

Water and Sewer Service in Rural Baltimore County, Maryland



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Table of Contents

Table of Tables	ii
Preface	iii
Executive Summary	iv
Introduction	1
Organizing a Response	6
Management of On-site Water and Sewer Systems	8
Examples of Monitoring Programs	11
Evaluating an OSDS Management Program in Baltimore County	15
Proposed State Regulations	15
Possible Management Approaches	18
The Operational Permit Approach in Detail	19
Developing Rural Water and Sewer Infrastructure	23
Existing Need for Rural Sewer Infrastructure	23
Existing Need for Rural Water Infrastructure	26
Water/Sewer Infrastructure for Rural Development	26
Technical Alternatives for Rural Sewer Service	29
Technical Alternatives for Rural Water Service	38
Legal, Organizational and Financial Issues of Individual Systems	40
Conclusion	54
Appendix A: Magnitude of OSDS Problem	A-1
Appendix B: Magnitude of Water System Problems	B-1
Appendix C: Water/Sewer Needs Associated with New Development	C-1
Appendix D: Water and Sewer System Costs	D-1

Table of Tables and Figures

Table 1: OSDS Problems and Potential Solutions 25

Table 2: Water System Problem Areas 27

Table A-1: Longstanding OSDS Problem Areas A-2

Table A-2: DEPRM Study Area A-3

Table C-1: Rural Population Projections C-2

Table C-2: Existing Rural Communities by Planning District C-3

Table C-3: Water/Sewer Options for New Households C-6

Table D-1: Inflation Multipliers for Historical Project Costs D-2

Table D-2: EPA Cost Estimates D-3

Table D-3: Capital Cost Estimates: DEPRM and EPA D-4

Table D-4: Capital Costs of Cluster Systems D-5

Table D-5: Capital Costs of Community Systems D-7

Table D-6: Water and Sewer Operating and Maintenance Costs D-9

Table D-7: Metropolitan District Capital Expenditures D-12

Figure 1: Water Supply and Sewerage System, Baltimore County 2

Figure 2: Problem Areas for Sewage Disposal in Baltimore County 24

Preface

Over the last several years, Baltimore County officials have been increasingly concerned about failing septic systems and contaminated wells in rural Baltimore County. The boundaries of the Metropolitan District, the entity that serves the water and sewer needs of county residents, does not extend much beyond urban areas. If public water and sewer services are needed in rural Baltimore County, who can deliver services and how can they do so?

This service question alone is significant but also affects the county's comprehensive plan. Two concepts included in the proposed plan--rural commercial centers and rural villages--probably cannot be implemented unless community water and sewer systems are available in areas beyond the Metropolitan District.

While these concerns were being raised among local officials, state officials began debating the need for tighter restrictions on individually owned septic systems. Among other things, state officials were considering whether to require septic systems to be inspected periodically to protect water resources. Most of these septic systems in Baltimore County lie outside the boundaries of the Metropolitan District. Consequently, if the county were made responsible for an inspection program, how could it be conducted?

To study these questions, the Baltimore County Department of Environmental Protection and Resource Management (DEPRM) received a grant from the Maryland Department of Natural Resources' Coastal Zone Management Program. DEPRM contracted with the Institute for Governmental

Service (IGS) at the University of Maryland to do the work. Specifically, the study was to focus on how water and sewer services might be brought to rural Baltimore County; on how the county might implement an inspection program for septic systems, if the state required it; and on whether a sanitary district should be established for rural Baltimore County.

IGS started work in September 1998.

Executive Summary

This study focuses on three questions. First, how can Baltimore County bring water and sewer capacity to areas that lie beyond the Metropolitan District and in so doing, allow two concepts in the county's proposed master plan--rural commercial centers and rural villages--to be implemented? Second, how can the county perform inspections of on-site sewage disposal systems (OSDS) should the state require it? Third, is a sanitary district necessary to perform these services?

The study shows that a sanitary district is unnecessary for fielding an inspection program. An OSDS inspection program may be required if proposed state regulations should be adopted. In this event, the study suggests that the new program operate as follows: the county government would require OSDS owners to obtain a permit from the county that allows owners to operate an OSDS for a period of three to five years; the permit would be issued only after the owner contracted with a private business to perform the inspection and only after the inspection showed that the OSDS operated properly and in accordance with state standards; the Department of Environmental Protection and Resource Management (DEPRM) and the Department of Permits and Development Management would create and oversee the program; and any existing permit would expire after three (or five) years, but could be renewed if an inspection showed the OSDS was operating properly.

The study shows that a sanitary district is unnecessary to bring community-based water and sewer services to rural Baltimore County. According to DEPRM, septic systems are failing in certain geographic pockets in rural Baltimore County and some wells are plagued

by contamination. Because of environmental constraints, these pockets will need community-based water and sewer systems in which multiple households or businesses are grouped in a system for disposing of wastewater or for receiving water from a centralized source. The study estimates that capital costs for installing these systems is less than \$12 million.

The problem arises in the fact that these geographical pockets lie, for the most part, outside the boundaries of the Metropolitan District. However, bringing community-based services to rural Baltimore County does not require a sanitary district. Several other alternatives, such as creating a water and sewer authority or even contracting with the Maryland Environmental Service to install, operate and maintain these small systems, are as appealing in their way as the creation of a rural sanitary district. Yet, implementing any of these alternatives does not appear as attractive as simply relying on the Department of Public Works (DPW) to do the job. DPW already provides water and sewer services in Baltimore County through the Metropolitan District.

Beyond the question as to which entity should deliver rural water and sewer services is the question of paying for these systems. When capital and operating costs of community systems are added together, additional costs to homeowners might run \$300 per month. The study finds that the county should, to the extent possible, rely on private developers for installing community systems in new developments. Nonetheless, for systems installed in existing communities, costs can outstrip the ability of some homeowners to pay for them. In such cases,

the county government may be forced to use tax dollars to pay a portion of the capital and/or operating costs.

Introduction

For most of this century the Baltimore County Metropolitan District, an entity over which Baltimore County and Baltimore City share responsibility and governance, has been providing county residents centralized water and sewer services. Nearly 87 percent of county households (11 out of 12 county residents) today receive water and sewer service from the Metropolitan District.¹ Yet 13 percent of the households do not receive the services. Almost 93 thousand county residents get water from their own private wells and dispose of sewage through their own private septic systems. Some of these households lie within the Metropolitan District in “no planned service areas,” but most are located outside the district boundaries. (See Figure 1.) In terms of wastewater alone, these systems account for approximately 10 million gallons per day, or 3.5 billion gallons per year² of wastewater flow into the subsurface of Baltimore County. As long as these private systems work well, as long as the soils can absorb the wastewater, the steady flow presents no real concern. Yet we know these systems do not always work well.

The federal government estimates that on average 10 percent of private septic systems

fail at least once during the year.³ The term *failure* here means an overflow of sewage to the surface or direct discharge into a stream or storm drain. If Baltimore County is similar to the national average, then the county should expect roughly 3,800 septic systems to fail at least once this year. The failures will cause nearly one million gallons of sewage to flow freely in the county.

Furthermore, the Baltimore County Department of Environmental Protection and Resource Management (DEPRM) estimates 750 systems fail chronically. The chronic failures collectively pump another 187,000 gallons of sewage periodically onto county land and into county streams. This number, incidently, excludes the 1,200 homes on failing systems on the county’s lower east side (Bowleys Quarters and Back River Neck peninsulas) that are being brought onto public water and sewer service.

The problem, of course, represents an environmental threat and a serious health concern. Waterborne disease outbreaks in the U.S. often are attributed to bacteria and viruses present in domestic sewage, according to the United States Environmental Protection Agency. Septic system failures are the most frequently reported source of contamination in these outbreaks. Septic system failures also cause increased levels of nitrates, heavy metals and synthetic organic chemicals in ground water. All of these things devastate water resources, degrade property values and erode human health.

1 Data provided by the Baltimore County Department of Environmental Protection and Resource Management, using Year 2000 estimates.

2 Estimate based on an average discharge of 250 gallons per day per household. Data from *Problem Areas for On-Site Sewage Disposal Systems in Baltimore County*, Baltimore County Department of Environmental Protection and Resource Management (1998).

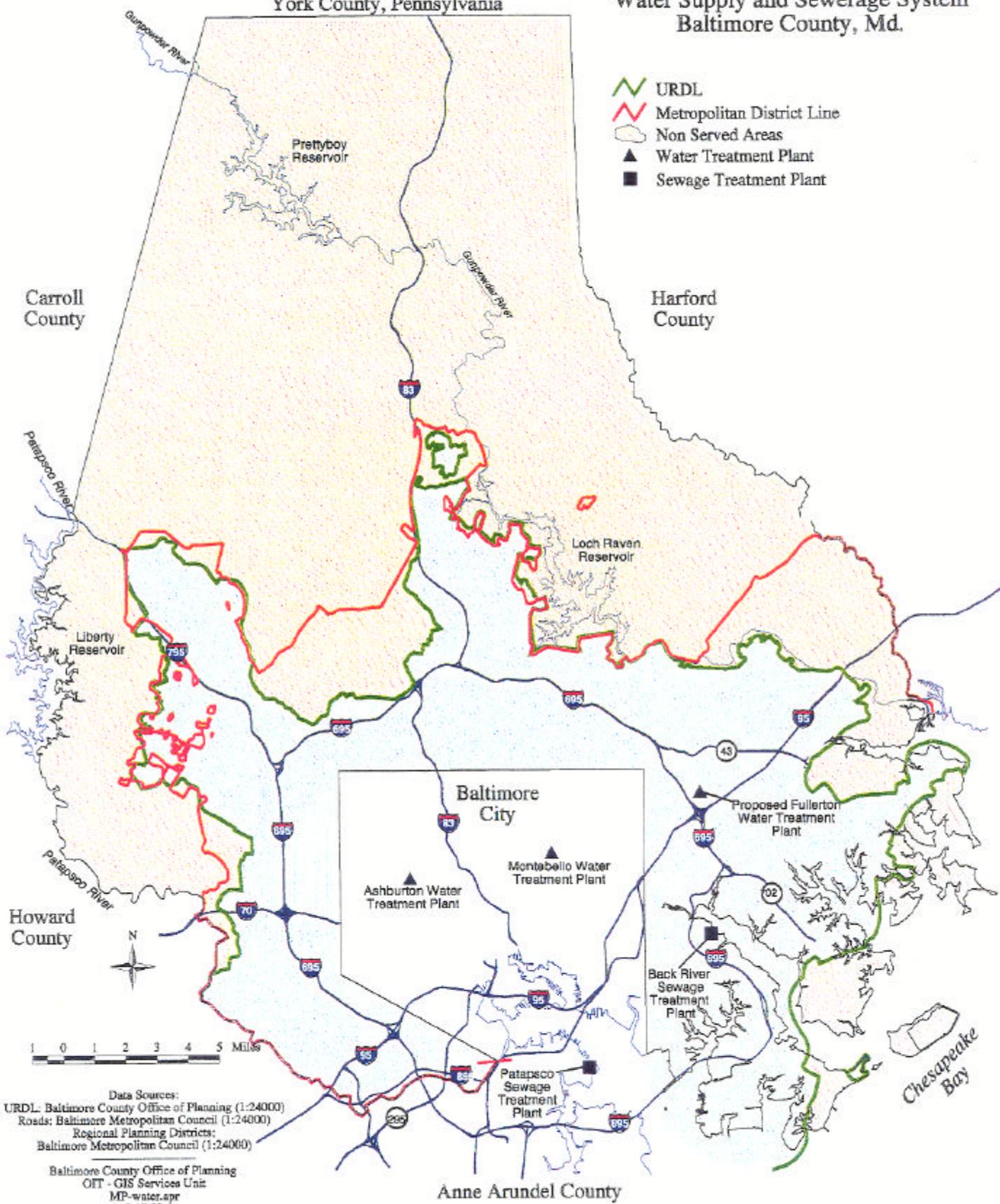
3 *Septic Stats, An Overview*, National On-site Demonstration Project, Small Flows Clearinghouse, West Virginia University (1998).

Figure 1

York County, Pennsylvania

Water Supply and Sewerage System Baltimore County, Md.

-  URDL
-  Metropolitan District Line
-  Non Served Areas
-  Water Treatment Plant
-  Sewerage Treatment Plant



On-site water and sewer systems are privately owned and maintained. Yet because of health and environmental issues, they present a public concern. Recognizing this fact, the Baltimore County government has become involved. The county government prohibits the discharge of sewage, except with a permit, into any waters of the county or onto the ground surface, streets or roads.⁴ The county actively enforces the ordinance along with another county ordinance that requires abandoned well and septic systems to be left in such a way as not to injuriously affect the public health.⁵ The county also issues building permits for drilling wells and installing septic systems, and county personnel are engaged in site and design issues. Furthermore, the state requires county involvement when nonconventional septic systems are at issue.⁶ Specifically, state agencies and DEPRM receive proposals for the installation of nonconventional septic systems, along with other related reports required by the state. Along with state officials, the county must approve the design and site of the installations. Local authorities also are required by the state regulation to monitor the nonconventional systems for several years.

Yet, this involvement to date may not be enough. The problems caused by failing septic systems persist and federal and state governments are calling for more and more effort. Specifically, several years ago the federal government established management measures requiring state governments to manage the siting, design, installation, and operation of on-site sewage disposal systems

(OSDS).⁷ Those measures require the following:

- Development of setback guidelines and official maps showing where conditions are suitable for conventional septic OSDS installations;
- Siting, design, and construction that provides sufficient separation between the soil absorption field and the seasonal high water tables;
- Assessment of site suitability prior to issuing OSDS permits;
- Minimal densities of development in areas that require the use of denitrification systems;
- Local plumbing codes that require practices that are compatible with OSDS use;
- Siting, design and construction that are appropriate for protecting surface water and ground water;
- Site designs that provide for a possible backup soil absorption field in case of failure of the first field;
- Soils that are not compacted in the primary or backup soil absorption field area;
- Post-construction inspections of OSDS.

4 Baltimore County Code, Section 35-74.

5 Id. Section 35-176.

6 See COMAR, 26.04.02.06.

7 See Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Water, Environmental Protection Agency, Office of Water, issued under the authority of Section 6217(g) of the Coastal Zone Act Authorization Amendments of 1990.

Through state regulations, Maryland has adopted many of the federal management guidelines.⁸ The regulations basically call for work at the state level, rather than at the local level. Nonetheless, other state regulations are being drafted that appear to require local effort. Specifically, a proposed set of regulations was circulated in the spring of 1999. They require, among other things, enforcing OSDS maintenance standards, tracking the frequency of maintenance, and certifying persons engaged in OSDS inspections. According to DEPRM, the proposed regulations, if approved, will require Baltimore County to hire more local staff to do the work.⁹

Yet aside from state and federal mandates and aside from persistent health and environmental threats from OSDS, another related issue reinforces the need for official action. According to DEPRM, conventional corrections of OSDS problems may be unavailable in some geographical pockets of the county.¹⁰ The problems arise from environmental constraints such as limited lot size, shallow water tables or impermeable soils. According to DEPRM, communities at risk today include Phoenix, Freeland, Baldwin, Monkton, Hereford, Jacksonville and Kingsville. Phoenix and Kingsville appear in immediate need of correction. The rest can wait, but not indefinitely.

8 See COMAR, 26.04.02 and proposed revisions.

9 Letter to James Dieter, Maryland Department of the Environment, re: Review of proposed changes to 26.04.02 and 26.04.03, dated 3/24/99.

10 Baltimore County Department of Environmental Protection and Resource Management. (1998). *Problem Areas for On-site Sewage Disposal Systems in Baltimore County*, Towson, MD.

Because these pockets are beyond the boundaries of the Metropolitan District or in "no planned service areas" within the Metropolitan District, no easy way exists to bring them water and sewer services.¹¹ OSDS failures in these areas will require alternative, often more expensive, systems than in other, more environmentally forgiving areas. The expense of these systems is an important issue. Whenever these alternative systems can be installed on-site of the property being served, the cost may be prohibitively high for some property owners. In the face of these costs, what can property owners do? An equally pressing concern, however, was raised in the recent DEPRM report on OSDS failures in Baltimore County.¹² The report concluded that community based-systems are the most appropriate alternative corrections in some areas of the county.

This conclusion opens up a range of issues for local policymakers. Community-based systems serve the sewage needs of multiple properties in a specific geographical area. Yet in rural Baltimore County, how could these systems be funded, installed, operated and maintained? No entity like the Metropolitan District exists to do the work. Should Metropolitan District boundaries be expanded to permit operation in these areas? If not, should the county government itself do the work? Perhaps the county would be better off setting up an entity like the Metropolitan District to provide water and sewer services in rural parts of the county. Or alternatively, perhaps self help is the answer. Government's

11 Certain laws also prohibit the direct discharge into reservoir watersheds and degrading waterways. These prohibitions add to the difficulty of addressing septic failures in the area.

12 See Note 10.

role could be confined merely to organizing a private response to the problem, with affected property owners in the end acquiring, running and maintaining their own community-based systems.

Whatever option ends up being chosen, the choice must be made with due consideration to a fourth issue: the need for community water and sewer systems to support the county's growth plans. Two concepts included in the Baltimore County master plan--rural commercial centers and rural villages--probably cannot be implemented unless community water and sewer systems are available.

The concept of rural commercial centers is presented in the proposed Master Plan 2010 as areas where retail and office service uses are concentrated. It is essentially the same as the rural center concept described in the *1989-2000 Master Plan* as "commercial areas which function or should develop to function as the commercial center for the surrounding resource residential area."¹³ The 1989 description continued, "Such a center should have a grocery store, restaurant, pharmacy, bank, gas station and other limited convenience retail and service establishments. These areas may also be appropriate for office and community services such as libraries and senior centers."

Hereford and Jacksonville were identified as rural centers in the 1989-2000 plan. They are identified as rural commercial centers in the proposed plan. Yet, the proposed Master Plan 2010 acknowledges that Hereford and Jacksonville are among the rural areas with

marginal soil conditions and small property sizes.¹⁴ The impact these environmental constraints will have on development is not explored in the proposed plan. Nonetheless, DEPRM identifies these environmental conditions as being problematic for installing OSDS corrections in the Hereford and Jacksonville areas, as noted above. Residents of Hereford, in fact, petitioned for annexation into the Metropolitan District to obtain centralized water and sewer services.¹⁵ To the extent the proposed plan touches on the issue of water and sewer services in these areas, it does so by stating that the county needs to "provide infrastructure support such as stormwater management."¹⁶ It further recommends evaluating a rural sanitary district as a mechanism for addressing rural water supply and sewage disposal problems.¹⁷

The concept of rural villages appears in the *1989-2000 Master Plan*. However, its meaning has changed in the proposed Master Plan 2010. In the earlier plan, rural villages were described as small rural crossroad commercial areas appropriate for a diversity of uses such as tack shops, garden centers and

13 Baltimore County. (1990). *Baltimore County 1989-2000 Master Plan*, Towson, MD, p. 142.

14 Baltimore County. (May 1999). *Master Plan 2010*: Towson, MD, pp. 169-70.

15 The remote area of Sunnybrook was annexed into the Metropolitan District in the 1960s. In the 1990s, a similar arrangement was proposed for a Phoenix neighborhood to solve a groundwater contamination problem. Baltimore City, which shares governance of the Metropolitan District, opposed the action, questioning the district's authority to annex noncontiguous areas. Consequently, the Hereford petition for annexation into the Metropolitan District has not been considered.

16 *Id.* at 160.

17 *Id.* at 150.

convenience stores but not intended to provide a complete range of services.¹⁸ Baldwin, Butler, Fork, Fowlesburg, Glen Arm, Kingsville, Maryland Line, Stevenson and White House were identified on the northern sector development policy plan map as rural villages.¹⁹ In the proposed Master Plan 2010, these communities (except Fowlesburg) are identified simply as villages.²⁰ Along with the two rural commercial centers, they are candidates for new nonresidential development. In contrast, the proposed plan presents rural villages as a concept for future residential development and a possible receiving area for a transfer of development rights (TDR).²¹

According to the proposed plan, the rural village concept "concentrates small pockets of development, with a consistent rural scale and appearance, in specific locations so that larger agricultural or environmentally sensitive areas can be preserved."²² A mix of housing types and lot sizes is provided with a maximum of 200-330 dwelling units." Preferred locations would minimize impact on agriculture and resource preservation and could include existing rural commercial centers, rural residential areas (Chestnut Ridge, Freeland, Hereford, Kingsville, Jacksonville and Patapsco) and certain fringe areas.

18 Baltimore County. (1990). *Baltimore County 1989-2000 Master Plan*, as adopted February 5, 1990, p. 142.

19 *Id.* at 130-31.

20 Baltimore County. (May 1999). *Master Plan 2010: Baltimore County, Maryland, Proposed*, p. 182.

21 *Id.* at 180.

22 *Id.*

The plan recognizes that the rural village concept may involve development that is too dense to rely on well water and septic systems. Among other action items regarding rural villages, the proposed master plan recommends determining the economic and environmental feasibility of providing water and sewage systems.

Master Plan 2010 comments that reliance on individual well and septic systems results in a development pattern that takes on a haphazard appearance and consumes large quantities of land.²³ The concepts of rural commercial centers and rural villages are presented as desirable alternatives. However, the land use patterns and development densities of rural commercial centers and rural villages are the same patterns and densities that have overtaxed OSDS in many of the county's existing rural communities. Alternatives to OSDS must be provided to implement the rural commercial center and rural village concepts. If OSDS is the only approach available, new development will continue to require large quantities of land.

Organizing a Response

The discussion thus far identifies four problems that today confront policymakers in Baltimore County:

(A) the proper maintenance and operation of OSDS, which have a critical impact on the health of county residents and the environment;

(B) the federal government's--but particularly the state's--more aggressive

23 *Id.* at 179.

commitment to closer inspection and regulation of OSDS, which will potentially require county resources;

(C) the projected use of community-based systems in treating OSDS failures in rural Baltimore County, as well as the expense of alternative OSDS for certain property owners; and

(D) the need for community water and sewer systems to support the county's growth plans:

None of these concerns can be tabled for any length of time; all seem to require attention. The question becomes how policymakers should respond.

A closer look at the four issues shows they can be divided into two categories. The first two problems deal with management of on-site water and sewer systems. The proper siting, design, operation and maintenance of OSDS are central to eliminating health and environmental threats and are behind the bulk of federal and state regulations. The third and fourth issues concern developing the infrastructure needed to meet rural water and sewer needs, including correcting existing problems and closing the gap between the master plan and water and sewer capacity in certain areas. The following sections of the report explore these groupings of issues further.

...the... OSDS... rural... Baltimore County... growth plans... health and environmental threats... federal and state regulations... infrastructure... water and sewer capacity... sections of the report...

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Management of On-site Water and Sewer Systems

For most of the 20th century centralized water and sewer services were considered by many as the only reliable, long-term solution for handling these problems. Private wells and OSDS were viewed as temporary solutions or, at any rate, second-best alternatives. But the usefulness of centralized water and sewer services over the years has been thrown into question by rising costs, dwindling federal and state grants, stricter treatment and discharge standards, and higher per capita costs. Today, individual and community-based water and sewer services are enjoying a renaissance of sorts among residential and commercial users. OSDS and individual water supply systems are being increasingly recognized as long-term solutions when they are properly managed. Yet, here is a problem: These systems are privately owned and operated.²⁴ To ensure the viability of these private systems--and to protect the environment and public health--local officials are challenged to develop strategies to assure that private owners properly operate and maintain their systems.

A variety of management schemes can be used to deliver services. They range from having the property owner retain full responsibility for all maintenance activities with little public oversight to having a public entity take responsibility for everything. Advantages and disadvantages apply to each

approach. The following describes a range of approaches that might be used.²⁵

Public Education Approach. The program goal is to provide property owners the information they need to properly operate and maintain their systems. Program activities include creating and distributing packets of information and community outreach programs that present educational material in public forums. The program can be managed by DEPRM.

The advantages to the approach include keeping property owners involved in caring for their systems and in keeping program costs low. Because the approach relies on voluntary compliance, the disadvantages include the difficulty of ensuring compliance with proper operating and maintenance standards. But a more serious problem concerns compliance with proposed state regulations. They propose, among other things, enforcement of OSDS maintenance standards, tracking the frequency of maintenance, and certifying persons engaged in OSDS inspections. If county government is to be responsible for those activities, as DEPRM suggests it might, then a purely educational approach is insufficient. Nonetheless, it is easy to value the contribution education makes to resolving OSDS and water-related problems.

System Guarantee Approach. The goal of this approach is for designers and installers to guarantee the performance of new or modified systems. As long as owners care for

24 The Maryland Office of Planning also believes that OSDS and community-based systems promote sprawl development and that consequently, these technologies should not be permitted. In effect, the position would eliminate development in rural areas. Memorandum from Richard E. Hall, Maryland Office of Planning to Lauren Wenzl, Department of Natural Resources, RE: Comments for the Septic System Taskforce Final Report (July 1, 1999).

25 The schemata is taken from *Guidance Handbook for On-site Sewage System Monitoring Programs in Washington State*, Washington State Department of Health (1996).

their systems in the proper manner, then designers and installers can correct any problems at no charge during a specified period (the guarantee period). DEPRM can oversee the program and evaluate the work of designers and installers.

The advantages include providing a strong incentive for property owners to properly care for their systems. Designers and installers are motivated to do their best work and provide good instructions for the proper care and maintenance of the system. The disadvantages include the fact that existing systems are unaffected by the program, and those systems to which the program does apply are only covered during the guarantee period. In either case, another monitoring strategy is needed. The act of requiring contractual guarantees for system installation and modification also is likely to require state approval: a disadvantage. Another problem is the eruption of disputes over the causes of system failures and the ability to verify that property owners actually maintained their systems in the prescribed manner. Finally, by itself the program does not accomplish maintenance tracking that proposed state regulations require.

Loan Certification Approach. In this approach, the county requires an inspection of each system as properties are sold or refinanced. The purpose of the inspection is to assess the condition of the system and to review maintenance records. Furthermore, as a result of the inspection, the program places specific conditions on system operation and maintenance and further serves to educate property owners about operation and maintenance issues. Under this approach, staff from DEPRM or private firms conduct the inspections.

We note that Baltimore County currently inspects well water for its bacteriological and chemical quality when real property is conveyed.²⁶ The county code also calls for the periodic yield-testing of wells, and the test results are valid for three years.²⁷ No similar ordinance or law requires an inspection of OSDS upon conveyance or at any other time.²⁸

The advantage of a loan certification approach is that it provides an orderly way to deal with the majority of systems. It is a relatively simple and low-cost alternative. Program costs are included in the loan certification process, which alleviates the needs for new funding sources and for routine billing of fees. Also, access to properties to conduct the inspection, which can be an issue in some cases, is not significant under this approach, since the certification--and the resulting inspection--would be required by law and, presumably, by lenders as well. This approach also covers state proposals calling for inspections, maintenance tracking and certification of inspectors.

The obvious disadvantage is that the program only affects properties that are sold or refinanced. Many systems are inspected at irregular intervals, if at all. Enforcement of the specific conditions placed on system operation and maintenance is not addressed in a loan certification program. The program needs the cooperation of lenders and private businesses engaged with inspections.

²⁶ Baltimore County Code, Sections 35-38 & 35-39.

²⁷ Id. at Section 35-37.

²⁸ Nonetheless, certain private lenders in Baltimore County require OSDS inspections before approving property transfers, according to county officials.

Operational Permit Approach. This approach requires issuing permits for all individual water supply systems and OSDS, which would be valid for a period of time. When the permit expires or when systems are installed, repaired or modified, a new permit is issued. The permit provides specific instructions and schedules for operating and maintaining the system, recording maintenance and monitoring activities, and reporting inspection and maintenance activities to DEPRM on a regular basis. The agency running the program charges fees to cover program costs and collects them through a separate billing process or local property tax statements. The agency records the information generated by the program and issues notices and bills.

The advantages of the approach include its ability to apply uniformly to all systems. It provides a high level of assurance for systems covered under the permit program. It provides a means to collect good information on permitted systems. Because requirements are stated in the permit, enforcement is easier than if such requirements did not exist. Finally, the approach allows property owners to retain control and exercise responsibility for their systems. They can contract with maintenance specialists to do the work and report the information, as required by a permit.

The disadvantages include the need for acceptance of a major changes in the regulation and management of OSDS and individual water systems. The fact that additional staff may be required to run the program, even if inspections are handled by system owners and private firms, also is a negative factor. The approach hinges on obtaining legal access to property if inspections are done by agency personnel. Access is less an issue when private

businesses inspect the systems because access typically is a subject settled in the contract that exists between the parties. Finally, a problem initially exists in requiring compliance from all system owners when information on existing systems is incomplete.

Public Authority Inspection Approach. This approach uses a public authority, if one exists [e.g., the Department of Public Works, the Metropolitan District or the Maryland Environmental Service (MES)], or one that is established if an appropriate public authority does not exist. In any event, system owners are required to contract with the public authority for periodic inspections of their systems. The public authority maintains records of inspection. If the public authority is independent of the county government (e.g., MES or a newly created entity) then the following occurs:

- (1) The public authority forwards the records to DEPRM;
- (2) When problems with a system are encountered as a result of an inspection, the public authority notifies the agency;
- (3) The agency then enforces the standards in effect.

If the public authority is already part of the county government (e.g., the Department of Public Works or the Metropolitan District), then most of the above activities are performed and coordinated with DEPRM.

Advantages to this approach include enhanced confidence by property owners in the objectivity of the program because inspections and maintenance suggestions come from a party without a profit motive. Because the county, likely, will wield control over the broad policies and practices of a public authority (the exception would be

MES), the county can be confident of the effectiveness of the public authority. A public authority allows DEPRM to concentrate on oversight responsibilities. Finally, access to property is not an issue under this approach due to the contractual nature of the arrangement and the statutory authority under which the public authority would operate.

Disadvantages include the possibility that in Baltimore County a public authority might need to be created to perform these tasks. Private businesses are affected by the opportunities lost when a public authority performs this type of work, unless the public authority itself contracts with private businesses to do the work. Lastly, the government may have difficulty enforcing the requirement that system owners contract with the public authority.

Public Authority Maintenance Approach. In this approach the public authority is responsible for maintaining the systems. The public authority conducts inspections and performs all maintenance activities, such as replacing pumps and system components. The owner is relieved of maintenance responsibilities but may be required to modify or change certain practices (e.g., pouring chemicals down drains). The public authority charges an annual fee that incorporates the cost of ongoing maintenance. The system owner pays additional amounts only for repairs and for replacing parts.

The advantages of the approach are the assurances that the systems are properly maintained. Complete information is available on all systems. Note too that this approach can still use the services of private businesses by placing them under contract for inspection and repair work. Alternatively, the authority can

do the work itself. Through economies of scale, the pooling of maintenance costs should over the long-term save owners money. The timing of payments for maintaining the systems is predictable, if not the amount of the payments.

Disadvantages include the possibility that owners, with little direct responsibility for their systems, may be less careful in using their system. If this possibility were to become fact, the maintenance costs are greater than would otherwise be the case. Access to property is a legal problem, although not insurmountable. Cooperation of owners cannot be assured. If the public authority performs the inspection and repair work itself, employees must obtain the technical knowledge, skills and abilities to service and replace a system. Additional staff and resources may be necessary to implement the approach.

Examples of Monitoring Programs

Perhaps because state law does not currently require inspections, no Maryland county has established a program to inspect OSDS or individual well systems, yet all perform inspection and monitoring functions to some extent. For example, counties inspect wells when yield problems become apparent, when wells need replacement or when new additions are built onto structures that use well water. Similarly, counties inspect OSDS when problems are brought to their attention, as in the case of OSDS overflows, or when nonconventional systems operate in an area. But no county in Maryland currently fields a program to inspect these systems periodically and routinely as a matter of course--for example, every three or four years.

Yet certain activities are being done in many counties. The On-site Sewage Disposal Task Force reports that all but three counties distribute at least some information about proper OSDS maintenance and operation. A little more than half the counties maintain at least some data on OSDS, although no county collects information about maintenance and operation. The task force confirms, however, that no county in Maryland notifies system owners that systems need periodic pumping.

While Maryland counties are mostly inactive in the area of regulating and tracking OSDS, two counties (Anne Arundel and Howard) actually own septic tanks attached to private homes. These tanks are part of a community system, or a shared facility system, where individual tanks are linked together and where waste is collected and then pumped to a common septic field or to a treatment plant. Because these tanks are part of a communal system, they are somewhat outside the scope of this discussion of OSDS, as we have defined the term. Nonetheless, resolving septic problems in Maryland through public ownership of (typically) private systems is an innovative solution that is worthy of attention.

Without local programs as illustration, out-of-state OSDS programs for inspection and monitoring must be used. Washington and California have been particularly active in this area, but several other states have as well. Though many states have not launched similar programs, many have. The following are some interesting examples.²⁹

²⁹ The following examples are outlined in *On-Site Sewage System Monitoring Programs in Washington State*, Washington State Department of Health (April 1996) and in *A Manual for Managing Septic Systems*, National Small Flows Clearinghouse, West Virginia University (1994).

Allen County, Ohio. Since the mid-1970s, the local health department in Allen County, Ohio, as in many counties in the state, has issued operational permits for all newly installed OSDS. Department personnel inspect the systems. Certain systems (aerobic systems) are inspected annually; all other systems are inspected for loan certifications or in response to complaints. The inspections are focused on observable conditions and observable system components. No lab work is done. The department also maintains files of inspection results and schedules of inspections.

The program is funded through permit fees. The basic fee is \$5 annually, but those systems that require annual inspection are charged \$25 annually. In addition, large systems are charged \$25 to \$150 annually, depending on the amount of water they use. System owners continue to be responsible for all costs related to maintenance (including pumping), repair and replacement.

Cayuga County, New York. Over a seven-year period, this county is phasing in a program to permit and inspect OSDS, after a popular lake tested at high coliform levels. The most sensitive areas of the lakeshore were targeted first.

The program issues permits that specify operation and maintenance requirements. The permit expires on a specified date, and the OSDS owner must obtain a new permit upon expiration of the old permit. The permit requires periodic inspections of the system, which are performed by certified inspectors whose names are given to system owners at the time they receive an OSDS permit. Property owners cannot inspect their own systems. Inspection requirements depend on the class and location of the OSDS. Properties bordering the lake, for example, are inspected

once every two years; other properties are inspected less frequently. Systems that fail to meet standards but that otherwise operate properly are granted a permit requiring more frequent inspections. Systems that fail altogether must be repaired or replaced before a permit is issued. Inspection is mandatory at the time a property is sold. Inspections are limited to observable features when no covers are lifted.

The initial program was grant funded. At the time the authors of this report were gathering information, no fees were being assessed. But program funding is expected to evolve as grant support diminishes. Nonetheless, an initial fee of \$300 is assessed to certify inspectors (certification is by the local health department). The certificate is valid for two years. Renewals cost \$100 and are valid for two years.

Santa Cruz County, California. This county provides an inspection program that begins with classifying each system into one of six categories (standard system, alternative systems, low-flow system, etc.). The classification determines operational requirements, fee schedules, inspection frequencies and property restrictions. Standard systems are inspected every six years, while all other systems are inspected every one to three years, depending on their type and proximity to surface or drinking water. The local health department performs all inspections. No components are uncovered during inspections unless a problem is suspected. No permits are issued (the practice was discontinued in 1993), but educational material about maintenance and operation are provided. The local health department also administers a public information program that conducts public outreach programs and prepares and distributes brochures.

The program is funded through two sets of fees. All parcels served by OSDS are assessed an annual fee of \$6.50 to pay for data management, education, water quality monitoring and certain capital facility needs. However, properties located in a particular watershed are assessed another fee to pay for inspections, studies and other services. Depending on the type of system, annual fees range from \$21 for standard OSDS to \$958 for experimental systems. The fees used to be collected through direct billing, but the process was reportedly ineffective and expensive. Today the fees are included on property tax statements.

Stinson Beach, California. In this county, a water district administers a program that issues permits for all OSDS, specifying the design flow for each system, proper operation and maintenance, and inspection schedules and results. Holding tanks are inspected monthly or quarterly, while systems themselves are inspected every one to three years, depending on the type and condition of the system and the sensitivity of the parcel. Inspections also are performed at the time of property transactions. Inspections include uncovering systems and dye checks, if necessary. The district maintains files of various information on each system. It conducts an educational program too, through written articles and discussion forums.

The program is funded by assessing property owners \$53 every two months to pay for inspections, water quality monitoring, reporting, database management and other administrative services. Additional fees are charged for monitoring special systems and certain other conditions.

Island County, Washington. This county established a program run by the local health

department based on voluntary participation by system owners. The program requires systems to be inspected every three years. An owner can inspect the system herself or can contract with a certified professional for the service. Mobile home parks, recreational vehicle parks and communities that own a system are required to report inspection and maintenance results. Other property owners are not required to report results, but professionals who perform the service are required to report results to the county. If the county has no record of inspection results for three years, the county sends reminders to system owners. The county department maintains a data base of ownership, location, inspection and pumping results. No fees are attached to the program.

Clark, Klickitat, and Skamania counties, Washington. The Southwest Washington Health District adopted a monitoring program in the early 1990s that issues permits for new systems. Existing systems are brought into the system on an ongoing basis. The permits specify operation, maintenance and monitoring requirements. Inspections usually are required every four years and property owners are notified when a system is due for inspection. Property owners can do the inspections themselves or can contract for the service. They have six months from the date of notification to complete the inspection and report the results to the district.

In 1995 the district budgeted \$177,000 for the program. It charges \$10 to issue a permit. It charges a tipping fee of 3.5 cents per gallon for septage disposal.

Sussex County, New Jersey. In response to proposed state regulations in the early 1990s that required counties to establish OSDS management programs, Sussex County

created four demonstration projects throughout the county, entirely funded by grant monies.

The demonstration project for the Culver Lake area required the county government to distribute educational material and for all owners of septic systems to submit a plot sketch of their systems. Furthermore, the owners of any property that was being sold or transferred that contained an OSDS were required to have their system inspected. The project found that a significant number of systems needed to be upgraded to have a positive affect on water quality. The plot sketches reportedly provided much needed information that was previously unavailable.

The Cranberry Lake demonstration project required all homeowners to obtain a system operator's permit that was to be valid for three years. Renewals were conditional on submitting a plot sketch of the septic system and providing proof that the system had been pumped out, a waiver had been granted by the local board of health or a licensed professional certified that pumping was not required. Educational materials were distributed to property owners.

The Hopatcong Borough demonstration project required an operators license to be issued to every system owner, after inspection by a private contractor. Licenses needed to be reissued prior to property being sold or transferred or after three years. If inspection found that the system needed repair or pumping, a license would be issued when work was completed. A one-time fee was charged of \$50.

The Sparta Township Germany Flats demonstration project excluded residential septic systems but focused entirely on

licensing all commercial and industrial systems. Proof of inspection and pumping were required every three years for license renewal. Survey and inventory forms were required of system owners. Administration was performed by the local health department.

None of these demonstration projects was actually implemented. The proposed state regulations that put these projects in motion were revised. The revision eliminated mandatory inspections of maintenance standards. The revised regulations required only that boards of health notify homeowners every three years that they should have their septic systems inspected or pumped out. The Sussex County demonstration projects stand as a reminder that preparing a local response to proposed state regulations can be problematic.

Evaluating An OSDS Management Program in Baltimore County

The need for an OSDS management program in Baltimore County is premised on several factors. First, more than 38,000 households in the county are dependent on septic systems. DEPRM estimates that 750 systems fail chronically in Baltimore County and 3,800 systems may fail at least once in any given year, based on nationwide statistics. This would suggest that over one million gallons of wastewater each year reach the surface in Baltimore County and flow into yards, streets and streams. Contact with this wastewater can pose a significant health risk and contaminate wells, groundwater and drinking water sources and pollute rivers, streams and the Chesapeake Bay. Furthermore, failed septic systems can cause property values to decline. Sometimes building permits cannot be issued or their

issuance can be delayed until systems are repaired or replaced.

Despite these potential problems, OSDS are known to provide reliable, long-term solutions for handling wastewater, but OSDS must be properly designed, sited, operated and maintained. Since 1972 the state has regulated the design and siting of OSDS, but prior to 1972 design and siting were loosely regulated. According to DEPRM, some OSDS are now in "areas where environmental conditions are less than adequate for current use."³⁰ As for operation and maintenance, these activities can be as important as siting and design to protect against failing septic systems. Improperly maintained systems, moreover, are expensive to replace, costing anywhere between \$3,000 and \$7,000, and preventive maintenance is comparatively cheap, costing perhaps \$100 to inspect every few years and another \$200 to pump.

To date, the state has not regulated operation and maintenance. It has proposed regulations, which are now being circulated. Consequently, two questions now present themselves. How might Baltimore County respond in the face of proposed state regulations? How should the county respond if the state fails to act?

Proposed State Regulations

The Spring 1999 proposals for new state regulations on sewage disposal that impact an OSDS management program are as follows:

30 DEPRM, 1998, p 1.

(A) Permits issued for the construction of OSDS include a statement that septic tanks should be pumped every three years or at a frequency adequate to ensure solids are not discharged from the septic tank.³¹

(B) Sewage must be treated in a "sewage pretreatment unit" before the effluent is discharged to an approved OSDS area. The effluent discharge must meet certain chemical standards, specified in the proposed regulations. The sewage pretreatment units must be maintained to ensure the effluent discharge meets the proposed chemical standards. The "Approving Authority" (Baltimore County) must adopt a system of tracking and enforcement to ensure that maintenance is performed at the proper interval.³²

(C) When "advanced pretreatment units" [emphasis added] are used in lieu of septic tanks, the county may require samples be drawn to ensure that the total nitrogen discharge is within certain specified tolerances.³³

(D) High strength commercial waste must be pretreated to the equivalent of typical domestic sewage.³⁴

(E) The maximum effluent loading rate for multi-use, community and private systems is reduced.³⁵

(F) Those engaged in inspecting OSDS for a transfer of property must have completed a course of instructions in proper inspection procedure.³⁶

In reading through the proposed regulation, the state appears to be stopping short of requiring inspection of all OSDS. It is requiring that the owners of new systems be notified that periodic pumping is necessary, but does not require the standard to be enforced. In contrast, enforcement appears necessary for the proposed standards for commercial waste and maximum effluent loading rates. Furthermore, the certification of OSDS inspectors may require local recordkeeping and enforcement action when an OSDS inspector violates the regulation. It is, however, the tracking and enforcement requirement for advanced pretreatment units that may most alter county responsibility for OSDS.

The regulations that pertain to pretreatment units do three things: (1) They require an OSDS design that uses a pretreatment unit to receive sewage from all plumbing fixtures; (2) they establish operational standards for the pretreatment unit in regard to the discharge of effluents from the unit; and (3) they require tracking and enforcing maintenance standards. While tracking is a matter of recordkeeping, enforcement in this instance requires an inspection in one form or another.

31 Proposed changes to COMAR, Section 26.04.02.02.S.

32 Proposed changes to COMAR, Section 26.04.02.02.U & 26.04.02.05.A

33 Proposed changes to COMAR, Section 26.04.02.05.H.

34 Proposed changes to COMAR, Section 26.04.02.05.J.

35 Proposed changes to COMAR, Section 26.04.02.05.L.

36 Proposed changes to COMAR, Section 26.04.10.

Accordingly, the state is requiring counties to oversee or provide, in one form or another, an inspection program aimed at pretreatment units.

As written, these provisions suggest that nitrogen pretreatment units are required for *all* OSDS in the state of Maryland; that is, nothing in the language limits the application of these regulations to only certain OSDS. Consequently, without any more guidance, the promulgation of these regulations could mean that Baltimore County might need to establish an inspection program aimed at all OSDS in the county. However, this interpretation may be incorrect. Reportedly, the state is drafting the OSDS regulations in three phases. Only the first set of proposed regulations has circulated. When all the proposed regulations are available, the pretreatment units may only be required of OSDS located in *areas of special concern*. The definition of areas of special concern does not currently exist. It should appear in draft form sometime during of the summer of 1999.

Those involved in the drafting process suggest (broadly) that the definition will focus on areas that are most sensitive to pollution and that have the greatest impact on clean water. Areas of special concern include some or all of the following:³⁷

- watersheds, where septic systems have been identified as significant contributors of nutrients;
- buffers around reservoirs;
- wellhead protection areas;

37 The following list is taken from the Preliminary Report 5/24/99, Existing Systems Committee, State Task Force on OSDS.

- areas with concentrations of domestic wells;
- areas where septic failures cause a public health threat;
- areas where hydraulic or treatment failures occur because of high water tables or poor soils;
- areas contained within the Chesapeake Bay Critical Area.

Assuming the inspection program is aimed only at areas of special concern, then the number of properties so classified by state regulation would drive the size of a county's OSDS program. The more properties contained under the definition, the larger the program. Moreover, some OSDS are included under a state-required county program. What might that program look like?

Using the proposed regulations as a guide, the following activities would be minimally required:

- (A) Obtaining the location, names and addresses of those properties contained in areas of special concern.
- (B) Informing OSDS owners that pretreatment units are required on their systems and that the units must operate in conformance with state standards.
- (C) Ensuring that pretreatment units operate in compliance with state standards by requiring periodic inspections.
- (D) Maintaining records of the maintenance of pretreatment units and enforcement activities.

As possible additions to the program, Baltimore County could consider the following:

- (E) Distributing educational material to OSDS owners.
- (F) Tracking the frequency of pumping.
- (G) Requiring periodic pumping of a system at intervals county officials believe prudent.
- (H) Requiring all OSDS in the county to be subject to inspection.

Possible Management Approaches

Under the proposed state regulations, Baltimore County could not use the Public Education Approach, described earlier. This approach relies entirely on public education to ensure OSDS are operating well and does not fulfill proposed state standards. Also problematic is the System Guarantee Approach, which requires designers and installers of new or modified systems to guarantee their work for a period of time. This approach would seem to hold merit since the actions required by the proposed regulations involve modifying existing systems. A problem arises, however, in that Baltimore County does not have the authority to require a set of contractual guarantees between private parties. The county would need authorization from the General Assembly to exercise such power, or the General Assembly itself might enact an appropriate law covering this type of subject matter. The Loan Certification Approach also has shortcomings. This approach requires public or private entities to inspect OSDS when property is purchased or transferred. The problem here is that the

approach cannot guarantee that all properties affected by the proposed state regulations are inspected: only those that are sold or transferred are affected.

The Operational Permit Approach is better suited for the county government in this instance. This approach has Baltimore County issuing permits for those systems covered by the proposed regulations (and all other systems the county wants to cover in an expanded program). The permits are valid for a period of time and expire at the end of the period. An option is for the permit to expire not only at the end of a designated period but also after a triggering event, such as when a property is sold or transferred or when a system is installed, modified or repaired.

Under the Operational Permit Approach, obtaining a permit is conditioned on a satisfactory inspection, conducted by a state certified inspector from the private sector. A permit is issued when the applicant submits a copy of the inspection report that indicates the OSDS is operating within state standards. Recordkeeping under this approach would also indicate when an owner is operating without a valid permit. The county in these cases begins enforcement action. The cost of the program is covered by the permit fees and fees charged for enforcement actions.

A Public Authority Inspection Approach could also be used. This approach eliminates service activities by the private sector and requires instead that a public entity performs inspections. In effect, the system owner is required to contract with a public authority to conduct inspections. The public authority in question might be the Metropolitan District or a county department such as DEPRM. MES also might do the work under contract to the county. Alternatively, the county could create

a new public entity. State law allows the county to create a water and sewer authority to perform services such as those at issue.³⁸

Aside from inspection work, this approach can be crafted in different ways. One variation is for the public entity to conduct all the tasks associated with the OSDS management program: inspections, recordkeeping and enforcement. Perhaps for cost control purposes, another variation assigns inspection work to the public authority, but other entities are assigned the tasks of recordkeeping and enforcement. This latter variation is suitable if a new public entity is created or MES is used to do the inspection work. An entity already engaged in recordkeeping and enforcement, such as DEPRM, might be assigned those tasks regarding this OSDS management program.

Finally, a Public Authority Maintenance Approach also could be used in Baltimore County. Under this approach the owner of a system is totally relieved of the responsibility for maintenance but is required to operate the system according to guidelines established by the public authority and pays for repairs on the system. The public authority under this approach does all the maintenance work and, in one variation, actually acquires ownership of the systems under its charge. The program is paid from annual fees that cover the cost of ongoing maintenance.

The problem with the latter two options--the Public Authority Inspection Approach and the Public Authority Maintenance Approach--is that they cannot be justified when private businesses currently exist to perform the work.

38 MD. ENV. CODE ANN., Title 9, Subtitle 9 (1999).

Under either of the two options, government displaces private business. A glance through the local yellow pages shows dozens of OSDS service providers in Baltimore County. Displacing private business is justified when, for example, issues of health and safety require quality assurances that private businesses cannot provide. Certainly issues of health and safety are at issue in an OSDS management program. But no one has alleged that private businesses have not or cannot provide quality services. Moreover, to ensure that no problem will arise in this area, state officials this year enacted into law a requirement that anyone engaged in OSDS inspection pass a course of instruction on proper OSDS inspection procedures. Courses began in the summer of 1999. With this added protection in place, entertaining an action that would compromise private inspection and maintenance services in this area at this time is unsupportable. The discussion consequently turns to a detailed description of the best alternative available for an OSDS management program in Baltimore County.

The Operational Permit Approach in Detail

Program Size. More than 38,000 OSDS operate in Baltimore County. If each of these is inspected every three years, the potential size of the program involves 13,000 inspections annually or 50 each business day. However, the state appears to be targeting only OSDS operating within *areas of special concern*. This phrase is undefined to date. Nonetheless, if we estimate conservatively that one-third of all OSDS in the county fall within the definition, the size of the OSDS program in the county consists of 17 inspections each business day.

Who Performs Inspections. Under the program, OSDS inspectors who have passed the state-approved course in OSDS inspection procedures contract with system owners to perform inspections.³⁹ It is envisioned that the county provides the names of inspectors when it notifies system owners about the new program and whenever it notifies an owner that a permit was near expiration. It is the owner's responsibility to contract with an approved service provider.

Cost of Inspections and Pumping and Impact on Private Business and System Owners. The information available suggests that inspections for conventional septic systems typically cost about \$200. If an inspection is required once every three years, the annual cost to homeowners would be almost \$70. At this rate, the inspection business generates \$910,000 annually in Baltimore County, given a program size of 13,000 systems. According to the United States Environmental Protection Agency, proper maintenance normally requires pumping every three to five years. The available information suggests that pumping runs about \$150, depending on system size and type. If every system in the program is pumped once every four years, the annual cost for a system owner is about \$35, bringing total annual maintenance cost for each system owner to \$105.

Program Responsibilities. We anticipate that both DEPRM and the Department of Permits and Development Management

(DPDM) are responsible for the program. DEPRM essentially defines its needs for the program. DEPRM together with DPDM then designs the program in detail. DPDM administers the program as it does the other permit programs in the county. The following program activities are required:

1. Enact an ordinance creating the program.
2. Identify OSDS systems located in areas of special concern. Obtain names and addresses of OSDS owners. Obtain the names and addresses of all inspectors who work or could work in Baltimore County.
3. Determine the type of information DEPRM will collect and track. At a minimum this should include the type of system operated, the inspector's conclusion that the system is operating within established legal standards, whether or not the system is in need of pumping and, if it is not in need of pumping currently, the date on which pumping should be completed.
4. Create a form for inspectors to use to record the desired information. Create a prototype permit that is issued upon compliance with the program requirements that specifies the date of issue, the date of expiration and a statement describing the significance of the permit and the conditions under which OSDS operations are valid in the county.
5. Plan for a program that is phased-in over a three-year period, with one-third of the OSDS brought into the program each year. All OSDS inspectors and all affected OSDS owners are notified of the program and notified of the owner responsibilities under the program. One-third of the owners are targeted

³⁹ At some point, the county may wish to certify inspectors who operate in Baltimore County, rather than rely solely on the state program. Until the consequences of the new state program are clear, we cannot recommend a county certification program at this time.

for compliance within the first year by giving each a list of approved OSDS inspectors and the final date for filing the form that indicates program compliance; one-third are targeted in the second year; and the remaining one-third are targeted the third year.

6. Plan for a program that allows owners to forward compliance information and their fee payment to DPDM in person or by mail. Upon receipt of the information and fee, DPDM issues a permit allowing the owners to operate the system under the terms specified in the permit.

7. Clerking, cashiering and accounting functions are handled within the services and facilities DPDM currently provides. If an average of 17 permits is issued daily, the program is not expected to increase the personnel needs of DPDM. A DPDM clerk can handle the entire process of issuing a permit, and a professional reviews the documentation before a permit is issued. The form on which the desired information is displayed is crafted in a way that a clerk determines at a glance of the documentation whether or not an inspector has approved the system. If approved, the permit is issued. Data entry and database management functions focusing on the second process only are necessary from DPDM.

8. Data entry and database management might also be necessary. On a routine basis, the database is reviewed to see if any owner is operating without a valid permit. If an owner is in violation of the OSDS ordinance, then DEPRM mails a notice to the owner that he or she is in violation of the ordinance and that compliance must be attained within a specified period or the owner will be subject to the penalties for noncompliance specified in the law. If compliance is not obtained and

valid permit issued within the specified period, the matter is referred to the county attorney for further action.

Program Costs. Costs are expected to be nominal for the county. Conversations with officials in DPDM suggest that program costs can be absorbed without much, if any, additional resources being required. Costs associated with data processing are involved, but they too are minimal. The study team attempted to locate specific cost data on the proposed permit program but could not obtain it.

Required Ordinance. The county council needs to pass an ordinance, under the authority of Article 25A, Section 5(S), the Annotated Code of Maryland (the general welfare clause of the Express Powers Act for charter counties), that provides the following: (1) An OSDS management program exists; (2) under the program, system owners are required to have their system inspected at least once every three years by an approved inspector;⁴⁰ (3) a permit allowing the OSDS to operate in the county is issued if the inspection shows that the system is operating properly and meets the operating standards specified by the state of Maryland; (4) the system owner shall submit to the county documentation that an inspection was conducted, the date of the inspection, the results of the inspection, and a statement by (or otherwise some indication of) the inspector that the system operates properly and in accordance with state law; (5) upon

40 The three year time period is often what is seen in the literature describing inspection programs. DEPRM should study the issue and suggest the length of the cycle between inspections. For example, instead of three years, a better interval in Baltimore County might be four or five years.

Developing Rural Water and Sewer Infrastructure

The failure of some existing septic systems and the desire for dense development patterns in villages and rural commercial centers create a need for alternative on-site technologies as well as community water and sewer systems, that is, systems connecting one or more properties. This section explores the extent of that need and the possible approaches to developing infrastructure capacity to meet this need.

Existing Need for Rural Sewer Infrastructure

While all incidents of OSDS failures do not come to the attention of government officials, county agencies often learn about individual systems that experience continual or ongoing failures and about communities in which system failures are widespread. Figure 2 shows a map of the problem areas for sewage disposal for Baltimore County. As required by state regulations, each update to the county water/sewer plan includes a Sewer Problem Areas Inventory listing individual and community systems with active problems. The study team reviewed several inventories from 1984 to 1997 as well as a report published last year by DEPRM. The DEPRM report assigned priorities ranging from 1 (lowest) to 5 (highest) in 16 problem areas.

An assessment of the magnitude of the county's OSDS problems is presented in Appendix A of this report. Based on this assessment, the study team compiled a list of OSDS problem areas and potential solutions that are presented in Table 1.

The first six areas listed in Table 1 are identified explicitly in the DEPRM report as

candidates for community systems. Two of the areas, northern Kingsville and downtown Kingsville, are within the Metropolitan District. These six areas comprise 157 households/businesses on OSDS of which 29 have documented failures. Twenty-five of the documented failures are in the two areas given the highest priority for correction by DEPRM, northern Kingsville and Phoenix.

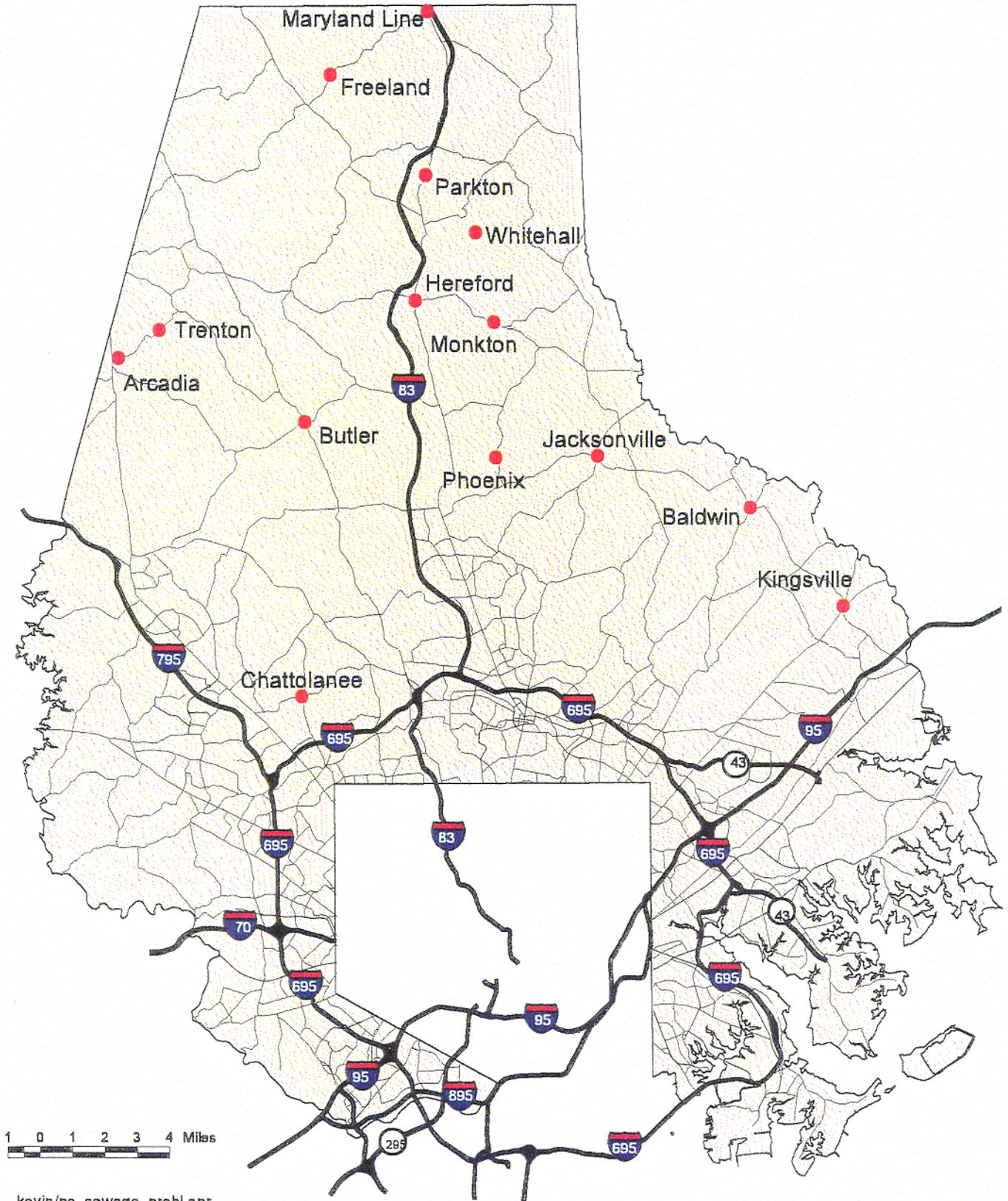
Nine other areas studied by DEPRM are possible candidates for community systems because individual corrections do not appear to be feasible. Although the DEPRM report did not state this explicitly, the report described conditions such as poor soils and small lot sizes that tend to preclude individual solutions. The nine areas comprise 234 households/businesses on OSDS of which more than 17 have documented failures. Most (14) of these documented failures are in Trenton where a number of homes are discharging wastewater into storm water drains that lead to streams. DEPRM assigned the next-to-highest priority for correction to Trenton. One of the areas in this group, Chattolancee, is within the Metropolitan District.

One area studied by DEPRM, eastern Kingsville, is listed in Table 1 as a potential candidate for alternative individual solutions because lot sizes are large enough to allow on-site corrections. Eastern Kingsville, which has seven failed systems among 24 OSDS users, was assigned the highest priority for correction by DEPRM.

The possible solutions to problems in the remaining areas listed in Table 1 are unknown. These problem areas were identified over the years in the county's

Figure 2

Problem Areas For Sewage Disposal In Baltimore County



1 0 1 2 3 4 Miles

kevin/pc_sewage_probl.apr
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Prepared By Information Systems
Baltimore County DEPRM

**Table 1
OSDS Problems and Potential Solutions**

Areas explicitly identified by DEPRM as candidates for community systems:	Priority	Metropolitan District	Properties on OSDS	Documented System Failures
Kingsville-northern	5	X	13	8
Phoenix	5		43	17
Baldwin	3		10	1
Kingsville-downtown	3	X	16	0
Hereford	2		50	0
Jacksonville	2		25	3
Total			157	29

Other possible candidates for community systems:

Trenton	4		16	14
Freeland	3		16	3
White Hall	3		29	0
Arcadia	2		27	0
Chattolanee	2	X	15	0
Parkton	2		36	0
Butler	1		14	0
Maryland Line	1		55	0
Monkton	1		26	some
Total			234	17+

Possible candidate for alternative on-site corrections:

Kingsville-eastern	5	X	24	7
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Problem areas with unknown solutions:

Chase (Marshy Point Road)	?	X	?	5
Essex (Island Point Road and portion of Eastern Avenue)	?	X	?	7
Loreley Beach	?	X	?	21
Perry Hall - New Forge Road	?	X	?	6
Perry Hall Manor	?	X	?	?
Riderwood	?	X	?	11
Riverview Park	?	X	?	6
White Marsh (Joppa and New Gerst Roads; Cowenton and Hornages Avenues; Holly and Snyder Lanes)	?	X	2	2
Total			?	56+

Source: DEPRM, 1998; Baltimore County. (1997). 10-Year Baltimore County Water Supply and Sewerage Plan 1990-2000: 1997 Triennial Review, Draft Report of the review as submitted to the Baltimore County Council, Towson, MD.

water/sewer plans. All are within the Metropolitan District and have not been studied by DEPRM.

Overall, the problem areas studied by DEPRM represent a potential need for 14 or 15 community systems, depending on whether northern and eastern Kingsville are treated as separate areas or combined. Additional community systems might be warranted to solve the problems identified in the water/sewer plans, which were not studied by DEPRM.

Existing Need for Rural Water Infrastructure

Both the county water/sewer plan and the DEPRM study of OSDS problem areas also provide information on water system problems. A review of this information is contained in Appendix B. Table 2 provides a summary of the rural water system problems identified by this review. The 11 problem communities listed contain a total of 285 properties.

In Hydes and Manor, where county facilities were responsible for ground water contamination, the county took corrective action. In Hydes, the county adapted an existing monitoring well to serve two homes with potential to connect an additional three households in the future. In Manor, the county drilled two separate wells to serve two households and acquired property for a third well to serve a local business. It is possible that in Manor, as in Hydes, contaminants already in the ground may affect additional properties in the future, requiring further action by the county. The third Manor well is capable of providing water to 15 properties.

The problems in the other communities in Table 2 remain unsolved. Since well users within each community are often drawing from the same ground water source, community solutions may be necessary and appropriate.

Water/Sewer Infrastructure for Rural Development

Every newly developed property requires water service and a system for disposing of wastewater. Consequently, the need for new water and sewer infrastructure is directly related to the amount of development taking place. Appendix C contains information on expected growth in the rural areas of the county and the resulting needs for water and sewer services.

Between 1997 and 2000, the nine regional planning districts that are almost entirely outside the URDL⁴¹ are expected to gain 815 households. Because no mechanism exists for these properties to be developed on community water and sewer systems, all these households will be served by individual wells and septic systems.⁴²

41 The county has established the Urban Rural Demarcation Line (URDL), a dividing line between areas designated for higher density urban development and areas designated for lower density rural development.

42 The exception is development in the Loveton urban area within the Sparks regional planning district, which is served by the Metropolitan District. The Sparks regional planning district is expected to receive 105 of the 815 anticipated new rural households between 1997 and 2000. The number that will be developed within the Loveton area is unknown.

**Table 2
Water System Problem Areas**

Area	Problem	Area Properties Served by Wells
Arcadia	Contamination from underground tanks at garage and from fire station floor drains; shared wells	27
Baldwin	Suspected septic system failures to ground water	10
Chattolane	Contamination; well setback variances	15
Hereford	Contamination due to road salting and septic system failures	50
Hydes	Contamination due to improper road salt storage	5
Jacksonville	Contamination from gasoline tanks; low well yields	25
Kingsville - downtown	Poor well yields	16
Kingsville - eastern	Poor well yields	24
Manor	Contamination due to improper road salt storage	15
Maryland Line	Contamination from underground storage tanks; well setback variances	55
Phoenix	Bacterial contamination due to poor well construction	43
		285

Source: DEPRM, 1998; Baltimore County, 1997.

During the period 2000 to 2010, an estimated 1,589 new rural households will be developed in the county. Master Plan 2010 proposes that some of this development be clustered in rural villages containing as many as 200 to 330 households. The density of development in these rural villages could preclude reliance on individual wells and OSDS. Furthermore, because of the size and density of development of these rural villages, community water and sewer systems may be cost-effective alternatives to individual wells and OSDS.

The study team estimates that between three and six large rural villages (200 to 330 households) could be developed over the next decade to serve between 600 and 1,200 of the 1,589 new rural households. The households projected for the Sparks, Chestnut Ridge-Worthington and Harrisonville regional planning districts are possible candidates for rural villages of this size. The new rural villages could be located within these districts or directed elsewhere through transfer of development rights. Another possibility is development of more than 100 small rural villages of 10 to 15 households. Nearly every rural planning district is a candidate for development of this type. In either case, each rural village would be served by community water and sewer systems.

Some of the new development in the next decade that is not directed to rural villages may be located in proximity to rural commercial centers, rural residential areas and existing villages in which community water and sewer systems are needed to alleviate existing problems. Both rural commercial centers and existing villages are identified by Master Plan 2010 (p. 182) as recipients of any additional rural commercial development. Rural commercial centers and existing rural

residential areas are identified as candidates for rural-village type development (p.180). Community water and sewer systems installed to correct existing problems could also be designed to make these communities more suitable for additional development. In some cases, the addition of households to these communities will reduce the cost per property of constructing and operating the community systems.

For example, some of the 29 new households projected for the Hereford-Maryland line planning district could be served by community sewer systems designed to correct problems in four existing communities: Freeland, Hereford, Maryland Line and Parkton, which currently have a total of 157 properties on OSDS. Similarly, some of the 150 households to be added in the Fork planning district, 51 households to be added in the Jacksonville district and 95 households to be added in the Kingsville district can be directed to the communities of Baldwin, Jacksonville and Kingsville where they could be served by community systems constructed to solve problems for the existing 64 properties.

Not all new development will be located in rural villages or adjacent to other community systems. Probably no more than 100 new households can be directed to the seven existing communities that are identified for growth and are candidates for community systems. Even with ambitious plans for developing rural villages and correcting existing problems using community systems, many new households developed during the next decade will have to rely on individual wells and OSDS. In some cases, property owners may have to install innovative technical solutions to deal with unfavorable site conditions.

Technical Alternatives for Rural Sewer Service

The vast majority of existing OSDS in Baltimore County are ordinary septic tank systems. In an ordinary septic tank system, wastewater from household drains (sinks, showers, bathtubs, washing machines and toilets) flows into the household sewer pipe that conveys it to the septic tank, typically a 1,500-gallon tank buried in the yard. The septic tank holds the wastewater for a day or more so that the solids and liquids separate. This is the first step in wastewater treatment.

Ordinary septic tanks have baffles to allow heavy material to settle out separate from the lighter effluent. The solids that are heavier than water sink to the bottom of the tank forming a layer of sludge. The solids that are lighter than water (grease, oils, toilet paper) float to the top and form a layer of scum. The middle layer of partially clarified wastewater flows out of the tank through an outlet baffle to a drain field (also called a soil absorption field).

Perforated pipes or drain tiles carry the wastewater through the drain field, which consists of a series of trenches or a bed lined with gravel buried three feet or more below the ground surface. The drain field treats the wastewater by allowing it to slowly trickle from the pipes into the gravel and down through the soil. The gravel and soil filter the water; organisms in the ground help to remove toxics, bacteria, viruses and other pollutants so that nearby ground water is not contaminated.

The layers of scum and sludge remain in the septic tank where naturally occurring bacteria break them down. Any scum and

sludge that does not break down remains in the tank and must be pumped out periodically.

According to Baltimore County officials, capital costs for ordinary septic systems average \$4,000 in 1999 dollars, with a probable range of \$3,000 to \$7,000. According to EPA, maintenance costs of ordinary systems average \$95 per household per year. (See Appendix D for cost information.)

The study team assumes that corrective measures using ordinary septic systems have been considered and rejected in the areas of the county with longstanding septic system problems. Solutions other than ordinary septic systems are needed to address many existing septic system failures. Alternative systems also may be needed for new development where site conditions are not favorable for ordinary septic tanks.

Alternatives to ordinary septic tank systems fall into two main categories: (1) individual on-site systems and (2) community systems. Community systems can be either cluster systems that utilize on-site technology to serve multiple properties or community systems with small wastewater treatment plants. Various technologies within each of these categories of alternatives are described below.

Alternative Individual Systems

The individual on-site alternatives to ordinary septic tank systems use alternative technologies for the pretreatment and disposal of wastewater. Pretreatment technologies that are alternatives to ordinary septic tanks are septic tanks with grease traps, aerobic

treatment units and fixed film units. Each system is briefly described below.

A grease trap is a concrete tank usually installed ahead of a septic tank to separate grease or cooking fats from the rest of the sewage. Grease traps are used primarily for restaurants or other businesses producing high-strength waste. They are relatively inexpensive, simple to install and require routine maintenance.

Aerobic treatment units (or aeration units) provide temporary storage similar to a conventional septic tank but have a mechanism to inject air into the tank. The aerobic environment promotes the growth of bacteria that degrade the wastewater contaminants. Aerobic treatment units can reduce nitrate levels by 90 percent or more. Cost data were not available for aerobic treatment units.

Several alternative technologies involve additional pretreatment of wastewater once it has left the septic tank but before disposal. These alternative technologies include recirculating filters, fixed film systems and constructed wetlands.

Recirculating filters consist of a bed of sand or shale through which effluent from a septic tank is recirculated several times before being discharged to a soil absorption system. Recirculating filters can reduce nitrate levels by 80 percent or more. The system is useful in areas that require very clean effluent, such as for ultimate discharge to a body of water. DEPRM estimates the average capital cost of recirculating sand filters as \$8,000 per household. This cost includes the pump chamber, alarm, electrical work and the filter itself, and is in addition to the other septic system components. According to EPA,

annual maintenance costs average \$195 per household.

Fixed film systems, like aerobic treatment units, rely on bacteria to degrade contaminants in wastewater. Fixed film systems incorporate media that increase the surface area and contact time for bacterial growth and degradation. Fixed film systems include trickling filters, upflow filters and rotating biological filters. DEPRM estimates the capital cost for the fixed film unit, including tank and compressor, at \$8,000. Again, this cost is in addition to the cost of the septic tank and drain field.

Constructed wetlands require sizeable land areas. They involve excavating an area and covering it with a waterproof synthetic or clay liner. The liner is filled with rock, gravel, sand and soil and is planted with aquatic vegetation, such as reeds. Wastewater flowing from a septic tank is treated by both the soil and the plants in this small natural wetlands. Often wastewater treated by wetlands requires additional treatment, such as disinfection or discharge to a drain field. DEPRM has no experience with constructed wetlands to enable it to provide cost estimates. EPA reports estimated average capital costs of \$1,000 per household, with a probable range of \$1,300 to \$4,000. Annual maintenance costs of \$35 per household are estimated.

Some common alternative technologies for individual on-site disposal are low pressure pipe (LPP) systems, also known as low pressure dosing (LPD), serial distribution systems and mound systems.

LPD systems rely on a pump to distribute wastewater uniformly in the drain field so as to prevent soil saturation. They are typically used in clay soils. The trenches are more

shallow and narrow than conventional drain field trenches. Perforated plastic drain field pipes are used. According to DEPRM, estimated average capital costs for LPD systems are \$8,000 per household, with a range of \$7,000 to \$10,000. Annual maintenance costs, as reported by EPA, average \$200 per household.

Serial distribution systems are appropriate for sloped sites. A series of trenches is dug across the slope, with each trench higher than the next. Each trench fills completely with wastewater then overflows through outlets to the next lower trench. No cost estimates could be found for serial distribution systems.

Mound systems are appropriate for sites with high water tables or shallow or tight soils that do not provide adequate treatment to the wastewater before it reaches ground water. A mound of sand is constructed above the plowed natural ground surface. The mound contains the gravel beds or trenches covered by a soil cap. Because the drain field is located within the mound, a pump is required to move the wastewater from the septic tank. According to DEPRM, the estimated average capital cost of a mound system is \$12,000 per household, with a probable range of \$11,000 to \$15,000. EPA data show estimated annual maintenance costs of \$240 per household.

A final individual alternative to an ordinary septic tank system is a sewage holding tank. These are concrete tanks designed to hold all sewage wastes generated by a facility. Sewage is periodically pumped into a septic waste hauling truck that transports it to a wastewater treatment plant. Sewage holding tanks are appropriate only for locations with low generation of wastewater or for temporary use while more permanent solutions are arranged. DEPRM estimates

average capital costs of \$5,200 per household with a probable range of \$4,000 to \$7,000. Estimated annual maintenance costs are \$2,860 per household, based on pumping out every other week at \$110 per load.

For failing systems that are far-removed from the Metropolitan District, replacement with ordinary individual septic systems is usually the first solution considered because it is the most economical alternative. In many cases in which this has not been a feasible solution, no action has been taken: the problem has remained. In severe cases, the property owner has been forced to install holding tanks, which must be pumped out frequently at considerable expense to the property owner.

Alternative individual OSDS systems have been used in Baltimore County for new construction. The alternative individual systems now in use in the county include recirculating filters, LPD systems and mound systems.

Community Systems

Where neither ordinary septic tank systems nor individual alternatives are feasible, systems that serve multiple properties are a possible solution. Generally, the terms *community system* or *community-based system* are used to describe a system serving multiple properties. The term *community system* nonetheless often signifies the existence of certain technical components in a system; specifically, a system in which untreated wastewater from multiple properties is collected and conveyed to a wastewater treatment plant. In contrast, the term *cluster system* often is used to describe a community-based system that requires pretreatment of

wastewater prior to conveyance and uses OSDS technology, such as drain fields, for treatment and disposal of wastewater. However, some cluster systems convey pretreated wastewater to a sewer main that transports it to a wastewater treatment plant rather than to a drainage field for disposal.

Cluster Community Systems

Cluster systems rely on a combination of on-site treatment and off-site treatment and disposal of wastewater. They typically employ alternatives to conventional gravity sewers to convey wastewater to the off-site treatment location. Cluster systems are appropriate where groups of homes and businesses exist on small lots or have poor soil conditions. Three types of cluster systems are in most common use: (1) septic tank effluent pumps (STEP); (2) grinder pump systems; and (3) small-diameter gravity sewers (SDGS). STEP and grinder pumps use pressure sewers, whereas SDGS does not. STEP and SDGS incorporate septic tanks, whereas grinder pump systems do not. A fourth type of cluster system, vacuum sewers, is also described below.

The STEP system relies upon a septic tank on each property for initial wastewater treatment, after which a submersible, low-horsepower sump pump pushes the wastewater through the collection system. Because the wastewater has received initial treatment and solids are broken up further by the pump, plastic pipes that are as small as one and one-half inches in diameter can be used to collect and transport the wastewater to final treatment.

Grinder pump systems eliminate the need for a septic tank on each property. Grinder

pumps are installed on each property, or one serves several properties. The grinder pump works like a garbage disposal, cutting up and grinding solid material in the wastewater into tiny pieces. The wastewater is then pumped out into the collection line.

In SDGS systems, like STEP systems, a septic tank on each property provides initial treatment. SDGS systems rely on gravity, rather than pumps or pressure, as the main force to collect and transport wastewater for final treatment. SDGS systems use plastic pipes that are three to four inches in diameter to accommodate any stray solids in the septic tank effluent. These pipes are still much smaller than the pipes used in conventional gravity sewers.

The relatively small plastic pipes used in STEP, grinder pump and SDGS systems greatly reduce the cost of the collection portion of system construction compared to conventional sewer systems. However, the pumps and pressurized pipes of the STEP and grinder pump systems do increase maintenance requirements compared to conventional sewers.

Vacuum systems rely on the suction of a vacuum, created by a central pumping station, to draw and transport wastewater through the system. Wastewater from a property enters an individual holding tank. When the tank contains a certain level of wastewater (usually three to 10 gallons) a valve opens, and the wastewater is sucked into the sewer main by a vacuum that has been created by pumps at a central pumping station. At the pumping station, the mains empty into a collection tank. The wastewater is then treated nearby or pumped to another location for treatment. Typically, pipes from the service connection to the collection tank are three to four inches

in diameter, and sewer mains are four to 10 inches in diameter. Maintenance costs of vacuum systems are relatively high.

According to the National Small Flows Clearinghouse (NSFC),⁴³ "Alternative sewers [such as STEP, grinder pump, SDGS and vacuum systems] may be a good option if the following factors exist:

- conventional gravity sewers and on-site wastewater treatment technologies have been determined to be inappropriate or too expensive;
- the population in an unsewered area is such that there would be 50 to 100 homes or less per mile of sewer line;
- homes are located in hilly, rocky, low-lying or very flat areas, or areas with shallow bedrock, a high water table or other site conditions that would make installing gravity sewers impractical; or
- areas are experiencing potentially costly problems with existing conventional sewers that are leaking or otherwise deteriorating."

Because STEP and SDGS systems are equipped with septic tanks for pretreatment, effluent can be discharged in a large, community subsurface soil absorption field similar to the smaller ones used for individual properties with septic systems. If site conditions are not conducive to a conventional drain field, mound systems, sand filters or other alternatives can be used in combination with subsurface discharge.

Sewage from grinder pump or vacuum sewer systems can be directed to large septic tanks prior to subsurface discharge. Alternatively, wastewater from these systems can be treated in lagoons.

A final treatment alternative for all the cluster systems described above is a conventional wastewater treatment plant. According to NSFC, "Many alternative sewer systems empty into a conventional sewer main that leads to a centralized treatment facility. This is sometimes the most cost-effective plan for communities that have this option."

An advantage of cluster systems is their flexibility in addressing spotty septic failures. Small cluster systems can be used for lots unsuited for on-site systems when they are interspersed with lots that have functioning on-site systems.⁴⁴

Currently, no cluster systems are operating in Baltimore County. Several past studies have proposed these systems, but the county has rejected them.

Cluster systems were among the alternatives considered in a 1984 study of septic failures in Back River Neck. One alternative was to connect Cedar Beach to Metropolitan District facilities, but to serve seven other communities with systems that incorporated individual septic tanks and a community sand filter. An alternative in which Cedar Beach and Holly Neck were to be connected to the central system and four community treatment plants would have served the remainder of the Lower Neck also was considered. Both alternatives were

43 NSFC, Fall 1996, p. 2.

44 E-mail correspondence from Mike Hoover, North Carolina State University, July 15, 1999.

rejected in favor of connecting all the communities with failures to Metropolitan District facilities, which is currently taking place.

In its 1992 study, MES concluded that the most cost-effective solution to 17 failing septic systems in old town Phoenix was to install a small diameter force main to carry wastewater to Metropolitan District pipelines. The pipeline would have transported the wastewater to a centralized treatment plant, with a single septic tank located just prior to the pump station. Under the MES design, each household would have had a septic tank. Wastewater would have flowed from the septic tanks to the collection system by gravity, although some of the households would have required effluent pumps. There also would have been a shared septic tank prior to the pump station to protect the system if property owners failed to pump their individual septic tanks.

The cost of the system proposed for old town Phoenix translates to \$331,000 in 1999 dollars, or roughly \$19,500 for each of the households served. (See Appendix D for more detailed cost data.) MES' recommendation was not accepted, and no action has been taken to correct septic problems in old town Phoenix.

Cluster systems have been constructed in other Maryland counties and in other states to address septic system failures and to serve new development. For example, Anne Arundel County operates two cluster systems in which individual properties are equipped with septic tanks. In one cluster system, septic tank effluent is collected for subsurface discharge in a community drain field. In the other cluster system, the effluent is transported

to a central treatment plant. Cost data were not available for the Anne Arundel systems.

In Howard County, cluster systems serve two new developments. The first system, which was constructed in 1994, serves 109 households. Each property is equipped with a septic tank. A pressure sewer system conveys septic tank effluent to polishing tanks and a community drain field located on preservation land. The system was installed by the property developer at a cost of about \$20,000 per household. Once the system was in place, the county took over ownership and operation of the system, including the individual septic tanks. Prior to beginning operation, Howard County conducted a study of anticipated system operating costs and set an annual fee of \$330 per household. Actual operating costs have been about double that amount, which Howard County officials attribute in part to problems associated with construction of the development and the learning curve for employees.

The second Howard County development utilizing cluster systems comprises two clusters of five to six houses each. Rather than individual septic tanks, these cluster systems use grinder pumps, one for every pair of households. Wastewater is pumped from each cluster of houses to a large septic tank, which empties to a community drain field. Final cost data are not yet available for these systems, which are under construction. According to Howard County officials, two characteristics of the systems have resulted in lower costs than the 1994 system. Savings have come from eliminating individual septic tanks and from keeping the total effluent flow to less than 5,000 gallons per day (gpd). For systems that handle more than 5,000 gpd, the state requires various studies and permits that add

to the cost of the system. Systems that handle less than 5,000 gpd do not incur these costs.

Both the proposed system for old town Phoenix and the first Howard County cluster system involve costs of roughly \$20,000 per household. Examples of less expensive systems have been reported in other locations. A cluster system proposed for Deer Park, Maryland, would have cost about \$12,000 per household in 1999 dollars. The system costs in Deer Park included purchasing capacity at a centralized wastewater treatment plant to which effluent would be conveyed by a three-mile long pipeline.

The only examples of cluster systems costing less than \$10,000 per household are from outside Maryland. Cuyler, New York installed a cluster system serving 40 households at a cost of about \$10,000 per household in 1999 dollars.⁴⁵ Hume, Missouri installed a cluster system serving 100 households at a cost of about \$7,600 per household.⁴⁶

Norwood, Georgia constructed a cluster system serving 125 households. The Norwood system uses gravity sewers, treatment and storage ponds, and drip soil absorption. Capital costs were less than \$9,000 per household in 1999 dollars. Operation and maintenance costs in Norwood were expected

to be \$164 to \$218 per year per household, but have actually been less.⁴⁷

On Cape Cod, a cluster system that provides nutrient removal and conveys wastewater to a central treatment facility was constructed in what was described as ideal conditions at a capital cost of \$7,000 per household for the 24 units served. The system maintenance fee is \$100 per year per household. In this community, the costs of the cluster system are less than the costs for a typical conventional septic system.⁴⁸

Applied Wastewater Technologies, a New Jersey company that designs cluster systems and serves as a utility to operate numerous systems, uses the following rule of thumb. For high quality (denitrified) effluent, the system must serve at least 100 households to keep system operation, maintenance and replacement costs at \$900 per year per household. For lesser quality effluent, the same costs can be achieved with fewer households. For communities with fewer than 40 homes, biofilter or lagoon systems are more cost-effective.⁴⁹

The study team assumes that the costs of cluster systems in Maryland will fall in the range of \$10,000 to \$20,000 per household. To correct the 29 documented system failures in the six areas identified by DEPRM as candidates for cluster systems will cost between \$290,000 and \$580,000. (See Table

45 Feuss, James V., R. Paul Farrell and Peter W. Rynkiewicz. 1994. "A Small Community Success Story," *The Small Flows Journal* 1 (1):11-16.

46 Lee, Gary M. 1997. "Low -pressure collection," *Water Environment and Technology* 9 (11):33-34.

47 Gover, Nancy. 1994. "Norwood is site of Georgia's first municipal drip system," *Small Flows* 8 (2):4-5.

48 Telephone conversation with Roger Stern, Marine Studies Consortium, July 15, 1999.

49 Telephone conversation with Ed Clerico, Applied Wastewater Technologies, July 19, 1999.

1 for list of communities.) To construct cluster systems that serve all 157 properties on OSDS in these communities will cost between \$1.6 million and \$3.2 million.

Another \$200,000 to \$400,000 will be required for cluster systems to correct the 20 or so documented system failures in nine other areas studied by DEPRM. (See Table 1 for list of communities). To serve all 234 properties in these nine areas with cluster systems, capital costs of \$2.3 million to \$4.7 million will be incurred.

Traditional Community Systems

In traditional community systems, wastewater is collected directly from a household or business and flows by pipelines to a centralized plant where all treatment occurs. The individual properties have no septic tanks or other means of initial treatment. Wastewater collection is usually handled by gravity sewers with pipelines that are eight inches or more in diameter. Vacuum sewers are used sometimes. Where wastewater must be transported uphill, force mains are used. The traditional community system has its own small wastewater treatment plant using similar technology to the large Metropolitan District plants.

In a few Baltimore County communities to which eventual extension of Metropolitan District lines is planned, the Metropolitan District has constructed small wastewater treatment systems as interim measures. Forge Heights and Richlyn Manor are examples of community wastewater systems that have been constructed and operated by the Metropolitan District in anticipation of the extension of trunk lines. Forge Heights was taken out of service when lines were extended. Richlyn

Manor will probably be operated by Baltimore County for many more years until a trunk line reaches that community.

Several Maryland municipalities operate community wastewater systems that serve 200 to 350 households. Annual costs of these systems, including debt service, average about \$300 per year per household. (See Appendix D for more detailed cost information.)

Most of the information obtained by the study team on capital costs of community wastewater systems is for systems that were not constructed. The exception is the system operating in the Town of Grantsville. In 1990, Grantsville rehabilitated sewer lines and constructed a wastewater treatment plant with double the capacity required by the 200 households in town. The capital cost per household in 1999 dollars is about \$23,000. Grantsville received grants from the Maryland Department of the Environment, Maryland Department of Housing and Community Development, and U.S. Environmental Protection Agency to offset a large portion of these costs.⁵⁰

Recently, the Town of Goldsboro in Caroline County considered installing sewer lines and a wastewater treatment plant to serve 105 households. MES estimated total capital costs of more than \$7,600 per household for the treatment plant alone. Collection system costs would be \$22,000 per household if gravity sewer lines were constructed or \$16,000 per household if vacuum sewer lines were constructed. Total operating and maintenance costs, including treatment plant operation, was estimated at \$623 per household per year with the gravity system

⁵⁰ Town of Grantsville. 1992.

and \$804 per household per year with the vacuum system.⁵¹

Because of the high costs of a system to serve Goldsboro alone, MES also examined a system that would serve 368 existing households in four small Caroline County towns, including Goldsboro. The capital costs for the wastewater treatment plant dropped to about \$3,000 per household under this approach. Collection system costs remained high because the towns were about 12 miles apart.⁵²

The Town of Ridgely planned an upgrade of the wastewater treatment plant serving the town's 400 households at a capital cost per household of about \$5,200 in 1999 dollars. Town officials also considered annexing 51 nearby properties and connecting them to the system, but the costs for the collection system were prohibitive, more than \$28,000 per household in 1999 dollars.⁵³

Based on the limited data available on capital costs for traditional community sewer systems, their costs compare to the high-end estimates for cluster systems. Traditional community systems are not an appropriate option for solving septic problems of a few properties within an area. They are designed to serve all properties, whether or not problems existed for some of the individual properties. If traditional community systems are used to serve the 157 properties in the six areas

51 Telephone conversation with Ellen Frketic, MES, July 15, 1999.

52 Id.

53 Rohlfs, Joan. 1988. *Fiscal Impact of Annexation for the Town of Ridgely*. College Park, MD: Institute for Governmental Service.

explicitly identified by DEPRM as candidates for community systems, the total cost is \$3 million or more. In addition, if traditional systems are used to serve the 234 properties in the nine other areas studied by DEPRM that are possible candidates for community systems, the cost is in the neighborhood of \$5 million.

Extension of Metropolitan District Lines

In addition to homeowners replacing failing systems with new ordinary septic systems, the other solution to OSDS failures in Baltimore County to date is extending Metropolitan District lines. This solution is restricted to areas within the Metropolitan District boundary. Similarly, for new development on the urban fringe, owners of properties within or adjacent to the Metropolitan District boundary are able to obtain sewer service from the district, whether or not an on-site system is feasible, if the property is within the URDL.

From a technical standpoint, for properties within or near the Metropolitan District boundary, extension of Metropolitan District lines may be the most cost-effective solution to failing septic systems. For example, lines are being extended to solve problems in Bowleys Quarters and Lower Back River Neck even though these areas are outside the URDL. When extension of Metropolitan District services to properties outside the URDL is contemplated, administrative controls on future hook-ups must be established to ensure that urbanized development does not occur in these rural areas.

Having a cluster system convey wastewater to Metropolitan District pipelines, as was proposed for Phoenix, is another

variation of the use of Metropolitan District facilities to solve septic system problems and provide service to new rural development. In addition to requiring administrative procedures to ensure that such projects do not promote unplanned development, any project connected with the Metropolitan District has the added complexity of involving Baltimore City in project decisions.

For purposes of comparison with the cost data for individual, cluster and community sewer systems, the study team made an examination of Metropolitan District capital costs. The 1997 Triennial Review reported \$27 million in construction spending for subdivision sanitary sewer extensions for the five-year period FY 98 through FY 02. Based on planning department projections, the study team assumes the new subdivisions being served by these extensions comprise 12,120 new residents or 5,050 new households. (See Appendix D for computations.) The capital cost of the sewer extensions is \$5,453 per household.

Technical Alternatives for Rural Water Service

In theory, both surface water and ground water are potential sources of water for rural residents. However, the potential surface water sources in Baltimore County are dedicated to the Metropolitan District. All rural inhabitants of the county must rely on ground water that is extracted via wells.

Wells can be constructed by digging, boring, driving, jetting or drilling down to the layer of earth that contains the ground water source. Dug wells are shallow and difficult to protect from contamination. They are typically lined with brick, stone or concrete. Bored

wells of two to 30 inches in diameter can be constructed in suitable material to depths up to 100 feet. Driven wells are the simplest and least expensive. They are suitable for areas containing highly permeable alluvial deposits. They are cased with vitrified tile, concrete pipe, wrought iron pipe or steel, and produce small to moderate yields. Jetting involves forcing water under pressure down the riser pipe. Material is loosened by the jetting action of the water, allowing the well point and pipe to be lowered. Wells can be drilled by percussion or rotary drilling methods. Percussion drilling allows more easy detection of water-bearing layers. Drilled wells are cased in steel pipe. In areas of unconsolidated rock, screens or slotted casings are placed in the portion of the well within the water bearing layer to filter out ground particles. Ground water is drawn up through the well by a pump.

The area of Baltimore County on which this study focuses is underlain by fractured rock aquifers. Well construction regulations and technical considerations generally require wells to be drilled using air percussion methods. Screens are not warranted in wells in this area of the county, except southeast of Interstate 95 where unconsolidated rocks are present.

Well components are sized to provide the quantity of water required. This quantity depends on whether the well serves individual households, businesses or multiple users. The main issue is whether the ground water aquifer can produce an adequate supply of water. Sometimes it is necessary to drill very deep wells to tap an aquifer that fulfills this requirement. Over time, wells may fail to produce due to failure or wear of the pump, lower water levels, plugged screens or accumulation of sediments in the well.

A second technical issue is whether water treatment is necessary. If the ground water contains high concentrations of certain chemicals or minerals it is not potable. The chemicals or minerals may be contaminants or naturally occurring. In either case, the water must be treated to serve as a potable supply. Ideally, the ground water requires minimal or no treatment. In some cases, however, water treatment processes that require some level of technical sophistication are necessary.

A variety of technical solutions have been used to address well contamination problems in Baltimore County. In some cases, the county has recommended that property owners install carbon filters to treat contaminated ground water. In two communities--Sunnybrook and Phoenix--community water systems with water treatment plants were installed to address groundwater contamination.⁵⁴ In Manor, individual wells were installed, and in Hydes, multiuse wells were installed by the county. In areas within the Metropolitan District experiencing problems with private wells, the problems have been solved by extending Metropolitan District lines, often as part of a project designed to address failing OSDS.

Almost all new development in rural areas of the county has had to rely on individual on-site wells. Metropolitan District lines are sometimes extended to properties on the urban fringe, within or adjacent to the Metropolitan District, if these properties are within the URDL. Current environmental regulations for new development are intended to ensure that

54 Sunnybrook was annexed into the Metropolitan District for purposes of financing construction of its water system. The federal government financed the Phoenix system because a Nike missile site created the problem.

each developed lot can support the proposed usage with an adequate on-site well and septic system. For properties being developed remote from the Metropolitan District, the absence of a suitable well site may prevent development.

One creative developer resorted to odd lot configurations upon encountering a problem of ground water contamination. Each lot contained a narrow strip of property extending to an individual well among a cluster of wells in the only suitable well site in the subdivision. A community well at this location would have been a more straightforward solution from a technical standpoint.

The costs of small community water systems are generally higher than the costs of systems serving large populations. The well, supply lines and treatment plant constructed for the Sunnybrook community in 1965 had capital costs that amounted to \$4,700 per household in 1999 dollars. More recent construction of a well, one-mile pipeline and water treatment plant serving 200 households in Grantsville, Maryland cost more than \$10,000 per household in 1999 dollars. As with its sewer system project, Grantsville obtained outside funding to defray the cost of its water system, in this case a combination of grants and loans from the U.S. Department of Agriculture, Farmers Home Administration, and grants from Maryland Department of the Environment and Maryland Department of Housing and Community Development. Costs for the system built in 1992 to mitigate contamination problems for 11 households in Phoenix were much higher. They amounted to more than \$100,000 per household in 1999 dollars.

Among several municipalities around Maryland that operate water systems serving

200 to 350 households, annual costs (including debt service) average more than \$300 per household per year. (See Appendix D for more detailed cost data.) No operating cost data were found for smaller water systems, with the exception of the Sunnybrook and Phoenix water systems in Baltimore County.

Operating costs of the Sunnybrook water system totaled \$66,800 in calendar year 1998, which is more than \$400 for each of the 160 households served by the system. These costs resulted in a water rate for Sunnybrook customers of \$4.45 per 1,000 gallons. This rate is equivalent to more than \$33 per 1,000 cubic feet, compared to the \$7.54 per 1,000 cubic feet charged to Metropolitan District customers served by the district's large water systems.

The costs of operating the Phoenix water system, which serves only 11 households, totaled \$37,300 in calendar year 1998. This cost represents roughly \$3,400 per household. The costs of providing Phoenix residents with water have been subsidized by the federal government because a federal facility created the ground water contamination that necessitated the system. Households connected to the Phoenix water system pay the same rate for water as Metropolitan District customers. It is not possible to say whether the costs at Phoenix are representative of systems serving this small a community because cost data were not available for comparably-sized systems.

The study team used \$15,000 per household as a rough estimate of the capital costs of installing a community water system. The total cost to construct facilities to serve the 270 or so properties currently served by

private wells in areas identified as having water problems is about \$4 million.

Again, for comparison, the study team looked at expenditures for subdivision water projects in the Metropolitan District. The most recent data available were for the 10-year period from 1991 through 2000. Water program costs for subdivision projects totaled \$88 million for that period in 1991 dollars.⁵⁵ The study team estimates that during that time, 17,349 households were added to the urban area of the county. Converted to 1999 dollars, the average cost of subdivision projects per new household is \$5,985. (See Appendix D for computations.)

Legal, Organizational and Financial Issues of Individual Systems

For water and sewer systems that are solely contained on an individual property, the simplest legal and organizational arrangement is private ownership and maintenance of the system by the property owner. Because of the public health implications of failing septic systems, the potential for contamination of private wells by third party actions and the demand for publicly financed corrective action when problems occur, government typically sets standards for privately owned water and septic systems and has access for inspection and testing. As long as government oversight is possible where water and sewer systems are contained on individual properties, no need for government to organize or own the system exists.

A common role for government with respect to individual OSDS is to assist

⁵⁵ Baltimore County, 1991. p. III-1.01.

property owners with financing the upgrade and repair of these systems by making low-interest loans available. The State of Maryland operates a revolving loan fund from which it issues low-interest loans to property owners for purposes of replacing failing septic systems.

Ordinary septic systems involve capital costs of roughly \$4,000 per household. Capital costs for alternative OSDS are closer to \$12,000 per household. Special site conditions inflate these costs. The monthly payment by the property owner on a 20-year loan of \$12,000 at a market rate of 8 percent is \$100.44. If the property owner obtains a \$12,000 loan through the state revolving loan fund at 3 percent interest, the property owner's monthly payment is reduced to \$66.54. Property owners also incur annual maintenance costs, which run approximately \$100 per year if periodic system inspection and pumping are included.

Mike Cook, director of EPA's Office of Wastewater Management, believes it is reasonable to expect households to devote up to 2 percent of their income to sewer improvements. Other experts believe this level is unrealistically high.⁵⁶ County planners estimated median household income in the county at \$44,889 in 1997.⁵⁷ The estimated \$66.54 per month in capital costs plus \$100 per year for maintenance of alternative OSDS would amount to \$898, which is exactly 2 percent of the estimated median household income. By definition, half of county households have income below the median. Many of the households experiencing septic

failures have incomes lower than the median and therefore would be paying a higher percentage of their income for sewer services.

DEPRM estimates 750 chronic septic system failures exist in the county. Assuming these system failures must be corrected with alternative on-site systems at an average cost of \$12,000, the total capital requirement is \$9.0 million.

Legal, Organizational, and Financial Issues of Cluster and Community Systems

The move from individual to cluster systems is very significant from a legal and organizational standpoint. Cluster systems require property and equipment that is used in common by multiple residents and businesses. Collective action and pooled resources are required to acquire real property for a multiuser drain field or a community treatment plant. Similarly, arrangements must be made for financing and overseeing construction of the facilities. Finally, the facilities involve some level of operation and maintenance. Acquisition of capital and operation of facilities for multi-property use are best accomplished by a collective entity created under the law, such as a homeowners' association, corporation or government agency.

Community systems, like the in-common portions of cluster systems, require that capital, property and equipment be acquired, operated and maintained to serve multiple users. As with a cluster system, a legally structured collective entity is best suited to develop and operate a community system.

Recovering the costs of cluster and community systems is also much more

56 Mealey, Misty (1999). "The CSO Controversy." *Civil Engineering* 69(9), p.41.

57 Baltimore County (1999), p. 16.

complex than individual systems. Total capital costs must be spread across current and future system users in some equitable manner. Operating costs also must be allocated in an equitable manner; only current users bear these charges.

Discussion turns now to ways in which Baltimore County can deliver community water and sewer services to areas in need. Throughout this century Baltimore County has used an entity separate from the county government to provide public water and sewer services--namely, the Metropolitan District. Yet, this fact does not mean that the county must provide rural water and sewer services through some sort of district mechanism. The county is free to use whatever mechanism is most suitable for its purposes, as long as state law permits it. Several alternatives present themselves. These can be divided into two groups: those organizations already in existence providing water and sewer services and those that need to be created. The former group includes the Baltimore County Public Works Department, the Metropolitan District and the Maryland Environmental Service. The latter group includes public authorities known as sanitary districts, and water and sewer authorities. It also includes private corporations.

Baltimore County Public Works Department

The Baltimore County Department of Public Works (DPW) is a strong alternative for delivering rural water and sewer services. Among other things, DPW designs, maintains and operates the water and sewer services of the Metropolitan District. Consequently, DPW personnel have the knowledge, abilities, skills and experience necessary to serve the needs of

rural Baltimore County.⁵⁸ Another advantage of using this alternative is the element of control. The policies, practices and activities of DPW always will be directly controllable by elected and appointed county officials, unlike other options discussed below. In fact, out of all the options for providing rural water and sewer services, this option places in the hands of county officials the most control over the character of such services.

Although the county attorney should address this matter, the legal authority that could enable the DPW to provide water and sewer services beyond the Metropolitan District is not in much dispute. Article 25A, Section 5(T) of the Annotated Code of Maryland empowers the county council to enact ordinances that protect and promote public health regarding the disposal of waste. Furthermore, the general welfare clause of Article 25A, Section 5 (S) empowers charter counties to enact any ordinance "deemed expedient in maintaining peace, good government, health, and welfare of the county." The Maryland Court of Appeals has construed this clause liberally over the years to permit home rule counties to legislate on matters not specifically enumerated in the Annotated Code of Maryland.⁵⁹ Moreover,

58 Note that DEPRM cannot be involved in managing and operating "community facilities" in Baltimore County, as that term is defined in COMAR (a system in which two or more lots or users are linked together). DEPRM is the "approving authority" for community facilities in Baltimore County and cannot also be the "controlling authority," the governmental entity that manages and operates community facilities. COMAR, 26.04.05.02.

59 See *Montgomery Citizens League v. Greenhalgh*, 253 Md. 151 (1969); *Stiemel v. Board of Election Supervisors*, 278 Md. 1 (1976); *Bradshaw v. Prince George's County*, 285 Md. 294 (1979);

counties throughout Maryland, such as Anne Arundel, Carroll, Frederick, Howard, and Queen Anne create, operate and maintain water and sewer services using nothing more than their public works departments. This suggests that even if the county must ask the General Assembly to approve DPW action in this area, the request probably would be approved.

Once DPW action in rural Baltimore County is authorized by ordinance, several other preliminary matters must be performed. First, the county's water and sewer plan must be amended to reflect the scope of projects needed in rural Baltimore County.⁶⁰ Second, plans for community water systems and community sewer systems must be approved both by DEPRM and Department of the Environment.⁶¹ Both of these activities will be required regardless of whether DPW or some other entity ultimately performs the work. Finally, rural water and sewer projects must be incorporated into the county's capital improvement plan, and the financing must be obtained.

and *Snowden v. Anne Arundel County*, 295 Md. 429 (1983). While a local ordinance would not, evidently, conflict with any state law, an outstanding question may be whether the subject matter has been pre-empted by state law. If the state has pre-empted this area of law, a local ordinance would be barred, despite the general welfare clause discussed above. If this were true, then perhaps the only way to provide rural water and sewer service in Baltimore County, without a special enactment for Baltimore County by the General Assembly, would be through a water and sewer district or a water and sewer authority. Both of these options are discussed below.

60 See generally, COMAR, 26.03.01.

61 COMAR, 26.04.03.04.

Once the work is underway, state law expressly allows the county to charge-back expenses to owners of properties served by county water and sewer projects. Specifically, to pay principal and interest on indebtedness, the county may establish connection charges and set an annual assessment on properties that abut streets and roads served by a water main or sewer.⁶² Fees also can be collected for maintenance, repair and operation.⁶³ The county's power to issue bonds for public works projects is unaffected by DPW involvement with water and sewer projects. Nonetheless, it is notable that capital costs of county water and sewer projects are eligible for state revolving loan fund interest rates, which today run approximately 3 percent annually for a 20-year loan.⁶⁴ The rate is a floating rate, subject to change.

The Metropolitan District

A second alternative for building water and sewer capacity in rural Baltimore County is the Metropolitan District. The use of the Metropolitan District offers several benefits, the most pronounced being that it already is doing water and sewer work in Baltimore County using the DPW. Thus, the county has confidence in its management and capabilities.

62 MD. Code Ann., Envir. Section 9-722 (1998).

63 *Id.* at Section 9-723.

64 *Id.* at Sections 9-1605 & 9-1505.1. According to sources at the state's Water Quality Financing Administration, the bonds would be available if the county would pledge that (1) the bonds would be backed by the county's full faith and credit; (2) that the state could intercept their state-shared revenues in the event of a default; and (3) that otherwise user fees generated from the project be used to pay-off the loans.

Furthermore, the Metropolitan District has adequate revenue-raising powers. For example, it is empowered to issue general obligation bonds to pay for infrastructure cost and installation⁶⁵ and can collect monies through user fees for connection to and use of its water and sewer services.⁶⁶ These monies can be used to pay the costs of operating and maintaining community-based systems.

However, several problems make this alternative impractical. The boundaries of the Metropolitan District determine its primary service area. For the most part, only those areas contained within the its boundaries receive its services. However, the boundaries would need to be expanded if it were to serve rural water and sewer needs. Yet changes in district boundaries are initiated by petition of the owners of property in the areas affected by a proposed change.⁶⁷ Evidently, no other person or entity can initiate a boundary change. A methodical, systematic enlargement of district boundaries will be all but impossible under these current provisions.

Moreover, the mayor and city council of Baltimore City, along with the county council, must approve boundary changes.⁶⁸ The city also holds joint approval authority over the extension of water lines and operating control over water extensions as well.⁶⁹ The conclusion to be drawn from these observations is that service extensions into

rural areas are intergovernmental decisions. It adds a layer of complexity and underscores the difficulty in making the district the instrument of choice for serving rural areas. In effect, because the county is not solely in charge of Metropolitan District performance, reliable service in rural areas cannot be guaranteed through this option. The significance of the entity's name--the Metropolitan District--should not be lost either. The name has obvious geographical significance for its intended service area.

Nonetheless, the Metropolitan District might still be considered a valid alternative for addressing septic failures and water problems in areas within the current district boundary, such as Kingsville and Chattolane. The district's experience in funding and operating (through DPW) community sewer systems in Forge Heights and Richlyn Manor and a community water system in Sunnybrook provide some precedent for district construction of self-contained systems for Kingsville and Chattolane.

The estimated capital costs of a cluster system to correct the eight documented system failures in northern Kingsville are \$80,000 to \$160,000. Alternatively, capital costs to construct cluster or community systems to serve all 29 properties on OSDS in northern and downtown Kingsville and 15 properties in Chattolane are between \$440,000 and \$880,000. Community water systems for northern and eastern Kingsville and Chattolane are an estimated \$825,000. Because all of these construction costs total less than \$2 million, the benefit of having the Metropolitan District finance and administer these projects may not outweigh the burden of intergovernmental control of projects that physically are not connected to Metropolitan District facilities.

65 Baltimore County Code of Ordinances, Section 35-251.

66 Id. at Sections 35-211, 35-214 & 35-215.

67 Id. at Section 35-127.

68 Id.

69 Id. at Section 35-138 and 35-148.

Maryland Environmental Service

Another alternative that relies on existing institutions is the Maryland Environmental Service. MES can contract with Baltimore County to provide water and sewer services in areas outside of the Metropolitan District. It would operate like any other contractor, performing tasks according to the specifications agreed upon by MES and the county.⁷⁰ In this option, MES and the county become partners in serving rural Baltimore County. The two collaborate on project planning, but implementation falls to MES.

MES is allowed under state law to take an even more active role in providing water and sewer services in Baltimore County. Specifically, at the county's invitation, MES can establish and operate one or more service districts in rural Baltimore County. These districts operate in accordance with state policies and the wishes of the local government involved.⁷¹ For example, at the county's request and with the permission of the secretary of natural resources, the secretary of the environment, and the director of planning, MES will determine the boundaries of a given service district. After making various studies, MES then creates a five-year plan for the district, which must be consistent with the county water and sewer plan. Among other things, the five-year plan designates the construction projects, methods of operation, anticipated costs and sources of revenues.

The five-year plan can be adopted only if it is first approved by the county council or by the General Assembly and after a public

hearing in the county. Once adopted, the plan is updated biennially. Projects may be added to the plan, with the consent of the county. Immediately after the plan's adoption, MES must implement the plan and assume jurisdiction over and provide for the maintenance and operation of the various projects. Any existing facilities and operations in the district must be turned over to the sole ownership of MES, as provided in the plan (with provisions for compensation).

When MES is in charge of a district, it can issue bonds to help pay for projects.⁷² The bonds will be general obligations of MES, payable out of any MES revenues.⁷³ MES is authorized to charge persons, property or the county for its services. The charges must reflect the full cost of the projects.⁷⁴

Consequently, MES can be used in a variety of ways to help Baltimore County, and the county can be more or less involved in projects in accordance with its preferences. Yet in using an MES service district, the county would not be in control of district activities; it would have a voice in decision-making, but MES ultimately remains in charge. Furthermore, the need for a district to install, operate and maintain water and sewer projects is not at all obvious.

The water and sewer problems in rural Baltimore County are scattered over the area and exist in geographical pockets. All things being equal, one district for the entire area signals that the need for community water and sewer services is uniform in rural Baltimore

70 See MD Code Ann. Nat. Res., Section 3-104 (1997).

71 Id. at 3-106.

72 Id. at 3-112.

73 Id. at 3-114.

74 Id. at 3-108.

County, which is false. Most households and businesses today are adequately supplied by their own private septic systems and wells. These entities do not need community water and sewer service. Nonetheless, a single district still may be justified if cost savings would be realized by having costs spread over all the projects within the district; that is, the various projects within the district might share overhead expenses and thereby realize cost savings through the district mechanism. This would be the recommended approach if no simpler option is available, one in which costs can be kept at a minimum and one that is functionally tailored to the work at hand--specifically, capable of treating pockets of failing wells and septic systems without signaling that all of rural Baltimore County is problematic.

Instead of a single MES district, multiple districts could be established, yet this too is problematic. Under this scenario, the cost savings are lost that might otherwise be realized under a single district. The option does not allow the sharing of overhead expenses between districts. Consequently, functionality is gained under this option: The district would be functionally tailored to meet water and sewer needs in pockets of the county. However, cost efficiency is lost in comparison to a single district mechanism. With these problems in mind, and the loss of some control over projects, an MES service district, however configured, may not be suitable for Baltimore County at this time.

However, rather than an MES service district, the option of having MES contract with the county to provide rural water and sewer services is still on the table. The advantage to this option is that MES services are highly regarded. Unlike some private contractors, confidence in the quality of MES

work is not be an issue. Moreover, suitable control of project specifications are exercised by county officials under this option, since all points of MES service are subject to contract negotiation.

However, two concerns exist in using this option. First, the county probably needs to purchase and own any capital facilities involved in a project. While MES is empowered to purchase and own facilities, it does not have the power to issue general obligation bonds. Consequently, capital costs for projects likely will be higher if MES rather than the county purchases and owns the facilities. In essence, use of this option likely splits operational control from ownership, which perhaps merely is an inconvenience rather than a serious impediment. Second, and more importantly, the need to use MES when DPW is perfectly capable of installing, operating and maintaining water and sewer facilities is not at all clear.

A Sanitary District

State law permits the creation of one or more sanitary districts in a county. Nothing in the Metropolitan Act or in any local ordinance or charter provision seems to prohibit the creation of another sanitary district. Consequently, we can review how a rural sanitary district might operate in Baltimore County. In powers and abilities, its activities would look very similar to the Metropolitan District.

According to state law, a sanitary district is created by ordinance passed by the county council that describes the geographic boundaries of the district and includes articles

of incorporation.⁷⁵ Each district is run by a three-member sanitary commission, appointed by the county council, each of whom serves a six-year staggered term.⁷⁶ The district is a corporate body, with all the powers and privileges of a corporation.⁷⁷ The sanitary commission determines the number of officers, employees and agents of the district.

The general powers of the district include acquiring, constructing, operating and maintaining projects. However, the powers are limited. They cannot be used to duplicate or compete with any utility that runs similar projects in the district.⁷⁸ Note that a district for solving rural sanitary problems would not compete with the Metropolitan District. The rural sanitary district would serve only areas not reached by the Metropolitan District.

A sanitary district issues tax-exempt, general obligation bonds, pledging the full faith and credit of the district to pay the cost of projects.⁷⁹ The sanitary commission sets and collects benefit assessments and connection charges to pay the principal and interest on bonds.⁸⁰ For each project it operates, the district charges property owners served by the project a minimum charge and a usage charge based on the use by the property. The charges are used to pay operating expenses and maintenance costs, among other

things.⁸¹ Note also that until the district can collect its own revenues, it is authorized to borrow from the county government, and the county government is authorized to make advances and loans to the district, with repayment on terms set by the county.⁸²

A useful power of a sanitary district is the ability to create service areas within the district. These may be created either directly by the county and sanitary commission working together or they can be initiated by petition of property owners.⁸³ Within a service area, the sanitary commission may create water service subareas and sewage service subareas.⁸⁴ A district is empowered to consolidate the operational, engineering and financial functions of the various service areas and to combine their funds.⁸⁵

These are all useful features, but this option has some of the same problems inherent in an MES service district. A single district encompassing the area outside the Metropolitan District may be financially desirable, but it is functionally inefficient as more territory is contained in the district than needs to be served. Alternatively, establishing several districts is functionally efficient, but inefficient financially because overhead costs are not shared or allocated among all the districts. Finally, a rural sanitary district does not have flexibility to serve properties within the "no planned service areas" of the

75 MD. Code Ann. Envir., Sections 9-611 & 9-612.

76 Id. at Sections 9-621 & 9-622.

77 Id. at Sections 9-607 & 9-627.

78 Id. at Sections 9-607 & 9-643.

79 Id. at Sections 9-682 & 9-689.

80 Id. at Section 9-657.

81 Id. at Section 9-662.

82 Id. at Sections 9-628, 9-640 & 9-641.

83 Id. at Sections 9-647, 9-648, & 9-649.

84 Id. at Section 9-652.

85 Id. at Section 9-651.

Metropolitan District. Nonetheless, a sanitary district in rural Baltimore County remains a viable option, if no simpler options are available.

A Rural Water and Sewer Authority

In comparison with a sanitary district, a water and sewer authority is a simpler option. It has many of the powers available to a sanitary district but is not defined by geography. Instead, the authority is defined by the projects it manages, regardless of their locations. Consequently, we escape the problem inherent in drawing borders.

A public authority is created by the county council and is a corporate entity.⁸⁶ It is controlled by a board of directors, appointed by the county council. The members of the board may be members of the county council or may be appointed by the county council to a five-member board, each member serving a five-year term.⁸⁷ The law that creates the authority includes the articles of incorporation.⁸⁸

Like a sanitary district, an authority acquires, constructs, operates, repairs, and leases projects.⁸⁹ It cannot duplicate or compete with any existing private or public utility that serves substantially the same purpose.⁹⁰ This provision prohibits the use of

both a rural sanitary district and a water and sewer authority in rural Baltimore County. It might also preclude an authority from undertaking projects in the "no planned service areas" of the Metropolitan District.

An authority can issue bonds to pay for any part of a project's cost.⁹¹ However, the bonds cannot pledge the full faith and credit of the state or county, and there is no obligation to levy a tax to pay back the bonds if project revenues fall short.⁹² Instead, they pledge to be repaid solely out of the revenue of the authority.⁹³ An authority may set charges and collect fees to pay the expenses of the authority, including the costs involving bond payments, construction, operation, maintenance and repair. Moreover, for purposes of operating and financing, an authority can combine different water and sewer systems into a single project.⁹⁴

Without going further into the legal points of this option, we can conclude that it appears stronger than the district option. A water and sewer authority is functionally efficient. Its services are directed solely at areas that require water and sewer projects. It also is financially efficient. Overhead costs such as the cost of administering operations, financial administration, legal costs and procurement costs can be shared among all the projects handled by the water and sewer authority. Yet, a problem arises in the restriction on issuing general obligation bonds. If the authority cannot pledge the county's full faith and credit

86 Id. at Sections 9-901 & 9-906.

87 Id at Section 9-914.

88 Id at Section 9-907.

89 Id at Section 9-905.

90 Id at Section 9-918.

91 Id at Section 9-928.

92 Id at Section 9-930.

93 Id at Section 9-932.

94 Id at Section 9-918.

toward repaying a debt, then the interest rates on capital debt will be higher than otherwise. Moreover, the restriction also means that favorable loans through the state revolving loan fund also are unavailable. Ultimately, the cost of water and sewer projects are higher than otherwise, and the charge back to customers of community water and sewer service are higher under this option than under some others.

To resolve this problem the county might purchase and own the community water and sewer systems. The public authority installs, operates and maintains them. Using the county's bonding authority, capital costs on these projects then are kept at a minimum. The relationship between the county and the public authority should be described carefully in the founding documents. The County Attorney needs to carefully review these matters.

Private Corporations

Private construction of community-based water and sewer systems is an option to pursue whenever possible. Currently, only a few privately-owned community water systems are in Baltimore County, and no privately-owned community sewer systems are in the county.⁹⁵

95 The 1997 Triennial Review of the county's water/sewer listed four privately-owned community water systems, which served three neighborhoods--Glen Arm (Valley Water Supply), Schmidt Properties (Elmo Road) and Stevenson and one school (Villa Julie). The report lists eight small sewage treatment plants serving non-industrial properties. Several of these small systems serve properties with multiple tenants as users, but they are not considered community systems because they serve individual parcels.

The advantage to the county government of private or homeowner association ownership of community systems is that the county is relieved of financing, constructing and operating the systems. In the case of new development where a developer wants to obtain site approval, county requirements induce private construction of community systems. These systems are then managed through a private contractor or a homeowners' association. However, informal discussions with Carroll County officials suggested that in time many of these private corporations can be expected to approach the county government about the county assuming ownership and control over their systems.

In anticipation of eventual county involvement in operating community systems, another option is for private developers to convey these facilities for government operation after they have been constructed to county specifications. This is the approach taken by Howard County with the cluster systems that have been constructed in two new developments. The advantage of this approach is that developers (and, as a result, buyers) incur up front the capital costs of the facility.

If rural villages were developed in Baltimore County over the next decade, comprising a total of 600 to 1,200 households, between \$6 million and \$24 million in capital would be needed for cluster or community sewer systems and between \$9 million and \$18 million for community water systems. The county is relieved of a substantial financing burden if these costs are incurred by private developers and passed directly to the new homeowners. The systems are operated privately or by whatever entity is chosen by

the county to operate other rural water and sewer facilities.

For existing communities, the use of private corporations to meet water or sewer needs is more problematic than with developing communities. Specifically, individual households and businesses must first believe they share a common problem, believe that collective action offers advantages over other alternatives and then, ultimately, hire a contractor to plan, install and operate the system. This is a process of self-organization, and the tasks are not simple to perform. The process may well challenge the total resources of some communities. Furthermore, in cases of existing ground water contamination or septic system failures, government has an interest in taking action either because government activities created the problem or because public health is at risk.

In effect, while private corporations can assist the county in meeting rural water and sewer needs, they probably are not a reliable solution for existing communities. Self-interest may urge people voluntarily to organize themselves collectively to solve water and sewer problems, but nothing compels a response from them. Government exists for just this reason: to fill the void left when collective action is needed and people fail to act collectively. Consequently, if the county is to pursue this option for existing communities, the county likely needs to assist in organizing the community to solve the problems. The county is needed as a source of reliable information as well. Finally, the county needs to help these communities in obtaining loans for capital financing.

The Choice Among Alternatives

When the above alternatives are viewed together, it is apparent that the option of relying on self-help and private corporations for solving existing problems in rural Baltimore County is not a reliable solution by itself. Government needs to play a significant role in bringing service to these communities. Nonetheless, where it can work, self-help and private corporations should be encouraged and allowed. If the county wishes to pursue this option, a separate study of the elements involved in this type of self-help effort should be undertaken.

Private construction of community water and sewer systems to serve new development is a realistic option. This approach relieves the county of the significant burden of financing construction of rural water and sewer facilities. The facilities are operated privately under government oversight or government operates them using whatever entity the county chooses to deliver rural water and sewer services. The costs of government operation of these facilities are charged back to the property owners.

The Metropolitan District is not a strong option for providing rural water and sewer capacity. Here the problem is boundary constraints and the intergovernmental nature of this entity. As with the self-help option, reliability is in question. While reliability is not an issue with the MES service district option or the option of using one or more sanitary districts, they suffer other limitations. Their problems relate to functional or financial inefficiencies. Neither cannot be designed well enough to resolve both of those problems simultaneously.

In comparison to the above options, a water and sewer authority is a stronger solution. Yet it too has a problem: its inability to issue general obligation bonds. The restriction requires the county to purchase and own water and sewer facilities to keep capital costs at a minimum. This option also requires shouldering the additional burden of establishing, operating and funding a new corporate entity. In most instances, creating a new entity can be recommended only when no existing entity can do the job. Yet, MES and DPW already exist and can do the work. This fact undermines any preference for creating a public authority and, for that matter, for creating a sanitary district; simpler alternatives exist.

Between MES and DPW, DPW is the more reasonable choice. Under the MES option, the county contracts with MES to install, operate and maintain community water and sewer services in the county. Because of limitations on MES's bonding authority (which is virtually the same in this instance as a water and sewer authority) the county needs to purchase and own the water and sewer facilities operated under the MES contract. None of these elements--the split between ownership and operation and the need for managing a contract--would exist if DPW did the work rather than MES. Under the DPW option, the county would own and run the facilities. Moreover, a fundamental reason behind contracting for services is that in-house expertise for providing a service does not exist. Yet, that justification is absent in discussions about the DPW. That department currently installs, operates and maintains water and sewer systems in Baltimore County. DPW is the reasonable choice. It is the simplest option available and, all things considered, perhaps the most reliable one too.

A Closer Look at DPW as Provider of Rural Water and Sewer Service

Aside from the wells installed in Hydes and Manor to remedy ground water contamination, the county, as an entity, has not planned or constructed any community water or wastewater systems. Nonetheless, DPW, through its relationship to the Metropolitan District, has much experience in planning and managing construction of water and sewer projects, including the Sunnybrook water system and the Richlyn Manor wastewater system. Similarly, the county has not financed any community water or wastewater systems, but DPW staff have been involved in developing cost estimates and funding requests for Metropolitan District facilities. The department may need to develop additional expertise, through training, hiring additional staff or contracting with consultants, in on-site treatment technologies.

If DPW were to take on responsibility for rural systems, the department would include community water and wastewater systems in its capital improvement plan to be financed like other county projects. Any costs incurred by the department for planning or design of these projects, including the cost of acquiring special expertise, would be incorporated into the project costs and, ultimately, charged back to the properties that benefit from the project.

In terms of actually operating small systems, the DPW has experience with the Phoenix and Sunnybrook water treatment facilities and the Forge Heights and Richlyn community sewer systems. DPW has no experience operating cluster wastewater treatment systems and needs to develop expertise in this area or contract out operation of these systems.

Relying on small systems to provide water and sewer service is more costly per household than relying on large facilities like those operated by the Metropolitan District. Data obtained by the study team suggest that the capital costs for small community systems are two to three times as expensive per household as Metropolitan District costs.

If a \$20,000 capital cost per household for sewer infrastructure is charged back to a property owner over 20 years at an interest rate of only three percent, the property owner's monthly payment is \$111. If in addition, the property is served by a community water system that costs \$15,000 per household to construct, the property owner would owe another \$83 each month. On top of these charges are operation and maintenance charges of perhaps \$500 to \$1,000 per year. For many rural property owners, these costs are unaffordable.

While the community systems needed in rural Baltimore County are more costly on a per household basis than Metropolitan District facilities, the total financial demands of these systems are much less. Construction of cluster or community sewer systems to serve all 391 properties in 15 problem areas identified by DEPRM can probably be accomplished for under \$8 million, which is a small fraction of the 10-year construction budget for the Metropolitan District. Installing community water systems to serve the 285 properties in 11 water system problem areas identified by DEPRM and the county water/sewer plan can probably be accomplished for about \$4 million.

If the county leaves financing of community systems for new rural development as the responsibility of developers, the only future capital demands on

the county are to install community systems to correct problems as they arise and to replace these community systems as they age. Replacement costs should be factored into the operating charges to users.

Another option for reducing the costs incurred by individual property owners is to levy a tax on all properties that, at some future time, may be served by community water or sewer systems. The tax can be justified by the public health benefits of correcting well and septic system problems. For example, the county can designate all property outside the Metropolitan District as potential recipients of community water or sewer service and beneficiaries of an improved level of health. The current assessable base of property outside the Metropolitan District is about \$829 million. A tax of \$0.01 per \$100 valuation on this property would generate about \$83,000.

Twelve of the areas identified by DEPRM as having septic problems and eight of the areas with water problems are outside the Metropolitan District. The 12 sewer-problem areas comprise 347 properties; the eight water-problem areas comprise 230 properties. The total cost to install cluster or community sewer systems is probably less than \$7 million. The total cost to install community water systems is probably less than \$3.5 million. If these costs were spread over a 10-year period, they would total a little more than \$1 million per year. They could be funded by a \$0.13 tax on the property outside the Metropolitan District. For a \$150,000 home, which according to state law is assessed at 40 percent value, the annual tax bill to support rural water and sewer construction is \$78.

A more radical option is to fund all community water and sewer construction

through a tax on all property within the county. The total cost to install community water and sewer systems in current "no planned service" areas within and outside the Metropolitan District is estimated at \$12 million or less. Spread over 10 years, the cost would be \$1.2 million per year. The total assessable base of the county is \$15.556 billion. This base generates \$1.56 million for every \$0.01 per \$100 of property tax. Thus, the entire construction program to eliminate existing rural water and sewer problems can be accomplished over a 10-year period by raising the county property tax rate by \$0.0069 per \$100. For a \$150,000 home, the annual tax bill increases by about \$6 to support rural water and sewer construction that corrects existing problems. While the option of an across-the-county tax makes solving rural water and sewer problems seem very affordable, it is contrary to the way governments have traditionally paid for water and sewer service, which is that recipients should bear the cost.

Conclusion

Three questions drove this study. First, how can Baltimore County bring water and sewer capacity to areas that lie beyond the Metropolitan District and in so doing, allow two concepts in the county's proposed master plan—rural community centers and rural villages—to be implemented? Second, how can the county perform inspections of OSDS, should the state require it? Third, is a sanitary district necessary to perform these services? Taking the last question first, clearly a sanitary district is not necessary. A sanitary district would be useful only if no other entity now existed that could bring water and sewer capacity to rural Baltimore County and if no other entity might do the work in a more efficient way.

However, the study shows that a sanitary district is unnecessary for fielding an inspection program, should the state require one for OSDS. An inspection program can be created out of the resources now available in the county. Namely, it requires the coordination of DEPRM and DPDM to design and administer a program that places responsibility for the proper operation and maintenance of OSDS where it belongs: with the owners of these systems. Under the envisioned program, the owners of OSDS would be required to contract with private businesses that now do inspection work in the county. In other words, the government would not take on the business of conducting OSDS inspections. When an inspection finds a system operating properly and in accordance with state standards, the county, upon receipt of proper documentation, would issue an operating permit to the system owner. The permit would expire after three to five years, depending on DEPRM's needs. A new permit would be issued only after a system was

reinspected and found to be operating properly. In this way, OSDS is assured to meet state standards, DEPRM will have a database to track these systems, and enforcement requires combing the database periodically to determine who is operating without a valid permit.

Additionally, a sanitary district is not required to bring water and sewer services to rural Baltimore County. Water and sewer services in this case means community-based systems in which multiple households or businesses are grouped in a system that receives water from a centralized source or disposes of wastewater. Only certain geographical pockets of the county currently need community-based services. The estimated capital costs of installing these systems is less than \$12 million.

With this information in mind, the study finds that bringing community-based services to rural Baltimore County does not require a sanitary district. Several other alternatives such as creating a water and sewer authority or even contracting with the Maryland Environmental Service to install, operate and maintain these small systems are as appealing in their way as the creation of a rural sanitary district. Yet, implementing any of these alternatives does not appear as attractive as simply relying on the Department of Public Works to do the job. DPW already provides water and sewer services in the county through the Metropolitan District and, in few locations, operates community water and sewer systems. No reason justifies contracting with MES if DPW can do the work. Given DPW's current role, no substantial justification exists to create any new entity like a rural sanitary district or a water and

sewer authority to provide services already being delivered elsewhere in the county by DPW.

While the county attorney should comment on the matter, there seems to be no legal reason barring the use of DPW for these purposes. Granted, the county council should enact relevant ordinances, but nothing seems to prohibit the county from enacting those ordinances. Even if state law required Baltimore County to first seek state approval for DPW action in rural Baltimore County, counties throughout Maryland now use their public works departments to bring water and sewer services to county residents. In fact, Howard County, like Baltimore County, uses a metropolitan district to bring water and sewer services to many of its residents, but those areas outside the metropolitan district receive service from the Howard County Bureau of Utilities, which is part of the county's DPW. Consequently, even if the state required the county to obtain approval for DPW action in rural Baltimore County, the state is unlikely to deny the request.

Funding these projects is made simpler by use of the DPW also, rather than some other vehicle. If MES or a water and sewer authority were used, for example, Baltimore County still would need to purchase and own the community-based water and sewer facilities. This is because of restrictions placed on MES or a water and sewer authority on issuing general obligation bonds, a restriction that does not exist for Baltimore County. In effect, the restriction means that, if MES or a water and sewer authority were used, control over community-based facilities would be split from ownership. This split would raise liability issues for the county and more fundamentally, would create a need for continually managing the relationship between

the county and the service agency (MES or a water and sewer authority). No similar problems occur if DPW were the service agency.

However, we note that a rural sanitary district has essentially the same capacity to issue bonds as does the county and, like the county, can assess charges and require fees be paid by those benefitting from a service. Consequently, on the issue of finance, a rural sanitary district is nearly as strong as the DPW alternative. The essential difference between the two is that the county wields the power to tax, whereas a sanitary district does not.

Taxing power may become important to the extent that the installation or operation costs of community-based systems outstrip the ability of homeowners to pay. If grants and low-cost loans are inadequate to reduce capital costs to affordable levels or if operating costs are inordinately high, the county may decide to use tax dollars to partially offset the costs associated with community-based systems, as Washington County does. Tax dollars might be more equitably raised from the area that can potentially receive service from community-based systems: namely, the area outside the Metropolitan District. The justification for the tax probably would focus on the choice people make in living in areas of low population density and the burden they place on areas that are already environmentally stressed (as evidenced by pockets of failing wells and septic systems). In any event, the county may wish to use its power to establish one or more special tax districts for water and sewer services in rural Baltimore County, a power totally unavailable to a sanitary district or to any other alternative examined in this study, except for the county alternative.

Appendix A Magnitude of OSDS Problems

The November 1984 inventory contained in the county water/sewer plan identified 2,300 failing septic systems in 25 communities plus an undetermined number of failing systems in three communities. All of the communities listed were within the Metropolitan District boundary. Seven years later in 1991, the water/sewer plan listed 1,945 failing systems in 19 communities plus an undetermined number in four communities. One community added to the list was Phoenix (old town), which was the only community identified outside the Metropolitan District boundary. The most recent water/sewer plan update, the 1997 Triennial Review, identified 1,755 failing systems in 12 communities plus an undetermined number of failing systems in four communities. Once again, all the communities identified, except Phoenix, were within the Metropolitan District boundary.

The reduction in the number of failing systems reported in the water/sewer plan, from 2,300 in 1984 to 1,755 in 1997, demonstrates slow but steady progress in correcting existing problems. By 1997, construction had begun on Metropolitan District facility extensions that would replace 1,343 failing systems in Bowleys Quarters/Seneca Avenue and Back River Neck. When completed, these corrections will reduce the overall number of failing systems identified in the water/sewer plan to 412 in 10 communities plus an undetermined number in four communities.

Despite the reduction in the reported number of failing systems over the past 15 years, little or no progress has been made for nine communities identified in the water/sewer plan as having OSDS problems. Table A-1 lists communities with

longstanding problems and describes the problems and planned correction dates as reported in the water/sewer plans. Six of the communities with longstanding problems (Loreley Beach, White Marsh, Perry Hall Manor, Essex, Riderwood, and Riverview Park) are located within Metropolitan District service areas. Two of the communities, Chase and Kingsville, are located within the Metropolitan District boundary, but in areas designated for no planned service. The ninth community, Phoenix, is located outside the Metropolitan District boundary.

The septic system failures documented in the water/sewer plan are not a complete inventory. DEPRM estimates that 750 chronic septic system failures are in the county, not counting the failures now being corrected in Bowleys Quarters/Seneca Avenue and Back River Neck.⁹⁶

DEPRM recently published the study, *Problem Areas for On-site Sewage Disposal Systems in Baltimore County*, which identifies and prioritizes 16 areas of the county with current or potential septic system failures. Table A-2 lists the study areas, the number of properties in each area and the priority assigned by DEPRM. Not all the properties in each area have documented system failures. However, site conditions such as a poor soils and a high water table led DEPRM to conclude that failures are likely.

The DEPRM study included two areas identified as problems in the water/sewer plan:

⁹⁶ E-mail correspondence from Nancy Pentz to Victor Tervalá, April 28, 1999.

**Table A-1
Longstanding OSDS Problem Areas**

Location	Problem Description	Planned Correction Date	
		as reported in 1984	as reported in 1991 and 1997
Loreley Beach	21 failing systems	Pending facilities study	Pending facilities study
White Marsh (Joppa and New Gerst Roads; Cowenton and Hornages Avenues; Holly and Snyder Lanes)	Part of large survey; number of failing systems could not be determined	Pending facilities study	Pending major facilities
Perry Hall Manor	Blank	Pending facilities study	Original Survey 1966, to be resurveyed by DEPRM.
Essex (Island Point Road and portion of Eastern Avenue)	7 failing systems	To be resurveyed by Health Dept.	Original Survey 1977, to be resurveyed by DEPRM.
Riderwood	11 failing systems	Bid and rejected	Bid and rejected, to be resurveyed by DEPRM
Riverview Park	6 failing systems	Bid and rejected	Original Survey 1975, Bid and Rejected, to be resurveyed by DEPRM
Chase (Marshy Point Road)	5 failing systems	Bid and rejected	Bid and rejected, to be resurveyed by DEPRM
Kingsville	94 failing systems	Pending conflict resolution	1969
Phoenix (Old Town)	Blank	not listed	Being surveyed by DEPRM. 201 facilities study proposed.

Source: Baltimore County 1984, 1991, and 1997.

**Table A-2
DEPRM Study Areas**

Area Name	Number of Properties			Priority
	Residential	Commercial	Total	
Arcadia	24	3	27	2
Baldwin	3	7	10	3
Butler	12	2	14	1
Chattolane	13	2	15	2
Freeland	16	0	16	3
Hereford	24	26	50	2
Jacksonville	0	25	25	2
Kingsville-downtown	7	9	16	3
Kingsville-eastern	23	1	24	5
Kingsville-northern	4	9	13	5
Maryland Line	50	5	55	1
Monkton	22	4	26	1
Parkton	30	6	36	2
Phoenix	43	0	43	5
Trenton	16	0	16	4
White Hall	24	5	29	3

Note: Priorities correspond to potential impact of OSDS problems on human health and the environment with 1 signifying the lowest priority and 5 signifying the highest priority.

Source: DEPRM, 1998.

Kingsville and Phoenix. In addition, the report examined one area within the Metropolitan District boundary--Chattolanee--and 12 areas outside the Metropolitan District boundary that are not among the problem communities listed in the water/sewer plan.

DEPRM explicitly identified six of the communities in the study--Baldwin, Hereford, Jacksonville, downtown and northern Kingsville, and Phoenix--as likely candidates for community sewer systems. Kingsville and Phoenix are described as "in immediate need of a community correction." In the case of Baldwin, which has existing failures, the identification of a community system as the appropriate solution is based on soil conditions, small lot sizes and proximity to domestic wells. Although septic system failures are not presently evident in Hereford, downtown Kingsville or Jacksonville, due to the limited area for repair and/or poor soil conditions, DEPRM identified these areas as candidates for community systems when septic failures do occur.

In the community of Trenton, DEPRM noted that 14 properties in need of septic system repair cannot employ conventional methods due to small lot sizes and steep slopes. This situation suggests the need for a cluster or community system, but the DEPRM report did not explicitly make this recommendation.

According to DEPRM, eastern Kingsville, which has a number of known septic system failures, has adequate area for repairs, but soil conditions are not conducive to conventional on-site repairs. The DEPRM report did not suggest it, but properties in eastern Kingsville may be candidates for on-site corrections using alternatives to ordinary septic systems.

DEPRM reported an absence of current septic failures in Arcadia. However, Arcadia has several existing shared wells and septic systems that were built when multiple residences were owned by the same family. Small lot sizes, soil contamination problems and the existing shared facilities all suggest that community septic (and water) systems may be appropriate for this community. Perhaps because of Arcadia's low priority rating, DEPRM did not go so far as to recommend a solution to future problems.

For the other areas included in the study, DEPRM documented past septic system failures and conditions that make future failures likely. Because all these communities have small lot sizes, community sewer systems may be the only option for correcting failures. The DEPRM report did not discuss possible corrections for the problems in these communities.

Based on information in the water/sewer plan and the DEPRM report, the Institute study team has grouped areas of the county with OSDS problems according to the potential solution. The areas include the communities that have appeared continually in the water/sewer plan and are assumed to have longstanding problems as well as the additional problem areas identified in the DEPRM report. These groupings are presented in Table 1 of the text. The documented system failures shown in this table comprise only about 100 of the 750 chronic failures estimated by DEPRM.

Appendix B

Magnitude of Water System Problems

As with failing septic systems, most of the water system problems reported in the water/sewer plans over the years have been within Metropolitan District boundaries. The 1984 water/sewer plan identified 273 deficient water systems in seven communities plus four communities with unspecified numbers of deficient systems. All the deficient water systems were within the Metropolitan District boundary, and many coincided with failing septic systems.

By 1991, most of the problems identified in 1984 had been solved. The December 1991 problem inventory listed 122 water system problems in five communities. Ninety of the deficient systems were in Kingsville. Of the remaining 32 deficient systems, eight systems in the vicinity of Phoenix⁹⁷ were experiencing chemical contamination from an old Nike missile base. The problem in Phoenix was ultimately addressed by construction of a community water system paid for by federal funds and operated by the county public works department.

Although the 1991 sewer problem inventory continued to identify septic system failures in the Island Point Road area of Essex and the Marshy Point area of Chase, these communities no longer appeared on the water problem areas inventory. Apparently the water problems in these areas were solved even though the septic problems were not.

The 1997 Triennial Review of the water/sewer plan listed only problems affecting Metropolitan District facilities (e.g., algae growth in Loch Raven Reservoir; deficient water mains) in the table of problem areas. The list did not include deficient water systems in Kingsville, although there was no indication that the 1991 problems had been corrected. The only mention of problems with individual water systems was in the text of the report, which described rural water problems in Hereford, Jacksonville, Manor and Hydes, all of which are outside the Metropolitan District boundary.

The 1997 Triennial Review cited 1989 testing of domestic wells in Hereford that found elevated levels of nitrates, sodium and chlorides. On-site sewage disposal systems and application of road salts were the suspected sources of the contaminants. No corrective action was described in the 1997 Triennial Review. However, maps W10-B and S10-B at the back of the report show that the Hereford community has applied for annexation to the Metropolitan District. Baltimore City has concluded that noncontiguous areas are not eligible for annexation into the Metropolitan District.⁹⁸ Consequently, the Hereford application will not be approved. Some other approach to correcting the problems is required.

97 The Phoenix properties with well contamination are not in the old town of Phoenix where septic failures have been identified.

98 The noncontiguous area of Sunnybrook was annexed into the Metropolitan District in the 1960s. However, in the 1990s when county officials proposed annexing the Nike-contaminated Phoenix area into the Metropolitan District, Baltimore City refused because the site is noncontiguous.

The 1997 Triennial Review also noted past contamination of ground water from local gas stations in Jacksonville. In this case, the report noted that contaminated water had been remediated, but warned of the potential for future problems due to small lot sizes, the high percentage of paved surfaces and a limited-yield aquifer system. The report also described cases in Manor and Hydes where replacement wells were installed by the county after improper storage of road salts had created elevated levels of chlorides in ground water. Additional properties in these areas were expected to be affected in the future.

The recent DEPRM study of problem areas for sewage disposal also identifies properties with water system problems. The DEPRM report cites a 1984 study of old town Phoenix, which found water from three wells to have bacteriological contamination because of poor well construction. DEPRM also cites the problems in Hereford and Jacksonville noted in the water/sewer plan. The DEPRM report notes further that ground water contamination has been a problem in Arcadia, requiring relocation of wells and carbon filtration. Several wells in Chattolane do not meet minimum setback requirements. Chattolane also has experienced ground water contamination.

Appendix C

Water/Sewer Needs Associated with New Development

Since 1990, Baltimore County has issued annually an average of 443 residential occupancy permits.⁹⁹ However, a slower rate of rural population growth is now taking place and is expected to continue after the turn of the century.

County planners estimate an increase of 1,957 residents between the years 1997 and 2000 in the nine regional planning districts that roughly define the rural portion of the county. (See Table C-1.) Given an average household size of 2.4 people, this population increase corresponds to 815 new households over the three-year period or 272 households per year. The same nine districts will gain an estimated 3,814 residents between 2000 and 2010, representing 1,589 additional households over the decade or 159 new households per year.

The proposed Master Plan 2010 identifies rural villages as the potential recipient of new residential development. These densely developed areas would contain a maximum of 200 to 330 households.

Residential growth almost inevitably generates some commercial development. The proposed master plan does not estimate the magnitude of rural commercial development, but the plan proposes channeling this development to Hereford, Jacksonville, and the existing villages of Baldwin, Butler, Fork, Fowblesburg, Glen Arm, Kingsville, Maryland Line, Parkton, Stevenson and White House.

All nine planning areas examined here, except the Loveton area of Sparks, are outside the URDL and the Metropolitan District. New development in these areas cannot rely on Metropolitan District services. During the period 1997 to 2000, no mechanism will be available to develop properties on community water and sewer systems. Consequently, the households and businesses developed in rural areas during the period 1997 to 2000 will be served by OSDS and individual wells.

For the period 2000 to 2010, if all 1,589 new households anticipated in rural areas are built with individual wells and septic systems, an average of 159 new on-site systems will be required in the county each year. Alternatively, if all the new development is to occur in rural villages of 200 to 330 households, five to eight community systems are needed over the ten-year period. The more likely scenario is for some of the new households to be developed with individual on-site systems and others in rural villages served by cluster or community systems. The rural villages may be as small as 10 households or as large as 330.

The proposed Master Plan 2010 states that the two rural commercial centers and existing rural residential areas should be considered as potential locations for rural villages. Table C-2 lists each of these types of communities for the nine rural planning districts. Although the proposed master plan does not designate existing villages as potential rural villages, it does designate them as appropriate locations for additional commercial development. Existing villages also are listed in Table C-2.

⁹⁹ Baltimore County. (1999). Master Plan 2010: Baltimore County, Maryland, Proposed May 1999, p. 161.

**Table C-1
Rural Population Projections**

Regional Planning Districts		1997	Estimated Increase		2000	Estimated Increase		2010
Number	Name	Population	Population	Households*	Population	Population	Households*	Population
301	Hereford-Maryland Line	12,576	64	27	12,640	69	29	12,709
302	Prettyboy	4,482	3	1	4,485	(31)	(13)	4,454
303	Fowblesburg	3,980	131	55	4,111	44	18	4,155
304	Sparks	6,429	251	105	6,680	689	287	7,369
305	Jacksonville	10,094	41	17	10,135	122	51	10,257
307	Chestnut Ridge-Worthington	11,962	1,040	433	13,002	1,951	813	14,953
310	Fork	7,003	103	43	7,106	359	150	7,465
311	Harrisonville	4,517	244	102	4,761	382	159	5,143
318	Kingsville	5,142	80	33	5,222	229	95	5,451
	Total rural districts	66,185	1,957	815	68,142	3,814	1,589	71,956
	Total urban districts	656,135	8,423	3,510	664,558	18,486	7,703	683,044
	Total county	722,320	10,380	4,325	732,700	22,300	9,292	755,000
	Rural districts as percent of total	9%	19%	19%	9%	17%	17%	10%

*Number of households based on 2.4 persons per household
Source for population: Baltimore County Master Plan 2010, p. 9.

**Table C-2
Existing Rural Communities by Planning District**

<u>Regional Planning District</u>	<u>Urban Center</u>	<u>Rural Commercial Centers</u>	<u>Rural Residential Areas</u>	<u>Existing Villages</u>
Hereford-Maryland Line		Hereford***	Freeland* Hereford***	Maryland Line*** Parkton*
Prettyboy				White House
Fowblesburg				Fowblesburg
Sparks	Loveton			Butler*
Jacksonville		Jacksonville***	Jacksonville***	
Chestnut Ridge-Worthington			Chestnut Ridge	
Fork				Baldwin*** Fork Glen Arm
Harrisonville			Patapsco	
Kingsville			Kingsville***	Kingsville***

- * OSDS problem area
- ** Water problem area
- *** OSDS and water problem area

**Table C-2
Existing Rural Communities by Planning District**

<u>Regional Planning District</u>	<u>Urban Center</u>	<u>Rural Commercial Centers</u>	<u>Rural Residential Areas</u>	<u>Existing Villages</u>
Hereford-Maryland Line		Hereford***	Freeland* Hereford***	Maryland Line*** Parkton*
Prettyboy				White House
Fowblesburg				Fowblesburg
Sparks	Loveton			Butler*
Jacksonville		Jacksonville***	Jacksonville***	
Chestnut Ridge-Worthington			Chestnut Ridge	
Fork				Baldwin*** Fork Glen Arm
Harrisonville			Patapsco	
Kingsville			Kingsville***	Kingsville***

- * OSDS problem area
- ** Water problem area
- *** OSDS and water problem area

downtown and northern Kingsville.¹⁰⁰ Currently, 29 properties are served by OSDS in Kingsville, including 13 in northern Kingsville and 16 in downtown Kingsville. Development not directed to downtown or northern Kingsville could be clustered in a few small rural villages served by community water and sewer systems.

Table C-3 summarizes the community water and sewer service options that are available in each rural planning district. The options for providing community water service can be applied in endless combinations. More than 100 new rural villages of 10 to 15 households and the seven or eight existing problem areas could be served by relatively small community systems. If development is concentrated in larger rural villages, perhaps 12 to 14 larger community systems could serve the new development plus problem areas.

100 It is not clear whether one community system could serve both downtown and northern Kingsville, or whether each area will require its own system.

**Table C-3
Community Water/Sewer Service Options for New Households**

Regional Planning District	Estimated	Metropolitan District	New Rural Villages*		Existing Problem Areas
	New Households 2000-2010		Minimum Size	Maximum Size	
Hereford-Maryland Line	29		0	0	4
Prettyboy	(13)		0	0	0
Fowblesburg	18		1	0	0
Sparks	287	X	20+/-	1	0
Jacksonville	51		1	0	1
Chestnut Ridge-Worthington	813		60+/-	3-4	0
Fork	150		10+/-	0	1
Harrisonville	159		10+/-	1	0
Kingsville	95		5+/-	0	1-2
Total	1,589		110+/-	5-6	7-8

*Note: Minimum size rural villages contain 10 to 15 households. Maximum size rural villages contain 200 to 330 households.

Appendix D

Water and Sewer System Costs

The study team had to rely primarily on data from outside Baltimore County to estimate the costs of providing water and sewer service in rural areas of the county. Much of that data is historical. To present the information in terms of current dollars, the study team obtained information on changes in the Consumer Price Index for all urban consumers (CPI-U) over the past 35 years. That information is presented in Table D-1. For the years 1964 to 1983, the only index available is the average for all U.S. cities. From 1984 through 1997, an index specific to Baltimore was published. However, beginning in 1997, the Baltimore index was replaced by a joint Washington, D.C.-Baltimore index. The study team used these three indexes to arrive at a multiplier for each year that was used to convert costs for that year into costs in 1999 dollars. The multiplier for each year is shown in the last column of Table D-1.

Costs for OSDS Technologies

The study team's first use of the multiplier was in converting costs presented by EPA from 1988 dollars to 1999 dollars. These costs, related to ordinary and alternative OSDS technologies, are presented in Table D-2. The costs provided by EPA are based on values reported in other published works. In several cases, the reported average is lower than the probable range, reflecting the fact that these data came from a variety of sources. They are provided to give a ballpark idea of the costs that might be expected if these technologies are used. It should also be noted that, for a particular site, some of the costs may be additive. For example, a site may have the components of a conventional septic tank

system plus constructed wetlands. For some sites, it would be possible to have a low pressure pipe (LPP) system alone. Alternatively, a site may require an LPP system with a recirculating sand filter.

DEPRM also provided the study team with capital cost data for some of the OSDS technologies. These costs are presented in Table D-3 juxtaposed with the EPA data. For ordinary septic systems and holding tanks, capital cost estimates provided by DEPRM tend to be lower than the corresponding EPA estimates. For other technologies, however, the capital costs estimated by DEPRM for Baltimore County are generally higher than the costs reported from EPA's national data.

Capital Costs of Cluster Systems

Cluster systems serve multiple properties using OSDS technology. They are a subset of community systems. The study team obtained data from a number of sources on the capital costs of cluster systems, which are presented in Table D-4. The projects are ordered from most recent to oldest. The sources listed reported total costs for the specified project year. The study team converted these costs to 1999 dollars and computed the cost per connection. (A connection is equivalent to one property served.) As noted in the table, some of the reported costs do not include the engineering cost of designing the system. Typically, engineering costs add another 10 percent to project costs.

The projects listed in Table D-4 serve between seven and 199 properties. Costs per connection range from about \$5,000 to more

**Table D-1
Inflation Multipliers for Historical Project Costs**

Year*	Consumer Price Index, All Urban Consumers (CPI-U)			Multiplier to May-99
	U.S. Cities	Baltimore	D.C.-Baltimore	
1964	31.1			5.10
1965	31.6			5.02
1966	32.5			4.88
1967	33.4			4.74
1968	34.9			4.54
1969	36.8			4.31
1970	39.0			4.06
1971	40.7			3.89
1972	41.9			3.78
1973	44.3			3.58
1974	49.4			3.21
1975	54.2			2.92
1976	57.1			2.78
1977	61.0			2.60
1978	65.7			2.41
1979	73.1			2.17
1980	82.7			1.92
1981	91.6			1.73
1982	97.5			1.63
1983	99.9			1.59
1984	103.2	104.7		1.54
1985		108.3		1.48
1986		110.4		1.46
1987		115.0		1.40
1988		119.9		1.34
1989		124.9		1.29
1990		130.2		1.23
1991		136.5		1.18
1992		140.6		1.14
1993		143.7		1.12
1994		148.2		1.08
1995		151.5		1.06
1996		155.7		1.03
1997		156.9	101.1	1.02
1998			102.8	1.01
1999			103.6	1.00

* CPI-U is provided for July of each year, except 1999, which reflects May.

Source: U.S. Department of Labor, Bureau of Labor Statistics

**Table D-2
EPA Cost Estimates**

Technology	Capital Costs Per Household (1988 dollars)*			Capital Costs Per Household (1999 dollars)			Average Annual Maintenance Costs Per Household	
	Probable Range			Probable Range			1988 \$'s*	1999 \$'s
	Average	Low	High	Average	Low	High		
Ordinary septic system	\$ 4,500	\$ 2,000	\$ 8,000	\$ 6,000	\$ 2,700	\$ 10,700	\$ 70	\$ 95
Alternative technologies:								
Constructed wetlands	\$ 710	\$ 1,000	\$ 3,000	\$ 1,000	\$ 1,300	\$ 4,000	\$ 25	\$ 35
Holding tanks	\$ 3,900	\$ 4,000	\$ 6,000	\$ 5,200	\$ 5,400	\$ 8,000	\$ 1,300	\$ 1,745
Low pressure pipe (LPP)	\$ 5,100	\$ 4,000	\$ 6,000	\$ 6,800	\$ 5,400	\$ 8,000	\$ 150	\$ 200
Mound systems	\$ 8,300	\$ 7,000	\$ 10,000	\$ 11,100	\$ 9,400	\$ 13,400	\$ 180	\$ 240
Recirculating sand filters	\$ 3,900	\$ 5,000	\$ 8,000	\$ 5,200	\$ 6,700	\$ 10,700	\$ 145	\$ 195

Note: Costs in 1999 dollars reflect a multiplier of 1.34 applied to costs in 1988 dollars.
1999 capital costs are rounded to the nearest \$100; 1999 maintenance costs are rounded to the nearest \$5.

*Source: U.S. EPA, 1993, pp.4-104 to 4-106..

**Table D-3
Capital Cost Estimates: DEPRM and EPA**

Technology	Average Per Household		Range			
	DEPRM	EPA	Low End DEPRM	EPA	High End DEPRM	EPA
Ordinary septic system	\$ 4,000	\$ 6,000	\$ 3,000	\$ 2,700	\$ 7,000	\$ 10,700
Alternative technologies:						
Constructed wetlands	N.A.	\$ 1,000	N.A.	\$ 1,300	N.A.	\$ 4,000
Holding tanks	\$ 5,200	\$ 5,200	\$ 4,000	\$ 5,400	\$ 7,000	\$ 8,000
Low pressure pipe/Low pressure dosing	\$ 8,000	\$ 6,800	\$ 7,000	\$ 5,400	\$ 10,000	\$ 8,000
Mound systems	\$ 12,000	\$ 11,100	\$ 11,000	\$ 9,400	\$ 15,000	\$ 13,400
Recirculating sand filters	\$ 8,000	\$ 5,200	N.A.	\$ 6,700	N.A.	\$ 10,700
Fixed film	\$ 8,000	N.A.	N.A.	N.A.	N.A.	N.A.

Note: N.A. = not available

**Table D-4
Capital Costs of Cluster Systems**

Location	Project Technology	Number of connections	Capital Cost	Year of Cost Estimate	CPI-U Multiplier	1999 Capital Cost	1999 Capital Cost per Connection	Source
Warwick, RI*	STEP/RSF	7	\$ 59,000 **	1997	1.02	\$ 60,180	\$ 8,597 **	(1)
Ariton, AL	STEP/lagoon	198	\$1,750,000 **	1996	1.03	\$1,802,500	\$ 9,104 **	(1)
Browns, IL	STEP/RSF	101	\$ 945,000 **	1996	1.03	\$ 973,350	\$ 9,637 **	(1)
Howard County, MD	septic tanks/pressure sewers/common septic tank/soil absorption	109	\$2,000,000	1994	1.08	\$2,160,000	\$ 19,817	(2)
Deer Park, MD	septic tanks/SDGS/POTW	150	\$1,601,780	1993	1.12	\$1,793,994	\$ 11,960	(3)
Hume, MO	grinder pumps/LPP/package plant	100	\$ 678,000	1993	1.12	\$ 759,360	\$ 7,594	(4)
Norwood, GA	gravity/pond/soil absorption	125	\$ 950,190	1992	1.14	\$1,083,217	\$ 8,666	(5)
Phoenix, MD	septic tanks/small diameter force main/common septic tank/POTW	17	\$ 290,400	1992	1.14	\$ 331,056	\$ 19,474	(6)
Brooks, OR	STEP/lagoon	199	\$1,700,000 **	1991	1.18	\$2,006,000	\$ 10,080 **	(1)
Elkton, OR	STEP and STEG/RSF	135	\$ 897,800	1989	1.29	\$1,158,162	\$ 8,579	(7)
Union Gap, OR	STEP and STEG/POTW***	70	\$ 262,000 **	1989	1.29	\$ 337,980	\$ 4,828 **	(1)
Back River, MD	septic tanks/RSF/surface water discharge	32	\$ 446,300	1984	1.54	\$ 687,302	\$ 21,478	(8)
Cuyler, NY	grinder pumps/pressure sewer/common septic tanks/soil absorption	40	\$ 166,100	1978	2.41	\$ 400,301	\$ 10,008	(9)

Notes:

* Costs per connection based on approximate total costs when system has all 7 homes on line; costs to date are \$45,000 for 3 homes.

** Capital cost does not include engineering cost.

*** Capital cost is for collection system only; treatment by existing plant.

Legend:

LPP = low pressure pipe system

POTW = collection system discharges into existing gravity sewer line

RSF = recirculating sand filter

SDGS = small diameter gravity system

STEP = septic tank effluent pump system

STEG = septic tank effluent gravity system

Sources:

(1) Correspondence from Eric Ball, Orenco Systems, July 21, 1999.

(2) Presentation by Jeff Welty, Howard County, July 16, 1999.

(3) Garrett County Sanitary District, 1992, pp. 1-2.

(4) Lee, 1997.

(5) Gover, 1994.

(6) MES, 1992, p. 12

(7) Orenco Systems, 1998.

(8) Anonymous comments concerning Draft Preliminary Study - Back River Neck, March 1, 1984.

(9) Feuss et al., 1994.

than \$20,000. The smallest systems do not always have the highest cost per connection. Interestingly, the four highest costs per connection are for projects in Maryland. The Maryland costs range from just under \$12,000 per connection for a cluster system in Deer Park to an estimated cost of over \$21,000 per connection for a cluster system that was proposed but not constructed on Back River Neck. The other two Maryland projects have very similar costs, about \$19,000 for the cluster system that was rejected for old town Phoenix and \$20,000 for a cluster system constructed in a new development in Howard County.

Cost data are not yet available for a second new development in Howard County in which cluster systems were used. According to Howard County officials, eliminating individual septic tanks in this second development and keeping flows under 5,000 gallons per day have reduced the costs per household compared to the first development.

Capital costs per connection in numerous locations outside Maryland, as well as in Deer Park, are in the \$10,000-to-\$12,000 range, and cluster systems are being constructed in Howard County for less than \$20,000 per connection. Based on this information, the study team concluded that a range of \$10,000 to \$20,000 per connection for cluster systems is appropriate for obtaining ballpark estimates of the capital costs of systems to serve Baltimore County communities. Obviously, \$10,000 to \$20,000 is a wide range. However, with no actual examples of cluster systems in Baltimore County and with the wide variety of site conditions that can be encountered, the study team believes this is as precise an estimate as can be made at this time.

Costs of Traditional Community Sewer Systems

Traditional community sewer systems comprise a collection system that receives untreated wastewater from each property and conveys it to a centralized wastewater treatment plant. Costs of small community systems, like costs of cluster systems, are difficult to estimate. The study team obtained capital cost data for several Maryland projects, most of which have not actually been built. These data are presented in Table D-5.

The one sewer project listed in Table D-5 that was completely built is a system in Grantsville. That project involved extensive rehabilitation of sewer lines and construction of a wastewater treatment plant (WWTP) at a cost of almost \$23,000 per connection. The plant is sized to handle twice the wastewater now generated by the town's 201 households.

Only costs for the WWTP were obtained for a project designed to serve four communities in Caroline County. The estimated cost of the plant is about \$3,000 per household. Costs per connection for the collection system are likely to be much higher than the WWTP costs because the towns are 12 miles apart.

The four-town project in Caroline is proposed as an alternative to constructing a system for the Town of Goldsboro alone. The capital cost estimates for the complete Goldsboro system are almost \$30,000 per household if gravity collection lines are used and over \$24,000 per household if vacuum lines are used. Both estimates include \$7,600 for a wastewater treatment plant.

The estimated costs for the Goldsboro system, which includes a WWTP, are

**Table D-5
Capital Costs of Community Systems**

Location	Project Components	Number of connections	Project Capital Cost	Year of Cost Estimate	CPI-U Multiplier	1999 Capital Costs		Source
						Project	Per Household	
Traditional sewer systems:								
Caroline County, MD	WWTP	368	\$ 1,100,000	1999	1.00	\$1,100,000	\$ 2,989	(1)
Goldsboro, MD	gravity lines/WWTP	105	\$ 3,100,000	1999	1.00	\$3,100,000	\$ 29,524	(1)
Goldsboro, MD	vacuum lines/WWTP	105	\$ 2,500,000	1999	1.00	\$2,500,000	\$ 23,810	(1)
Grantsville, MD	sewer lines/WWTP	201	\$ 3,725,000	1990	1.23	\$4,581,750	\$ 22,795	(2)
Ridgely, MD	WWTP	457	\$ 1,760,400	1988	1.34	\$2,358,936	\$ 5,162	(3)
	sewer lines	51	\$ 1,075,500	1988	1.34	\$1,441,170	\$ 28,258	(3)
Water systems:								
Phoenix, MD	well, supply lines, treatment plant	11	\$ 1,000,000	1992	1.14	\$1,140,000	\$ 103,636	(4)
Grantsville, MD	well, supply lines, treatment plant	201	\$ 1,623,790	1989	1.29	\$2,094,689	\$ 10,421	(2)
Sunnybrook, MD	well, supply lines, treatment plant	160	\$ 150,000	1965	5.02	\$ 753,000	\$ 4,706	(4)

Legend:

WWTP = wastewater treatment plant

Sources:

- (1) Telephone conversation with Ellen Frketic, MES, July 15, 1999.
- (2) Town of Grantsville, 1992, pp. 20-23.
- (3) Rohlf, 1988, p.14
- (4) Telephone conversation with Bruce Keller, Baltimore County Department of Public Works, August 3, 1999.

comparable to the estimate of more than \$28,000 per connection for extension of sewer lines to 51 households outside the Town of Ridgely. WWTP costs of more than \$5,000 per household in Ridgely would be added to this amount.

The information presented here on capital costs of community sewer systems suggests that these systems are very extensive. With no examples of more affordable systems, for purposes of making ballpark estimates, the study team assumes that capital costs of community systems are at least \$20,000 per household.

Capital Costs of Community Water Systems

The study team was able to obtain capital cost information for only one community water system. The Town of Grantsville drilled a new well and constructed a two-mile long supply line and a water treatment plant about 10 years ago. The capital costs for this project were slightly over \$10,000 per connection, when converted to 1999 dollars.

Operating and Maintenance Costs

The study team uses several sources of data on operation and maintenance costs of community water and sewer systems. The first source is financial information published by the state for each municipality.

Many municipalities in Maryland operate water and sewer systems. Often financial accounting for these systems is accomplished through use of an enterprise fund that isolates the expenditures and revenues for the water and sewer operations from other municipal finances. Table D-6 lists municipalities in Maryland that (A) operate water and sewer systems that serve fewer than 350 households and (B) maintain enterprise funds that reflect the entire cost of their water/sewer systems. Expenditures from the enterprise fund are presented in Table D-6 for three recent fiscal years. These expenditures include any debt service paid by the municipality for these systems.

For six of the municipalities, the data reflect both water and sewer operations. System expenditures for these municipalities range from \$450 per household per year in Betterton to \$755 per household per year in Secretary. Average operating costs for the combination of water and sewer systems is \$615 per household per year. Two of the municipalities operate sewer systems only. Average expenditures are essentially the same for both sewer systems, \$300 per household per year. This information led the study team to conclude that expenditures in the six municipalities for which data reflect both water and sewer systems are probably split fairly evenly between the two types of systems.

Keedysville, the one municipality in this group that operates only a water system, has average annual expenditures per household of \$200 for water service. This expenditure level is somewhat lower than was anticipated from the deductive reasoning used above.

**Table D-6
Water and Sewer Operating and Maintenance Costs**

	Number of Households	FY'95 Expenditures		FY'96 Expenditures		FY'97 Expenditures		Three-Year Average		
		Total	Per Household	Total	Per Household	Total	Per Household	Total	Per Household	
Water and Sewer:										
Woodsboro	350	\$ 241,419	\$ 690	\$ 259,162	\$ 740	\$ 236,048	\$ 674	\$ 245,543	\$ 702	
Preston	300	156,974	523	162,871	543	159,328	531	159,724	532	
Betterton	265	117,451	443	124,654	470	115,383	435	119,163	450	
Queenstown	265	187,232	707	176,892	668	178,603	674	180,909	683	
Secretary	234	131,159	561	168,156	719	230,727	986	176,681	755	
Galena	225	120,353	535	128,859	573	129,337	575	126,183	561	
Total	1,639	\$ 954,588	\$ 582	\$ 1,020,594	\$ 623	\$ 1,049,426	\$ 640	\$ 1,008,203	\$ 615	
Sewer only:										
Millington	225	\$ 58,084	\$ 258	\$ 63,704	\$ 283	\$ 81,191	\$ 361	\$ 67,660	\$ 301	
Church Hill	267	80,839	303	78,774	295	80,360	301	79,991	300	
Total	492	\$ 138,923	\$ 282	\$ 142,478	\$ 290	\$ 161,551	\$ 328	\$ 147,651	\$ 300	
Water only:										
Keedysville	214	38,623	\$ 180	\$ 34,552	\$ 161	\$ 41,476	\$ 194	38,217	\$ 179	

Sources of expenditure data:

Department of Fiscal Services, 1996, pp. 203-290 and 1997, pp. 167-254.

Department of Legislative Services, 1998, pp. 167-254.

Source of information on services provided and households served:

Institute for Governmental Service telephone survey, July 1999

The article that provided data on capital costs of the Norwood cluster wastewater system also discussed operating costs. Total operating costs of \$1,500 to \$2,000 per month (1994 dollars) had been projected, but reportedly actual costs were less.¹⁰¹ The predicted costs represent \$144 to \$192 (1994 dollars) per year for each of the 125 households or \$164 to \$218 (1999 dollars) per year per household. These costs are less than the sewer system operating costs reported or deduced for Maryland municipalities.

MES reported estimated operating costs of \$55,400 per year for the WWTP to serve Goldsboro plus \$10,000 per year for gravity sewers or \$29,000 per year for vacuum sewers. These costs represent \$623 per household per year under the gravity sewer option and \$804 per household per year under the vacuum sewer option.¹⁰²

A final source of operating cost data was the Baltimore County Department of Public Works. The department provided the study team with capital costs for the Sunnybrook and Phoenix community water systems¹⁰³ and with operating cost data for these systems for calendar year 1998.¹⁰⁴ The Sunnybrook system was constructed in 1965 at a cost of \$150,000.

101 Gover, Nancy. 1994. "Norwood is site of Georgia's first municipal drip system," *Small Flows* 8 (2):4-5.

102 Telephone conversation with Ellen Frketic, MES, July 15, 1999.

103 Telephone conversation with Bruce Keller, Baltimore County Department of Public Works, August 3, 1999.

104 Telephone conversation with Bill Frankensfield, Baltimore County Department of Public Works, July 19, 1999.

In 1999 dollars, that translates to \$4,700 per household. Sunnybrook serves 160 households at a total operating cost of \$66,800, which is an annual cost per household of \$417.50. To recover these costs, the Metropolitan District charges Sunnybrook residents \$4.45 per 1,000 gallons of water used. In contrast, other Metropolitan District customers pay \$7.54 per 1,000 cubic feet of water used. Since each cubic foot contains more than 7.4 gallons, Sunnybrook residents pay a rate that is equal to 4.45 times 7.4, or more than \$33 per 1,000 cubic feet. This rate is more than four times the standard Metropolitan District rate.

The Phoenix water system was constructed in 1992 at a cost of \$1,000,000. This translates to a staggering \$104,000 per household in 1999 dollars. Costs per household to operate the Phoenix water system, which serves only 11 households, are also very high. The total cost to operate Phoenix for the year is \$37,300. This represents \$3,391 per household. (The Phoenix system is designed to serve 14 households. If all households were connected, the costs per household would drop to \$2,664, assuming total operating costs did not change.) Fortunately for Phoenix residents, they are not expected to pay the full cost for their water service. The system was constructed as a solution to ground water contamination caused by an old Nike missile site. The federal government covered the cost of constructing the system and subsidizes its operation. Phoenix residents pay for water use at the same rate as typical Metropolitan District customers, even though the system is not part of the Metropolitan District.

The costs of operating Sunnybrook appear to be somewhat higher than the costs reported or deduced for the municipal water systems listed in Table D-6, which all have at least

one-third more customer connections. The costs of operating Phoenix are higher by an order of magnitude, reflecting the fact that Phoenix's customer base is an order of magnitude smaller than the municipal customer bases.

Based on these data, the study team decided to use a range of \$500 to \$1,000 per year per household as a ballpark estimate of the cost of providing both water and sewer service from community systems.

Metropolitan District Costs

A final cost analysis performed by the study team was to estimate the capital cost per household of Metropolitan District facilities. The study team assumed that there is a rough correspondence between the county's gain in population and the construction of new subdivisions. That is, roughly the same number of people are occupying homes in new subdivisions as are being added to the county's population. More precisely, the number of households added to the county during a given period is roughly equal to the number of households in new subdivisions. Relying on this assumption, the study team obtained the average Metropolitan District capital costs per household by dividing the total cost on subdivision projects by the change in number of households. The computations are presented in Table D-7.

The 1997 Triennial Review of the water/sewer plan reported planned Metropolitan District expenditures of \$27 million (1997 dollars) on sewer projects in new subdivisions during the five-year period FY98 to FY02. During the first three years of that period, the county's urban population was expected to increase by 8,423 people. (See

Table C-1.) During the fourth and fifth years, the urban population was expected to increase by 1,849 people per year or 3,697 people for the two years. A total population increase for the five-year period of 12,120 was expected. At a rate of 2.4 persons per household, the population increase represents 5,050 new households. The \$27 million sewer project expenditure over these 5,050 households represents \$5,346 (1997 dollars) per household or \$5,453 (1999 dollars) per household.

The 1997 Triennial Review did not present aggregate data for water project expenditures in new subdivisions, so the study team relied on data in the 1991 update of the water/sewer plan. That document reported planned expenditures of \$88 million on subdivision water projects for 1991 to 2000. The study team had no data on the county's urban population at the start of the period, so it made the assumption that 90 percent of the county's population (622,921 people) live in the urban area. The study team had already computed the county's urban population for the year 2000 as 664,558. (See Table C-1.) The net gain in urban population from 1990 to 2000 is 41,637 people or 17,349 households. The \$88 million water project expenditure over these households represents \$5,072 (1991 dollars) per household or \$5,985 (1999 dollars) per household.

Table D-7
Metropolitan District Capital Expenditures

Sewer expenditures for new development (FY98-FY02)*		\$ 27,000,000
Population increase in urban area of county (1997-2000)**	8,423	
Population increase in urban area of county (2000-2010):**		
	Total	18,486
	Average annual	1,849
Estimated population increase in urban area of county (2000-2002)	3,697	
Estimated population increase in urban area of county (1997-2002)	12,120	
Estimated increase in urban households (based on 2.4 persons per household)	5,050	
Sewer project costs per new household		
	1997 dollars	\$ 5,346
	1999 dollars	\$ 5,453
Capital costs for subdivision water projects (1991-2000)***		\$ 88,000,000
1990 County Population	692,134	
1990 urban population (assuming 90% of total)	622,921	
2000 urban population**	664,558	
Estimated increase in urban population (1990-2000)	41,637	
Estimated increase in urban households (based on 2.4 persons per household)	17,349	
Water project costs per new household		
	1991 dollars	\$ 5,072
	1999 dollars	\$ 5,985

* Baltimore County, 1997, p. 93

** See Table C-1.

*** Baltimore County, 1991, p. III-1.01