Virginia Water Resources Research Center
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Are Virginia's Wastewater Treatment Plants Financially Healthy?

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The Problem

The future success of wastewater pollution control in Virginia will depend in part on the ability of local communities to maintain financially self-sufficient wastewater treatment operations. Localities will be financing wastewater construction without the assistance of either federal or state grants. Higher levels of treatment and larger volumes of wastewater will raise treatment costs significantly. The U.S. Environmental Protection Agency (EPA) estimates that the cost of sewage treatment for the average urban household will increase by 50 percent during the 1990s, and that smaller cities, with fewer households to pay fees, will see annual charges nearly double.[1]

A Peek at Virginia's User Charges

Do Virginia-communities have a healthy usercharge system that provides adequate revenues to support operations and debt repayment? To obtain information on the financial solvency of Virginia communities, EPA designed a survey that was implemented by the Virginia Water Resources Research Center.

Information was gathered on costs and revenues of wastewater treatment facilities, and demographic data were collected to shed light on the user-fee structures currently employed. One hundred and fifty publicly owned plants, out of 262 identified as municipal holders of Virginia Pollutant Discharge Elimination System (VPUES) permits, were surveyed. To investigate the significance of plant size, the permit holders were grouped into four categories according to the reported average daily treated flow. In Category A are those facilities treating less than 100,000 gallons per day (gpd); in Category B, those treating between 100,000 and 1 million gpd; in Category C, those treating between 1 million and 10 million gpd; and in Category D, those treating more than 10 million gpd. The overall response rate to the survey was 42 percent.[2]

Summary of Findings

- Twenty-five percent of _all the responding treatment facilities reported revenues to be less than their basic costs for operation, maintenance, and equipment replacement, which do not include additional costs of loans and bonds, or depreciation.
- Small wastewater treatment facilities appear to have the most trouble generating revenues that are at least equal to costs. All plants treating more than one million gpd reported revenues sufficient to cover operation, maintenance, and equipment replacement.
- Forty-seven percent of the smallest plants (less than 100,000 gpd) did not receive revenues sufficient to cover their basic costs.
- The deficit between revenues and costs ranged from 53 percent to 92 percent for the smallest facilities.
- Reported user charges for the smallest plants exceeded the state's "reasonable and affordable fees" for economically depressed or mid-range income areas, raising concerns for the residential users' ability to pay.

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Figure 1: Survey Summary			
	Number in Each Category in	Number of Plants	Number of Respondents in
A	58	33	19
B	134	76	27
C	49	29	8
D	21	12	**9**
Total	262	150	63

Federal Water Quality Legislation

Present circumstances are shaped by federal laws passed in the 1970s that were aimed at reducing water pollution. After the passage of the Water Pollution Control Act of 1972 and the Clean Water Act of 1977, many communities had to upgrade their wastewater treatment facilities.' However, their financial resources frequently were not sufficient to cover the capital expenses required to meet deadlines imposed by the legislation. Federal construction assistance grants covering up to 75 percent of capital expenditures were necessary to help many communities achieve compliance. In some cases, there were supplemental grants from states; often, local communities paid only a fraction of the total costs.

The fiscal outlook for future capital assistance is not encouraging

Federal funds generally were directed toward cities with larger quantities of inadequately treated wastewater, leaving the water-quality protection needs of smaller communities unaddressed.[4]

In 1987, Congress passed legislation to phase out federal construction grants to localities, and encouraged states to set up revolving loan programs. The availability of federal or state grants has decreased considerably, and only extreme hardship cases are likely to receive assistance. The fiscal outlook at both the federal and state levels for future capital assistance is not encouraging.

Will User Fees Cover Future Needs?

Publicly owned treatment works (POTWs) constructed or improved in response to the 1972 and 1977 acts may be approaching a time when the need for increased capacity, treatment level upgrades, or extensive system repairs will require additional capital expenditures. Ideally, POTWs can achieve fiscal self-sufficiency by adjusting user charges to balance expected operation, maintenance, and capital expenses. In fact, however, communities sometimes are compelled by external factors and public pressure to set user fees artificially low.

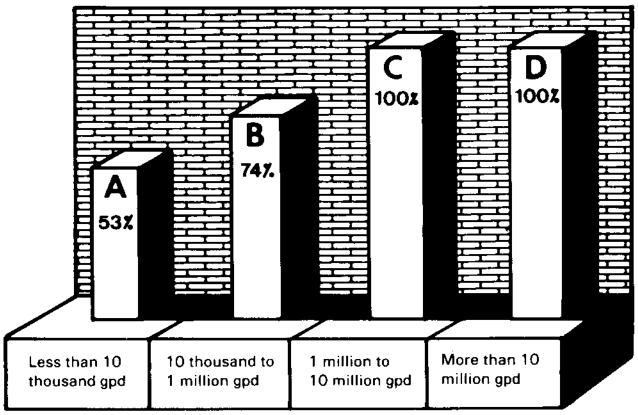
True costs of waste treatment often are not covered by charges to those benefiting from the service

General tax funds may be used to make up revenue shortfalls for operation and maintenance costs, with no money set aside to cover future capital expenses. In many cases, the true costs of waste treatment often are not covered by charges to the people benefiting from the service.

Financial Health Linked to Facility Size

Twenty-five percent of all the survey respondents reported that their revenues were less than their costs. The size of the treatment facility appears to be the most significant factor in determining its financial health, since deficits were reported only by those plants treating less than one million gallons per day (see Figure 2). The smallest facilities (Category A) reported the highest percentage-47 percent-where revenues did not equal their costs. The revenue shortfalls in this category ranged up to 92 percent. In Category B, 26 percent reported revenues less than costs, with revenue deficits ranging up to 46 percent. All of the respondents in Categories C and D reported revenues at least equal to their costs.

Figure 2: Percent of Treatment Plants With Revenues Equal to Costs



Economies of scale become apparent when the costs and revenues reported by the survey respondents are analyzed in terms of unit costs per thousand gallons. In a comparison of average unit costs, the smallest plants have 4.8 times higher costs than the largest plants. The disparity is only slightly less when median costs are compared-3.6 times higher for the smallest plants.

There is some question whether many small plants will ever be able to charge the full cost of treatment

With costs as high as $7.31 to treat 1,000 gallons of wastewater, there is some question whether many small plants will ever be able to charge the full cost of treatment.

Figure 3: Unit Costs of Treating 1,000 Gallons of Wastewater

Category	Range	Average	Median
A	$1.62 - $7.31	$3.65	$3.06
B	$0.31 - $6.02	$1.65	$1.25
C	$0.47 - $1.67	$0.88	$0.83
D	$0.43 - $1.15	$0.76	$0.85

Figures 3 and 4 show the range, average, and median unit costs and unit revenues for each category of respondents.

Figure 5: Annual Household Charges for Wastewater Treatment Service

Category	Range	Average	Median
A	$99-$360	$210	$200
B	$84-$414	$180	$143
C	$58-$300	$180	$159
D	$48 -$257	$144	$130

The smallest plants reported average charges to their customers that were almost 2.8 times higher than those for customers of the largest facilities. When median charges are compared, the disparity only drops to 2.5 times higher for the smallest plants. Figure 5 shows the range, average, and median of annual household sewage treatment charges reported by each category of respondents.

Figure 4: Unit Revenues per 1,000 Gallons of Wastewater Treated

Category	Range	Average	Median
A	$0.38 - $9.13	$3.72	$2.79
B	$0.22 - $8.22	$2.25	$1.85
C	$0.64 - $5.78	$1.98	$1.33
D	$0.47 - $2.99	$1.33	$1.10

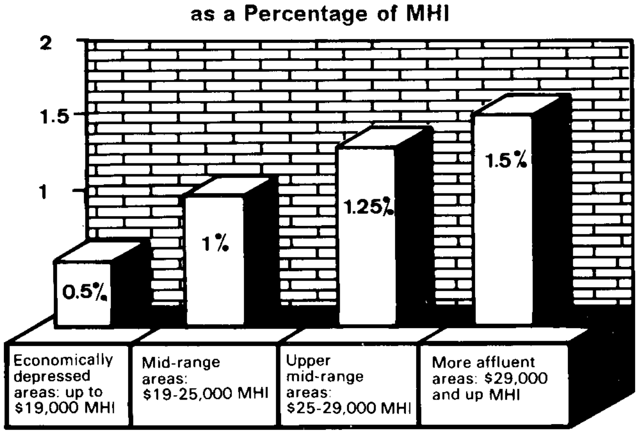
Ability to Pay

In cases where a large gap between current revenues and costs is reported, and where the stated **median household income** (MHI) is relatively low, there is some cause for concern regarding the residential users' ability to pay. It is possible that a disproportionate amount of family income might have to be devoted to wastewater services if charges were increased to make revenues equal costs.

A disproportionate amount of family income might have to go to wastewater services if charges were increased

Nationwide, on average, user charges are usually between .5 percent and 1 percent of MHI; 1.5 percent to 2 percent of MHI can be considered a reasonable upper limit in calculating the ratio of user fees to MHI, although some communities have found a willingness to pay even more for important projects.' The Virginia Water Control Board (VWCB) uses a slightly more conservative percentage of MHI, based on the relative affluence of user households; their criteria are shown in Figure 6.[6]

Figure 6: Virginia's Criteria for "Reasonable and Affordable" Wastewater Treatment Fees, as a Percentage of MHI



In the case of the smallest wastewater treatment facilities, the reported median household charge was near the upper limit of reasonable costs established by VWCB for more affluent areas, and well above the upper limit for economically depressed or mid-range areas. Since almost half of the facilities did not have revenues that equaled costs, it could be anticipated that the portion of the MHI devoted to wastewater treatment will have to be substantially higher for revenues to equal costs. Figure 7 shows the range, average, and median percent of MHI represented by the sewage treatment fees reported for each category.

Figure 7: Wastewater Treatment Charge as Percent of Median Household Income (MHI)

Category	Range	Average	Median
A	0.4% - 2.7%	1.0°/a	1.4%
B	0.4% - 3.2%	0.9%	0.7%
C	0.3% - 1.7%	0.9%	0.7%
D	0.2% - 0.7%	0.4%	0.5%

Survey Analysis by EPA

EPA's Office of Water, which developed this survey, worked with the National Small Flows Clearinghouse at the University of West Virginia to analyze the survey data. That analysis focused on the level of wastewater treatment used by the community (chiefly secondary or advanced treatment), rather than on the size of the treatment plant.

In over half of the communities, residential users may be paying less than their share of treatment costs

One of the issues addressed in the analysis was the equitability of residential user charges; are residential customers paying their fair share of the costs of wastewater treatment? Review of the data on the portion of wastewater flow, costs, and treatment attributable to residential users showed that, in over half of the communities (58 percent), those users may be paying less than their share of treatment costs. Where secondary treatment is used, about 57 percent of the communities charge residential customers less than their estimated share of treatment costs; where advanced treatment is in place, the figure is 67 percent.[7]

Another issue addressed by EPA was the effect of grant funding on capital costs. Debt-financing costs reported by the survey respondents were adjusted to reflect the cost of the capital without federal or state grant assistance; that is, the costs of interest on loans. This gave a rough estimate of the impact of grant assistance on community treatment costs.

Grants reduced the average treatment costs by 39 percent

The analysis showed that, without grant assistance, the average debt-financing costs for communities with advanced treatment would have increased from $.91 to $1.49 per thousand gallons, while it would have increased from $.64 to $2.48 per thousand gallons for secondary treatment. Overall, grants reduced the average treatment costs by 39 percent, from $4.23 per thousand gallons to $2.58.[8]

State Loan Program

VWCB has used federal "seed money" in recent years to make construction assistance loans and grants to more than 70 of Virginia's localities. This is a revolving loan program, with repayments going into the fund for future loans, so they can continue as the federal assistance program ends.

Interest rates are calculated by establishing a "reasonable and affordable" user charge

Assistance to communities is based on evaluations that consider financial and environmental criteria. Interest rates on loans are calculated by establishing a "reasonable and affordable" user charge, as described above; this charge is based on the number of wastewater treatment users and the median household income of the community. In some cases, where higher-cost loans would make user fees excessively high, low-interest or interest-free loans are made.

VWCB works with localities to reduce wastewater treatment costs, and to raise user rates gradually if necessary. Localities receiving funds must secure the loan through either a revenue pledge or a general obligation pledge; in addition, performance standards for wastewater treatment are incorporated into the construction projects. VWCB employs regional engineers to work closely with the communities, and to monitor the wastewater systems' operations.

The Clean Water Act of 1972 requires localities receiving assistance to set adequate user charges to cover treatment plant operation, maintenance, and repair. However, systems that are not receiving federal or state assistance have no obligation to set their user charges according to that requirement. In Virginia, although many publicly owned treatment works have received financial aid, a large majority of them have not; in addition, there are many privately owned treatment plants, which are not eligible for governmental grants or loans. This means that there are many wastewater treatment plants in Virginia that have no obligation to meet federal requirements for adequate user charges.

The reality is that, in many small communities, charges will have to be raised significantly

Wastewater treatment plants receiving federal or state aid are not required to have any sinking fund or escrow account set aside for possible future capital costs. Putting revenue funds in escrow is encouraged by VWCB when a community's treatment plant has reached its full capacity, and expansion or a new system is necessary. However, if creating such an account would entail raising the user charges over an affordable amount-which usually happens when the existing debt is large and the number of users is small-then the state works with the locality to find alternative ways of bringing their treatment system into compliance.' For example, the state may help the locality to redesign a scaled-down treatment system, or find other sources of financial aid."

Information on Virginia's POTWs

Some of the information that VWCB needs to carry out existing regulations is gathered in the monitoring data that is reported by all permit holders. These data indicate when a plant is nearing its peak capacity for adequate treatment and must be expanded or upgraded in the near future. The data also can be used for enforcement actions when a facility is not meeting the water-quality standards of its permit. Treatment plants that are not in compliance can be placed under a consent order, the terms of which may require plans for expansion, raising user charges, and developing a sinking fund for needed improvements. As long as plants are in compliance, however, the state will not require these actions." Since facilities receiving federal or state funds are required by the Clean Water Act to set adequate user charges to cover operation costs, they will have information on revenues and user fees.

The state may have to assume a more significant role if Virginia's waters are to be adequately protected

VWCB carries out periodic needs-assessment surveys of the state's POTWs; the next such survey is scheduled for early 1992. Localities are asked to identify their financial needs for wastewater treatment expansion or upgrades over the next 20 years. If a locality does not have the resources to carry out the planning that is necessary for this projection of needs, VWCB will work with them individually to develop a plan."

Policy Decisions Require Complete Data

The Clean Water Act requirement for adequate user charges suggests a federal emphasis on the need to ensure fiscal responsibility for wastewater treatment at the local level. However, there is no state-wide requirement that localities move to develop and implement fiscal programs providing a similar assurance of adequate and continued wastewater treatment, except where state loan funds are involved. In the future, the state may have to assume a more significant role in overseeing the fiscal soundness of all wastewater systems if Virginia's streams and rivers are to be adequately protected.

If the state were to exert greater oversight responsibilities over the fiscal policies of localities' wastewater treatment systems, a more comprehensive and detailed assessment of capital and financial needs for Virginia's POTWs would be required. Particular points of interest to be explored further include methods used by localities to determine user fees, as well as information on financing sources and debt repayment schedules. Also of interest would be data on the percentages of residential, commercial, and industrial users, and the fees they pay relative to the amount of wastewater to be treated.

Other information on the availability of system data (for example, customer counts, staffing levels, and expected life of the system) and cost and revenue data (e.g., operation, maintenance, and replacement expenditures, and cost of system components) would be helpful in determining POTWs' ability to carry out detailed and accurate cost analyses and to set equitable and adequate user fees. A thorough fiscal survey would provide information to help the state to judge the financial health of its wastewater treatment systems and to plan for the future.

Public Education: A Key Ingredient

When local decision makers are faced with the need to raise wastewater treatment charges, chests tighten and blood pressures rise. Although cost reductions can be achieved in some localities, the reality is that, in many small communities with facilities treating less than a million gallons per day, charges will have to be raised significantly if revenues are to equal costs. However, if a timely education program is initiated in advance, the trauma of the rate increase can be reduced.

Customers usually will pay for what they want or for what they don't want to lose

To be effective, the educational program must target three distinct groups, each with their own set of values: direct customers, elected officials, and the media in their role as the watchdog of government. Information must be carefully tailored to ensure that it is easily understandable and addresses the primary concerns of each group. The customers, for example, will place a high value on health and safety, clean water, and cost-effective service. They usually will pay for what they want or for what they don't want to lose, and educational programs need to operate from this premise in emphasizing the importance of wastewater treatment.

Local elected officials are customers as well, so they share the same concerns; in addition, they will be looking for specific facts they can use to answer questions during public debate on the subject. This will include information on the technical need for a wastewater-treatment upgrade, hard data on the cost-effectiveness of the project, and how other localities have handled similar situations. The local media will appreciate access to technical experts who can give them easily understandable background information on the project. It is crucial to clarify complicated issues so that they are comprehensible to the general public.[13]

State Role in Educational Programs

Small communities are often ill-equipped to manage an effective educational program. State programs generally are geared to provide technical assistance to communities, but have offered little in the way of effective educational programs to explain a rate increase to a treatment facility's users. As a result, an adversarial situation often arises when citizens are suddenly faced with higher charges that they don't understand.

Assistance from the state must include support for effective educational programs

Assistance from the state must be expanded to include support for effective educational programs if the state is to avoid a water-quality crisis in small communities where revenues fall short of costs. Where localities have used public education programs to achieve community acceptance of higher fees, information on their programs should be compiled and examined for use by other communities.

The Bottom Line

Recent opinion polls reflect increasing public support for stronger environmental protection. However, when stricter regulations result in a substantial increase of wastewater treatment charges, the public's enthusiasm may wane considerably. Local governments end up being squeezed between citizens' opposition to increased fees, more stringent regulations, and higher costs for public services.

Although everyone benefits from clean streams, differences in treatment costs may result in regional inequities that are felt at the household level

Unfortunately, wastewater treatment costs vary widely from region to region, primarily because more densely populated areas can take advantage of economies of scale, while rural communities are faced with substantially higher costs per capita for similar services. Most of us would agree that those who benefit from a particular service should pay the cost of it; in practice, however, this means that the more populous and wealthy regions of the state can comply with stricter wastewater treatment requirements at much lower costs per household. Therefore, a state policy requiring economic self-sufficiency for wastewater treatment would impose larger costs on the sparsely populated areas of the state.

Although everyone benefits from clean streams, differences in treatment costs may result in regional inequities that are felt at the household level. Fiscal self-sufficiency for every locality is the ideal, but it isn't likely to be a reality for smaller, rural communities where wastewater treatment costs are high. As Virginia works to achieve clean-water goals, subsidies and other alternative forms of financing may have to become components of the state's water management plans.

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NOTES

1. "Utilities Getting SDWA Bill," U.S. Water News, January 1991.

2. From a list of VPDES permits, 262 permit holders were identified as publicly owned wastewater treatment works. The permit holders were categorized into four groups, as described in the text. Percentages of these categories in the total population were calculated, and 150 survey forms were sent to permit holders selected by using a table of random numbers, in amounts corresponding to the populations' ratios within the categories. Two reminder letters also were sent, and telephone follow-up was carried out to improve the accuracy of questionable data.

   Sixty-three completed forms were returned, giving a response rate of 42 percent. A test of significance, or "goodness-of-ft" calculation, shows that the results were significant (P = .06878), but not strongly so.

3. Federal Water Pollution Control Act, Pub. L. No. 92-500, 86 Stat. 816 (1972); Clean Water Act, Pub. L. 95-217, 91 Stat. 1567 (1977).

4. Environment Reporter, Vol. 21, No. 38, 1-18 91, p. 1676.

5. Information from Mr. Haig Farmer of EPA, 2-1-91

6. Information from Mr. Richard Weeks of VWCB, 8-8-91.

7. Virginia User Charge Study, Office of Water, U.S. EPA. September 1990, p. 4.

8. Virginia User Charge Study, Office of Water, U.S. EPA. September 1990, p. 6.

9. Information from Mr. Don Wampler, VWCB, 7-15-91.

10. Information from Ms. Debra Welch, VWCB, 8-27-91.

11. Information from Mr. Richard Weeks, VWCB, 8-29-91.

12. Information from Mr. Walter Gills, VWCB, 8-29-91.

13. Daily, Stephen J., Larry McKinley, and Tom High, "Educating the Public about Sanitation Rate Increases," Journal of the Water Pollution Control Federation. Volume 60, Number 2, pp. 180-183.

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