewater planning. At that meeting, the on-site wastewater management concept was presented and representatives from the 208 planning agency,
ICA facility planning group, and the Green Meadows sewer facility were present to make comments and answer questions.

The future for wastewater treatment in Johnston is still uncertain. The final facility will most likely be a combination of sewers placed in the more densely populated problem areas and on-site treatment for the remaining population. The project is to be financed by federal construction grant funds which have been cut back severely. It is not possible to accurately predict the final program for Johnston.

Menlo

The City of Menlo is a small rural community in Guthrie County, Iowa. The city has a population of 406 with 157 houses (Bureau of Census, 1980). The city first became interested in on-site wastewater management after receiving notice that a complaint had been filed with the Iowa Department of Environmental Quality (IDEQ). A farmer living south of Menlo complained of raw sewage being discharged through a drainage tile into a tributary of the North River (IDEQ report of investigation, June 1981). Upon investigation the IDEQ found that the residences and businesses of Menlo were illegally connected to a city-owned tile which discharged at two points into a tributary of the North River one-half and one-quarter mile away.

At a September, 1981 Menlo City Council meeting (meeting minutes), the problem was discussed and the concept of wastewater management presented. It was felt that a conventional collection system would
be too expensive for this small community. The city would probably best be served through a series of cluster systems utilizing existing facilities. The city council voted to enter into an agreement with the Guthrie County Board of Health for the purpose of establishing a wastewater management district for Menlo.
CONCLUSIONS

Based on the current level of acceptance, accomplishments, and few difficulties experienced at Lake Panorama, public management of on-site wastewater treatment systems is a workable, realistic alternative for rural Iowa. From experience at Lake Panorama and in other states, the Iowa Department of Environmental Quality has recommended public management for the community of Menlo. The use of public management is attractive to these areas because it utilizes the facilities already in place, is flexible enough to be site specific, and is administered at the local level.

In order to establish a management district, it was necessary to prepare the appropriate legal documents. Before the passage of the County Home Rule Amendment, statutory authority was needed before a county could establish a special purpose district. Because of the conflicts between the different public agencies, the passage of a new state bill allowing counties to form on-site wastewater management districts would have taken at least another year, and it was doubtful that it could have passed without major changes. The County Home Rule Amendment gave counties the authority to establish such a district, if one was needed, without an enabling statute.

It is important to note that there are some advantages as well as disadvantages with utilizing an ordinance rather than a state statute. Some of the things lost were the sections on district formation. These sections provided for three levels of input. Also
lost was the standard procedure which the state bill provided. However, the distribution of the model ordinance by the Iowa State Association of Counties was helpful in this situation. Another loss was the reporting requirements to the state agencies, the Iowa Department of Health and the Iowa Department of Environmental Quality. The gains of utilizing county ordinances was the increased flexibility in implementation. Also gained was the support of an important special interest group, the Iowa State Association of Counties. Perhaps the most important thing gained, however, was the speed of implementation. This allowed the counties with the most pressing public health problems to act immediately.

The process of getting information on public management out to the decision makers was an important part of this research project. A news release and extension bulletin were prepared for distribution and presentations were made to groups of public health officers. The model ordinance along with an explanation document were also sent to all county boards of supervisors by ISAC. The best philosophy seemed to be to present all the information in a variety of media and at many levels. Hopefully, it will reach the right person at the right time. The information dissemination process is still a hit-and-miss situation. It was fortunate that the Guthrie County sanitarian was able to hear a presentation on public management.

Once a county decided to establish a management district, it was important to work with them to provide the benefits of past re-
search and to document the experiences of the new district. Assistance was given to Guthrie County by arranging meetings to discuss special problems, reviewing and commenting on documents prepared for the district, and doing background research for the preparation of regulations and policies. The documentation of the district development process should be valuable for other counties in Iowa and other states looking to public management as an alternative. Through this annotated account, the important actors are presented. The problems encountered by the district and how they are handled have been presented and analyzed. This experience should enable another district to avoid these problems and give them ideas of how to handle other problems as they are encountered.

Reflecting back over the course of this research project, it is interesting to note the role of the scientist and engineer in developing public policy. In this instance, the public health officer recognized a problem but had no definite solution. The scientist and engineer could offer technical solutions, but their implementation was legally restricted. The policy makers had the authority to remove these legal restrictions, but they were not aware of the need or the technical solutions. Working together, in a coordinated effort, a workable, effective solution was realized.
RECOMMENDATIONS FOR FUTURE RESEARCH

1. Application of public management of on-site systems in a rural municipality (Menlo, Iowa).

2. Application of public management of on-site systems in a suburban setting (Johnston, Iowa).

3. Comparison of the longevity of managed versus unmanaged on-site wastewater treatment systems.

4. Development of specific criteria for rules and regulation, such as:

   - determining when the soil is too wet to install an on-site system.

   - limiting the effects of soil compaction during and after construction.

   - examining the effects of water conservation and diversion of water softener brine.

5. Examination of the environmental impacts of managed on-site wastewater treatment versus a rural sewer system (Lake Panorama and Lake Diamondhead).
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Legislative Proposal
ON-SITE WASTEWATER MANAGEMENT DISTRICTS
FOR
COMMUNITIES WITHOUT CENTRAL SYSTEMS

Concept

The Clean Water Act of 1977 was a major step forward in the search for alternative wastewater treatment methods. The Act clearly establishes that treatment systems serving individual homes (on-site) are eligible for EPA grant funds if a public body applies for the funds and agrees to operate and maintain the system. An on-site system is defined as one where the sewage (usually from a single family dwelling) is treated and disposed within the boundaries of the lot. The concept of an On-Site Waste Management District (OSWMD) is one where an existing legal entity or modification thereof could exercise control over design standards, installation and as important, provide for the homeowner, an inspection and maintenance service of his sewage system. A district with these functions meets the criteria of the Clean Water Act, thus permitting the new concept that on-site systems are viable alternatives for waste treatment and are eligible for grant funds if properly constructed and maintained.

What are the kinds of problems encountered with on-site wastewater treatment systems?

Historically, the owner of an on-site sewage treatment system succumbs to the "out of sight, out of mind" syndrome and is not aware of trouble until the system fails. Probably of most importance to the land owner is premature failure of the system and its associated costs
and inconvenience. The public concerns are potential public health problems through surface and ground water contamination and the environmental impact of a failing system. Rural subdivisions with high density housing are being developed at a high rate in Iowa. Many of the existing subdivisions are in areas with unique soils and topography where failure of the treatment system through poor construction and neglect of maintenance pose definite health hazards.

**How could these problems be minimized?**

The chances of premature failure can be reduced if the system is properly designed for the proposed site. It is also important to insure proper installation and regular maintenance. An environmental monitoring program would aid in designing systems and identifying and correcting problems. The need exists now in some areas of Iowa for service that could be rendered by an on-site waste management district.

**How can on-site wastewater management districts become operational in Iowa?**

Legislation is needed to modify the Sanitary District Law of Iowa to where it would encompass on-site systems. California recently passed Senate Bill No. 430 which prescribes for On-Site Waste Management Districts the method of formation, the support needed for acceptance, delegated powers and the method of financing.

It's responsibilities could include setting design standards, inspection of sites, construction and operation, hiring of staff, consultants and contractors, and monitoring the environmental impact. It could also have the power to issue permits, declare and abate a nui-
sance, and enter property to correct a problem.

The operation could be financed through bonds, service charges, assessments, and other charges. The California bill specifically stated "No appropriation is made by this act." Funding may also be available from federal sources.

Revision and modification of California's Senate Bill No. 430 to meet Iowa conditions would provide a sound basis upon which to modify legislation to allow formation in Iowa of On-Site Wastewater management Districts or central management entities responsible for insuring the effective operation of many on-site individual sewage treatment facilities.
Proposed New Chapter 358——

County On-site Wastewater Management Districts

Explanation

This bill provides for the creation of on-site wastewater management districts. It offers county government the opportunity to manage the water resources in a part or all of a county to protect the public health and the environment. Currently there is no provision in the Iowa Code for management of on-site wastewater treatment systems or common management of cluster groups of water pollution control facilities in a county. There will be no appropriation made in this act; it will be financed through service charges and/or tax assessments for those landowners utilizing these services.

This bill allows for three avenues of district formation. The county board of supervisors may resolve it intends to form a district, or the landowners or another public agency may petition for formation of a district. A public hearing is then held on the question of formation with the final decision subject to an indication of public support through the number of written protests filed by the landowners. Upon formation of a district, the administrative authority is first delegated to the county board of health. If the board of health does not choose to take on this responsibility, the board of super-
visors, through the county engineer, another public agency, or a board of trustees may take on the administrative responsibilities.

The powers of this district would be to design, construct, operate, monitor, and maintain on-site wastewater treatment systems and cluster systems in the district, to protect the public health, promote water quality, and prevent pollution. The district would have the power to adopt and enforce reasonable rules and regulations. To carry out these responsibilities the district under specified conditions named in the act, would be permitted to have a right of entry, right to collect for services and right to abate a nuisance.
Sec. 1 Definitions
1) County board of supervisors means the governing authority for a county.
2) Public agency means county conservation board, county board of health, soil conservation district, or a political subdivision.
3) On-site wastewater treatment system means any of several works, facilities, devices, or other mechanisms used to collect, treat, reclaim, or dispose of wastewater from individual dwellings or buildings or from a common sewer collection system serving two or more dwellings or buildings, specified herein as a cluster system.
4) Real property means both land and improvements to the land.

Sec. 2 Whenever the county board of supervisors, upon its own initiative or upon petition, deems it necessary to provide management services for on-site wastewater treatment, for all or a portion of its jurisdiction, it shall resolve it intends to form an on-site wastewater management district.

Sec. 3 An on-site wastewater management district may be formed to:
1) assist in protecting the public health, in accordance with the rules promulgated by the state department of health.
2) assist in achieving the water quality objectives set by the Iowa water quality commission through the department of environmental quality.
Sec. 4 A resolution to form a district shall state:
1) the boundaries of the district.
2) the public benefit to be derived.
3) the number of residential units and commercial users in the
   proposed district, existing and potential.
4) the proposed means of financing the water quality management
   program.
5) the time and place of a public hearing on the formation of
   the proposed district.

Sec. 5 This resolution shall be filed with the county recorder.

Sec. 6 A proposal to form a district may be initiated by filing a
petition with the county board of supervisors.
1) such a petition shall contain all matters specified in subdivi-
sions (1), (2), (3), and (4) of section 4.
2) this petition must be signed by no less than 10 percent of the
   property owners in the proposed district.
3) following certification of the petition, the board of super-
   visors shall set the time and place of a hearing on the forma-
   tion of the district.

Sec. 7 A proposal to form a district may be initiated by written
petition by a public agency through an action of its board.
1) such a petition shall contain all matters specified in subdivi-
sions (1), (2), (3), and (4) of section 4.
2) upon receipt of the petition, the board of supervisors shall set the time and place of a hearing on the formation of the district.

Sec. 8

1) Notice of the hearing and a copy of the resolution or petition shall be published in a newspaper of record in the county.

2) Notice of the hearing shall be given to the county board of health, the state department of health and the department of environmental quality.

3) Notice of the hearing shall be sent to all property owners of record in the proposed district.

Sec. 9 The hearing on the question of formation shall be held no sooner than 30 days and no later than 60 days from the date of adoption of the resolution or receipt of a petition.

Sec. 10 After receiving notice of the hearing, the county board of health shall prepare a general plan for operation of the district and submit it as a written report to the county board of supervisors before the date of hearing. This report shall include:

1) the number of individual and cluster units currently operating in the proposed district.

2) the potential rural residential and commercial growth patterns in the proposed district.

3) alternative types of on-site wastewater treatment systems applicable in the proposed district.
4) a time schedule to prepare and implement a detailed water quality control and management program if said district is formed.

Sec. 11 At the hearing the board of supervisors shall hear and receive:

1) the report of the county board of health.
2) oral or written statements of interested persons.
3) reports of other public agencies.
4) protests and objections.

Sec. 12 At the hearing the board of supervisors shall have the power to:

1) exclude any territory proposed to be included in the district when the board finds that it will not be benefitted by becoming a part of the district.
2) include any additional territory contiguous to the proposed district when the board finds that it will be benefitted by becoming a part of a district and for which the landowners, by notarized written request, at or before the hearing, indicate their desire to be included.

Sec. 13 Within 10 days of the close of the hearing, the board of supervisors shall find and declare that the written protests on file represent one of the following:

1) less than 35 percent of the landowners of record in the proposed district.
2) 35 to 50 percent of the landowners of record in the proposed
district.

3) greater than 50 percent of the landowners of record in the proposed district.

Sec. 14 If the number of written protests is less than 35 percent as described in subdivision (1) of section 13, the board shall declare the formation of the district.

Sec. 15 If the number of written protests is greater than 50 percent as described in subdivision (3) of section 13, the proposed district will not be formed.

Sec. 16 If the number of written protests is 35 to 50 percent as described in subdivision (2) of section 13, the formation of the district is subject to an election of the landowners in the proposed district. Said election shall be conducted within 60 days of the hearing. The district will be formed if a majority of the landowners voting in said election are in favor of its formation.

Sec. 17 If a district is not formed, further proceedings shall not be undertaken for at least one year.

Sec. 18

1) Upon formation of a district, the county board of health shall be delegated the power to administer the responsibilities connected with the operation of the district.
2) If the county board of health does not have jurisdiction or it does not choose to administer these responsibilities, the board of supervisors through the county engineer, or some other public agency, upon its own request, may accept the responsibilities of the operation of the district.

3) If the board of supervisors or other public agency does not choose to administer these responsibilities, a board of trustees shall be elected.

Sec. 19

1) An election of the board of trustees shall be held within 60 days of formation, by the board of supervisors. The land owners shall vote on blank ballots without formal nominations. The board of supervisors shall select three trustees from among the five receiving the greatest number of votes.

2) The trustees shall have a term of three years, with one designated by the board of supervisors to have an initial term of one year, one with two years, and one with three years.

3) In cases where the county owns at least 100 acres contiguous to lakes and parks, the county conservation board, in counties where said board exists, shall appoint two additional members of the board of trustees. Their terms also shall be for 3 years, but can be eligible for reappointment.

4) Successors shall each serve terms commencing July 1 of the year they are chosen. Successors shall be chosen by the board of
supervisors or by election, at the option of the remaining trustees.

5) Vacancies in the office of trustees shall be filled by the remaining members of the board until a successor is chosen as prescribed in subdivision (4) of this section.

Sec. 20 All or a portion of a county may be included in a district.

Sec. 21 Municipalities may make use of the provisions of this chapter, to better serve the unsewered areas within their corporate limits.

Sec. 22 No board of supervisors shall form a district which includes part of another district.

Sec. 23 Upon completion of the detailed management program for the district, and before its adoption, the designated administrative agency, under Sec. 18, shall submit the plan for approval to:

1) the state board of health to assure that the public health in the district is being protected.

2) the department of environmental quality to assure the water quality objectives of the state are being met.

Sec. 24 An on-site wastewater management district shall have the power to:

1) collect, treat, reclaim, and dispose of wastewater without degrading water quality within or outside of the district.
2) acquire, design, own, construct, install, operate, monitor, inspect, and maintain on-site wastewater treatment systems within a district in a manner which will protect public health, promote water quality, prevent pollution, and abate nuisances.

3) conduct investigations, make analyses, and monitor conditions with regard to water quality within the district.

4) adopt and enforce reasonable rules and regulations necessary to implement the purposes of the district. Such rules and regulations may be adopted only after the administrative agency conducts a public hearing after giving public notice.

5) employ and discharge those employees found necessary to operate and maintain the detailed management program. Supervising employees operating water pollution control facilities, which require certified operators, shall comply with certification requirements of the state.

Sec. 25 Any authorized representative of the district, after obtaining an inspection warrant(?) or written permission of the landowner or occupant shall have the right of entry to any premises on which a water pollution waste, or contamination source is located, for the purposes of inspecting the source, securing samples of discharges and records.

Sec. 26 Any costs for ordinary operations of the district: payment of employees, contractors, and consultants; and construction, opera-
tion, and maintenance of waste treatment systems shall be levied exclusively upon landowners in the district. These costs shall be collected as either:

1) a service fee schedule, which if unpaid shall constitute a lien upon that real property.

2) a part of the annual property taxes upon the real property in the district.

Sec. 27 Any violation of a rule or regulation adopted as described in subdivision (4) of section 24 shall be abated as a public nuisance. By regulation a procedure shall be established to abate such a nuisance and to assess the costs of abatement on the violator, which if unpaid will constitute a lien on the property.

Sec. 28 The owner of any real property, upon which is located an on-site wastewater treatment system, may request that the district repair and replace, as necessary, all or portions of a system. The land owner shall be assessed the costs of the services, which if unpaid shall constitute a lien on the property.

Other issues for discussion:

1) penalties

2) occupancy permits

3) subdividing section 358

4) additions to district following formation

5) provisions contained in Sec. 358.15-24
Draft of Model Ordinance
Section 1. Title.

ON-SITE WASTEWATER MANAGEMENT DISTRICTS

Section 2. Application of Ordinance.

The procedures in this ordinance shall be used by the Board of Supervisors of ____________ county, Iowa, for the establishment and operation of on-site wastewater management districts in this county.

Section 3. Purpose.

A. The purpose of this ordinance is to insure the proper operation of on-site wastewater treatment systems in order to protect the public health, water quality and the environment.

B. To allow for the use of more high maintenance, innovative or alternative on-site wastewater treatment systems where "conventional" on-site systems are not appropriate.

Section 4. Definitions.

"On-site wastewater treatment system" means any works or facilities used to collect, treat, reclaim or dispose of domestic wastewater on-site from individual dwellings or buildings or a cluster of two or more dwellings or buildings.

A "conventional wastewater treatment system" means any septic solids settling chamber with a non-pressurized leaching field or bed.

Section 5. District Boundaries.

The on-site wastewater management district will be responsible for the design, construction, repair, operation and maintenance of all on-site wastewater treatment systems within (specify all or a
portion of county).

**Section 6. Extension of District Boundaries.**

The boundaries of any on-site wastewater management district established on passage of this ordinance may be extended by amending Section 5.

**Section 7. Administration.**

Upon establishment of a district, the county board of health shall assume the power and duties provided under this ordinance.

**Section 8. Management Program.**

A. The board of health shall adopt a detailed management program for the district.

B. The board of health shall also adopt reasonable rules and regulations necessary to implement the purposes of the district.

C. The management program and the rules and regulations may be adopted only after the board of health conducts a public hearing after giving ___ days public notice.

**Section 9. Powers and Duties.**

The board of health may:

A. Collect, treat, reclaim, and dispose of wastewater without degrading water quality within or outside of the district.

B. Acquire, design, own, construct, install, operate, monitor, inspect, and maintain on-site wastewater treatment systems within the district in a manner which will protect public health, promote water quality, prevent pollution, and abate nuisances.
C. Employ and discharge those employees necessary to operate and maintain the detailed management programs.

Section 10. Inspections.

The board of health may authorize its representative to apply for warrants to enter any premises in the district on which a wastewater treatment system is located for the purpose of inspecting the system, securing samples or records, or making repairs.

Section 11. Costs.

The board of health shall establish a service fee schedule to recover the operating costs of the district. The costs of operating facilities serving particular properties shall be paid by the owners of those properties benefitted. Failure to pay a service fee when due shall create a lien against the property when filed with the county recorder.

Section 12. Enforcement.

A violation of a rule adopted pursuant to Section 8 of this ordinance shall constitute a public nuisance. The board of health may commence any appropriate action in the name of the district to enjoin or abate a public nuisance in violation of its rules.
Explanation Document
ON-SITE WASTEWATER MANAGEMENT DISTRICTS:

AN EXPLANATION OF MODEL ORDINANCE NO. 3

ON-SITE WASTEWATER TREATMENT

In areas where the household wastes are not collected by sewers and treated at a central treatment plant, wastes must be treated on-site. The most common system used is a septic tank with soil absorption field. The heavy material, floatable solids and grease are retained in the tank. The clarified wastewater then overflows into a network of drainage lines where it is absorbed into the soil. As the wastewater filters through the soil, the bacteria and nutrients are retained in the soil.

If the system is designed for the appropriate family size, soil conditions and infiltration rate, it should work well for many years. The major maintenance required is periodic pumping of the tank. If the solids are not removed, they will start to carry over into the absorption field, clogging the soil. After a number of years the soil may also begin to clog with a biological slime. This can be relieved by resting the field for a few months. Some areas use two absorption fields and alternate between the two. It is also important not to compact the soil in the area. Driving over the area, for example, can cause serious damage to the absorption field.

Septic systems, unlike sewer systems, are owned and operated by the homeowner. Many homeowners have little knowledge of how their systems work and should be maintained. Some don’t even know where their system is located. This is a problem in high turnover areas.
such as rural subdivisions. The wastewater treatment system is not a major concern for most homeowners. Septic systems, therefore, are usually only maintained when they fail, when sewage begins to backup into the house or comes to the surface in the yard. When this occurs, major repairs or replacement may be required at a much higher cost than the periodic maintenance.

WHAT ARE SOME OF THE PROBLEMS COUNTIES HAVE WITH ON-SITE WASTEWATER TREATMENT?

**Failing septic systems**  Old, poorly designed or poorly maintained systems are discharging to the ground surface, road ditches or surface water, or are contaminating ground water.

**Development in areas with unsuitable soils**  Housing developments may exist or may be planned in areas where conventional septic systems are not working. Areas with thin soil, high water tables or steep slopes are not appropriate for septic systems.

**Use of septic systems in high density developments**  In these areas, septic systems may be appropriate because of good soil characteristics; but a failure, due to poor design, construction or maintenance, may pose a serious public health hazard.

WHAT ALTERNATIVES HAVE COUNTIES HAD IN DEALING WITH THESE PROBLEMS?

**Sewering**  In areas with failing systems, sewer lines could be extended out from a nearby community; or the area could establish its own sewer district (Chapter 358, Iowa Code). The county could also require developers to sewer an area prior to occupancy. This alternative is usually very costly.
Site and construction inspections

Some counties have required permits and inspections of on-site systems before and during construction. This has greatly improved the wastewater treatment systems because it requires planning and checks for proper construction. This procedure does not, however, insure that the system will be operated and maintained properly.

Use an alternative on-site system

These systems which include mounds, sand filters and aeration systems, can work in areas where conventional septic systems cannot. They are only being used on an experimental basis in some areas of the state because they require a higher degree of maintenance. Each of these systems operates with pumps or motors which require regular maintenance. Some of these systems also require regular cleaning and chemical additions. Counties have not been able to insure that homeowners will effectively operate their systems, so regulations have restricted their use.

Condemnation

If failing septic systems pose a public health hazard, it may be necessary to abandon the property until another wastewater handling system can be developed.

Holding tanks

Water tight vaults with regular pump-out have been used in areas where other wastewater treatment systems could not be used.

Under County Home Rule, what other alternatives do counties have?

The County Home Rule amendment to the state constitution granted counties the authority to determine their local affairs. However, such authority cannot be inconsistent with the laws of the general
assembly and cannot be a tax. Wastewater treatment is usually considered a local affair; and this is reinforced in section 332.55 of the Iowa Code under the Powers and Duties of the Board of Supervisors. This section entitled "Certain public improvement authorized", states that the county may provide for the collection, treatment and disposal of sewage in a sanitary manner. This section also refers to funding, stating that it may be done in a manner similar to cities as described in Chapter 304, Division 3, General obligation bonds, Division 5, Revenue financing and Division 6, Contract letting procedure.

The actions a county may wish to take in this area depends on the types of problems it has. Through some minor revisions in platting or permit procedures, future problems could be avoided. All too often wastewater treatment is an after-thought. After a house is built on a site, it may be difficult to put in an adequate waste treatment system. Other problems may require a more comprehensive approach, not only managing the initial design and construction, but also providing for future maintenance.

Model Ordinance 3, On-site Wastewater Management Districts, is an example of how a county could deal with its wastewater treatment problems. It can be modified to best fit in with the county government structure and the unique problems of the area.

**ADVANTAGES OF MANAGEMENT OF ON-SITE SYSTEMS**

1. Makes use of systems already in place; no need to construct extensive new facilities.

2. Construction more cost effective for small communities and rural areas.
3. Allows rural areas to deal with wastewater problems without waiting for construction grant funds.

4. Can be more ecologically sound than central collection and treatment.

DISADVANTAGES

1. Relatively new concept.
2. Need to change or implement enabling legislation or ordinances.
3. Higher operation and maintenance costs.
4. Requires on-site inspections.
5. May allow areas to be developed that couldn't be developed before.
6. Requires attention of homeowners.

HOW ARE WASTEWATER TREATMENT PROBLEMS BEING HANDLED IN OTHER AREAS OF THE COUNTRY?

Following are three examples of wastewater treatment techniques being used in rural areas. The first, Stinson Beach, California, is an example of a small rural community which was required to abandon on-site treatment and put in a sewer system. They chose a less expensive alternative. The second example, Auburn Lake Trails, was a proposed new subdivision which had problems with unsuitable soils. This area also selected an alternative to sewers. The last example, Finger Road, is an example of a sewer extension out into a rural area and the resulting impacts.

Stinson Beach, California

In Marin County, an on-site wastewater management district was established in Stinson Beach and is being administered by the Stinson
Beach county water district. The small community (pop. 1500, 500 homes) on the Pacific Ocean has used on-site systems for all its wastewater treatment. Between 1961 and 1972, water samples were collected from the stream and lagoon in the area; and these samples indicated that the coliform bacteria counts were in violation of the State Water Quality Standards. This led to the adoption of Resolutions 73-13 and 73-18 (Sept. 1973) by the Regional Water Quality Control Board which required elimination of all on-site septic systems by October, 1977. There was also a ban placed on building new on-site systems.

The community was then forced to look at several alternatives. Consultants were hired and an environmental impact report was prepared. Eleven different alternatives were examined including ocean disposal, subsurface injection, building a treatment facility with sanitary sewers, collection for treatment at a neighboring community or repair and maintenance of the on-site systems. The collection and disposal alternatives were found to be too expensive; and it was doubtful that it would be able to comply with regulations on discharges. Transporting the sewage to a neighboring community, Bolinas, for treatment, was a reasonable alternative, but the pipeline would have to cross the San Andreas fault. It appeared that the most economically and environmentally sound approach would be to repair and maintain the septic systems. This was compatible with the low growth and rural lifestyle in the community.

The management district was established early in 1972 and has
been very effective in its first year of operation. By November of 1978, of the 65 systems categorized as failing, 9 remained to be repaired or replaced.

Fees of $25 charged to operate the district are collected as inspection fees every two years. These fees cover the costs of design reviews and field inspections. If the system is found to be defective, corrective measures must be taken within six months of the normal expiration date. The first two years' budgets were about $122,000 and $83,000, which covered salaries, water quality monitoring and engineering costs.

The rules and regulations for the district are contained in Ordinance No. WI-771 and include such things as construction permit requirements, inspections, investigating powers and abatement of a public nuisance. Some particularly unique sections, allow for off-site mitigation of repairs, reconstruction or replacement of systems, which will not meet standards within the land available. The ordinance specifies penalties for non-compliance by a fine (up to $500) or imprisonment (up to 60 days). Also, because it is being administered by a water district, it has a special vehicle to insure compliance: the discontinuation of water service.

Auburn Lake Trails Subdivision

Auburn Lake Trails is a recreational subdivision, which is being developed in El Dorado County, California, by the Trans-Land Company. The area is 2,800 acres with a total of 1,850 lots, an equestrian center, country club and golf course, commercial facilities and a
planned private campground. Some of the lots in the area were found to be unacceptable for subsurface disposal of wastewater because of thin soil, high ground water and steep slopes.

Because of the low expected build out rate, approximately three percent per year, sewering this area would have been prohibitively expensive. Therefore, in 1971, the Georgetown Divide Public Utility District, which was responsible for providing water and sewage treatment for the area, adopted Ordinance No. 71-3: "An Ordinance Establishing Rates and Charges for Sewage Disposal Services and Providing Procedures for Its Enforcement." Under this ordinance, the District accepted responsibility for managing sewage disposal in the area. The ordinance established a fee schedule which included a $5.00 permit fee to construct a new sewage disposal system and a yearly service charge of $10.20 per residential lot and $12.00 per commercial lot. This service charge was raised in 1974 to $12.00 and in 1977 to $15.00 per residential lot. The permit fee was also raised to $10.00.

The primary staff for this program was a sanitarian hired by the Public Utility District. He worked part time on developing and administering the management program. His other responsibilities with the Public Utility were to assist in the water supply program. In 1974, another sanitarian was hired to work full time with the management program. The district also obtained the services of a geologist through the CMTA program who assisted with soil studies. It is estimated, that when the area is fully developed, it could be managed by at most four persons; that is, one sanitarian per 600 lots.
The district has the authority to perform the site feasibility work, design specific systems, inspect construction and operation, maintain systems and monitor watershed water quality. The district can also require sewerage, if needed, and common disposal sites. The district does not own the individual systems and does not choose contractors.

Finger Road Sewer Extension

Eight years after the construction of a sewer extension two and one half miles out into the countryside along Finger Road in Green Bay, Wisconsin, a study was prepared on the project's impact. The project was not a large one; rather it was a moderately sized collector sewer. Its impact, however, on the development of Green Bay's southeast side was quite surprising.

Before the sewer was built in 1967, Finger Road served as a major county highway with most of the land on either side under cultivation. There were also 60 homes, a tavern, a gift shop and the Holy Martyrs Catholic Church all scattered along the length of Finger Road.

In 1965, Holy Martyrs Church had plans drawn up for a school to accommodate 200 children. After the plans had been reviewed, the means of waste disposal were still to be finalized. The red clay soils in the area made them unsuitable for the use of a conventional septic system - several existing systems in the area had already failed. The use of an alternative on-site system was considered, but it would have required considerable monitoring and maintenance. Also the alternative system would have been more expensive than a
conventional septic system. The Board of Health felt a sewer hook-up would be preferable to an on-site system. In May of 1966, Holy Martyrs was granted a building permit and began construction. The school could not open, however, until it joined the Green Bay sewer system.

During the winter of 1966-67, a petition was sent to the city from the Finger Road landowners to extend city sewers. In June of 1967, the City Council approved the extension and work was done through the summer so the school could open in September. The decision to extend the sewer was based, oddly enough, on educational costs - the cost of adding over 120 students to the public school system. It was believed that 60% of the installation costs could be paid through assessments to the property owners. However, the costs were greater than originally estimated; and more than 80% of the project costs were paid by Green Bay's taxpayers.

It is important to look at the impact of this sewer extension on a predominately agricultural area. One impact was the sewer assessment. Each landowner on Finger Road was assessed four dollars for each linear foot of frontage, which for the individual farmers meant between $5,000 and $15,000 for a sewer which they did not intend to use. Farmers could defer the costs for a ten year period, but would be forced to subdivide and sell the land just to pay the assessment. Another impact on the farmers was an increase in value and developability of their land, and in turn an increase in property taxes. The increase in housing development, which was allowed by the sewer extension, was also a problem for the farmers. The increased
traffic on Finger Road made it difficult to cross the road with farm implements so some parcels of land could not be farmed. Also, people living in homes adjacent to the farms complained of allergic reactions from hay and weeds, odors from farm animals and the nuisance of wild animals such as skunks and raccoons.

The unplanned development caused by this suburban extension also presented a service problem for the city. Finger Road, which was originally a county highway, was not designed to carry heavy residential traffic. The road had no curb or storm drains and no sidewalk for pedestrian and bicycle traffic. Other city services, such as schools, parks and shopping centers, were all some distance away. This was found to increase the energy consumption more than 10% over the urban areas. It was also difficult to provide the area with emergency and transit service.

It is clear from this study that little thought was given to the costs and impacts of extending sewer services outside an urban area. It can be seen that the individuals who derived the most benefit, Holy Martyrs School and the 10 to 15 residences with failing septic systems, were not absorbing their share of the costs. It is unfortunate that the alternatives to sewers and conventional septic systems were dismissed so readily. If the city could have provided for proper design, monitoring and maintenance of alternative treatment for the failing systems and the school, the rural-agricultural atmosphere of the area could have been preserved; and the ones benefited would have been the ones assessed.
ON-SITE WASTEWATER MANAGEMENT DISTRICTS: MODEL ORDINANCE NO. 3

This model ordinance was constructed to provide for the formation of a management district. The management plan and rules and regulations used in the operation of the district will have to be drawn up separately to allow for the necessary flexibility. The district can be administered in a variety of ways: by a board of trustees, the county engineer or the board of health. The board of health was used in this example. In most counties, this would be the logical choice because they would already have the necessary staff and expertise. This would also reduce the problem of finding people to serve on a special board of trustees.

It is important to include a section on extension of district boundaries. It would not be desirable to have to dissolve the old district and form a new one just to add one or two more homes. The district need not be contiguous; that is, one district could handle several areas of the county. It is important to note that the county need not get into the septic tank business. The major concern is that the systems are constructed and maintained properly. This can be done through site inspections, licensing of contractors and pumpers or contracting with a firm or individual.

FOR FURTHER INFORMATION:

Iowa State University is doing research on on-site wastewater treatment and management in the Agricultural Engineering Department through the Iowa Water Resources Research Institute. For general
questions regarding the formation and operation of on-site wastewater management districts contact:

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TYPICAL ON-SITE SYSTEM

non-perforated pipe

absorption field

tile lateral lines

septic tank

distribution box

access ports

inlet

scum

baffles

sludge

outlet

Cross section of septic tank