

# National Overview of the 104(g)(1) Program

The Operator Training Program funding was authorized under section 104(g)(1) of the 1982 reauthorization of the Clean Water Act (CWA). The 104(g)(1) Operator Training Program provides on-site operator training, financial management, troubleshooting, and other operations and maintenance assistance designed to address the chronic problem of non-compliance by small, publicly-owned wastewater treatment plants. These plants discharge less than 5 million gallons per day, serve populations of less than 10,000, and often are in danger of being out of compliance with their discharge permit requirements.

This 1999 Wastewater Operator Training Program Evaluation reviewed historical data and surveyed all 104(g)(1) grantees about their work in fiscal years 1995 through 1998. The survey requested information about funding, program successes, program limitations, and case studies. Survey questions are included as an appendix to this report. Key findings are summarized at the end of the Executive Summary.

## History and Background

The 104(g)(1) program was designed originally to protect the huge investment of federal funds spent on construction and upgrades of small publicly-owned wastewater treatment plants. An October 1999 Congressional

Research Service report indicates that since 1972 Congress has provided \$69 billion to help communities with municipal wastewater treatment plant construction. In addition, state and local governments have invested more than \$25 billion in capital improvements at municipal wastewater plants.

As early as the 1980s, compliance problems at wastewater treatment plants were extensively documented in a series of reports published by the General Accounting Office (GAO). A GAO report published in November 1980 pointed out that many of the country's out-of-compliance municipal wastewater treatment plants had been built with Construction Grants Program funds authorized under the CWA.

The report estimated that between 50 and 77 percent of major municipal plants with at least secondary treatment capability were reporting



high incidences of non-compliance with their National Pollutant Discharge Elimination System (NPDES) permits. As of 1980, federal funds of \$34 billion had been appropriated for the Construction Grants Program, making it the second largest public works program in U.S. history. Despite the significant funding, many small systems still lacked the financial resources needed for capital improvements and for optimal operation. The continued widespread failure to meet standards was described in the report as “the potential waste of tens of millions of dollars in federal, state, and local funds.” Performance problems were attributed primarily to design and equipment deficiencies, infiltration and inflow, industrial waste overloads, and operation and maintenance deficiencies. Small treatment plants continue to struggle with many of these problems today.

In December 1983, another GAO report estimated that 82 percent of all dischargers exceeded their permit limits at least once during the 18-month period reviewed. The report also stated that municipal dischargers were in significant non-compliance more than twice as often as industrial dischargers.

The CWA Construction Grants Program’s substantial expansion of treatment capacity and upgrading of treatment standards from primary to secondary was expected to lead to improved effluent quality. However, the GAO and others documented that many of the systems which received funding continued to exceed their permit levels for pollutants. This finding led Congress to appropriate funds for operator training and technical assistance, with the motive of protecting the country’s vast investment in wastewater treatment infrastructure. As a result, the 104(g)(1) program was implemented.

**“The key to the success of the [104(g)(1)] program is knowing that building wastewater treatment systems alone will not protect and preserve water quality—educating people on how to operate and maintain them does.”**

—Michael Jefferson, 104(g)(1) outreach coordinator for Missouri’s technical assistance program

Since its inception in 1982, the 104(g)(1) program has received annual appropriations of about \$2 million each year. Funding has not grown to keep pace with inflation. In fact, EPA’s budget request for the program has shrunk to a mere \$294,000 in recent years. Each year, members of Congress who recognize the program’s benefits have added more than six times the requested amount to the 104(g)(1) appropriations during the final Conference Report preparation, bringing the appropriation to \$1.794 million for the past eight fiscal years. For FY00, the congressional add-on was reduced by about five percent, eliminating nearly \$75,000 from the program’s allocation.

Fortunately, considerable non-federal funds have been leveraged with federal 104(g)(1) dollars, increasing the program’s services and even expanding the types of technical assistance and training services offered. These funds have come from state governments, private organizations, and professional associations for wastewater operators. Many states use a combination of federal and other funding to provide comprehensive, long-term, on-site assistance, as well as classroom training, for wastewater operators. The focus of these additional services is to move plants beyond compliance, to a position where they can proactively address challenges that might contribute to future non-compliance.



*Before the pristine waters of the South Branch Potomac River, near Smoke Hole, West Virginia, reach the Chesapeake Bay, they will pass more than 40 wastewater treatment plants in three states.*

A number of state training programs which began with shoestring funding from the 104(g)(1) Operator Training Program have been able to leverage additional funding for expanded training and technical assistance for wastewater treatment professionals. Many state training programs now also receive separate funding to provide complementary training for drinking water treatment plant operators and managers and other environmental protection systems operators.

Since 1982, the 104(g)(1) program has helped the operators of more than 6,000 small systems develop and implement sound process control strategies, forward-looking preventive maintenance procedures, good housekeeping, record keeping, correct NPDES reporting, and better budgeting. The net result has been to help ensure the compliance longevity of treatment facilities, and thus protect both the environment and the investments in infrastructure construction.

Although CWA construction grants have now ended, public investments in infrastructure continue under the Clean Water State Re-

volving Loan Fund (SRF) program. The 1987 CWA Amendments authorized the new SRF program to provide federal funds to states. The states, which deposit a 20 percent match of the federal funds, offer loans to be used for wastewater construction. These loans are repaid by borrowers to the state, so that funds are available on a “revolving” basis for future construction in other communities.

EPA’s 1996 Clean Water Needs Survey (CWNS) described the water quality program needs for small communities as “significant,” noting that “there is a greater requirement in small communities for basic infrastructure, when compared to the needs for larger communities.” It is important to note that, because of smaller tax bases, the cost for upgrades presents a greater taxpayer burden on the typical small system user. Small community systems are therefore often eligible for public funds and, in fact, make up 71 percent of the total number of communities which are eligible for SRF monies for capital costs.

However, small systems need help in taking advantage of these types of funding opportunities. The Congressional Research Service said in its October 1999 briefing on CWA reauthorization that:

“Many small towns did not participate in the previous [construction] grants program and consequently are likely to require major projects to achieve compliance with the law. Yet these communities often lack an industrial tax base and thus face the prospect of very high per capita user fees, if their citizens are required to repay the full capital cost of sewage treatment projects.”

It is precisely because of these communities' limited resources that the 104(g)(1) program is needed. The assistance offered is at no cost to communities because it is fully funded by federal, state, and local monies. The program can also help communities locate and secure additional sources of financial aid to meet needs that are identified during technical assistance.

With funding of \$1.794 million and 988 facilities assisted across the country in FY99, the average federal cost per project was less than \$2,000. The clear benefits include improved operations, reduced operating expenses, and enhanced protection of public health and environmental resources.

The 104(g)(1) program successes are evident in the data reported to EPA for FY99. Nine hundred and eighty-eight facilities received assistance. Of these, 915 had either achieved, improved, or maintained compliance. These figures show the program's success rate at almost 93 percent for last year.

## Program Approaches to Improving Compliance

### Operator Professionalism

As plants built secondary treatment systems funded under the CWA Construction Grants Program, the 104(g)(1) program marshalled assistance to address compliance problems at plants struggling with new technologies and more stringent regulations. The vigorous and successful crisis intervention through the 104(g)(1) program addressed the chronic violations that occurred due to a lack of professional capacity and financial resources.

### Top Five Causes of Non-Compliance at Wastewater Treatment Plants

1. Poor understanding and application of process control by operator (first choice of 76 percent of survey respondents)
2. Inflow and infiltration
3. Staffing
4. Solids handling and sludge disposal
5. Operability/maintainability considerations

Source: responses to 1999 National Program Evaluation Survey of 104(g)(1) grantees and technical assistance providers

At the 104(g)(1) program's beginning in 1982, many factors contributed to the need for greater professionalism of the wastewater treatment workforce. Communities faced more stringent discharge requirements, necessitating more careful process management. In addition, the adoption of secondary discharge standards brought wide application of activated sludge and other secondary treatment technologies. At that time, these processes were new to most small system operators and had to be learned and mastered within very short periods of time. The operators of small wastewater treatment systems faced a period of rapid technical change and needed capable assistance. Many of the same challenges which drove the need for training in the 1980s continue to stress small systems even today.

For example, in a typical small community the wastewater operator may be a veritable "jack of all trades," who, in addition to being the wastewater treatment plant operator, may also be the drinking water treatment plant operator, the streets superintendent, or the recycling and solid waste collection manager. These varied duties intensify the challenges of complying with stringent regulations and operating wastewater treatment plants in a safe, cost-effective, and responsible manner.

The 104(g)(1) program continues to address the changing technologies and process control training needs of small system operators. For example, many systems are upgrading to sophisticated nutrient removal systems that require advanced treatment skills. In response to the 104(g)(1) program's recent customer service survey, 73 percent of respondents indicated that controlling treatment processes continues to be a problem. When surveyed for the program evaluation, 76 percent of 104(g)(1) technical assistance providers confirmed this statistic by choosing process control as the leading performance limiting factor at the plants they assist.

**The number of days committed to each technical assistance project varies between one and almost 50, but the national average is 3 days of assistance, sometimes carried out in small blocks of time over a period of months or even years.**

Effective process control requires careful monitoring and adjustment. It can be affected by outside forces, such as industrial and population growth, that put great pressure on treatment systems, many of which were originally designed for smaller capacity and lower standards. Nationally, a large number of systems that were constructed with CWA Construction Grants Program funding are now, more than twenty years later, reaching the theoretical end of their useful design life. It is especially important to optimize the performance of these plants to maintain compliance. The 104(g)(1) assistance program helps operators find low-cost solutions to treatment problems, design deficiencies, and inadequate capital funding.

Another key challenge related to operator professionalism is the difficulty associated with recruiting, paying, and keeping trained operators in small communities. Lack of financial resources for salaries and training can lead to increased turnover in small systems, as operators leave for more lucrative and career-enhancing positions at larger facilities.

To address these challenges, the 104(g)(1) program provides long-term, on-site assistance. The number of days committed to each technical assistance project varies between one and almost 50, but the national average is 3 days, sometimes broken down to a few hours at a time and carried out over a period of months or even years. During these long-term projects, the trainer often develops strong professional relationships with the operators and superintendents, local officials, and community leaders. The trainer working on a long-term project has the opportunity to work on-site with the operator to optimize plant



*Plant Superintendent, Jon Castro, with Maryland Department of the Environment Compliance Specialist Larry Schultz, holds up a beaker of his WWTP plant's effluent. The Chesapeake Beach WWTP has received 104(g)(1) assistance to help its dedicated operators meet one of the most stringent discharge permits in Maryland. Effluent consistently tests at less than 15–20 percent of its permit limits for suspended solids and biochemical oxygen demand and less than 50 percent of its limits for total nitrogen and phosphorus.*

performance during a variety of changing conditions, including changes of seasons; wet weather events; changes in flow volume, contaminant type, and concentration; equipment failure, maintenance, and replacement; and even plant upgrade and startup. Notably, technical assistance providers often get at the root of problems by helping local officials improve the management structures which support small system operators.

### **Cost Effectiveness and Savings for Communities**

The 104(g)(1) program operates cost-effectively, with an average federal cost per project of only \$1,816 in FY99. The modest federal investment of \$1.794 million also ensures the continued flow of funding from other sources. The 104(g)(1) grants to states require matching funds or in-kind contributions equal to at least 25 percent of the federal cash grant. This match requirement is a challenge for many of the grantees, but the availability of federal funding does create an incentive for the contribution of additional funds from other sources.

Many small systems also face serious financial challenges. They often lack financial management skills and have difficulty funding plant construction and upgrades. The 104(g)(1) program has been able to help communities with limited resources seek capital funding, as well as ensure that their operators learn to optimize treatment efficiencies and thus save money. As the plants built with CWA Construction Grant Program funds reach the end of their design life, some are experiencing significant compliance problems, further stressing operating budgets.

The 104(g)(1) assistance is offered at no cost to communities except for their willingness to participate, and technical assistance often



*This site near Hooper's Island in Maryland and other backwaters surrounding the Chesapeake Bay are critical nurseries for many fish species, including the regional favorite, the rockfish.*

results in dramatic improvements in compliance. As noted earlier, more than 90 percent of systems that receive assistance under the Operator Training Program maintain, improve, or achieve compliance, thereby improving surface water quality and protecting public health. The improved compliance has remarkable cost savings for small communities that could otherwise be subject to thousands of dollars in fines each day and require costly private assistance. Additionally, by optimizing treatment, it is often possible to reduce plant operating expenses and pass on the savings to customers or reinvest the savings into plant improvements.

Many 104(g)(1) technical assistance providers offer help not only with improving plant compliance but also with helping systems discover opportunities to move beyond mere permit compliance. These voluntary, “spin-off” programs abound and include pollution prevention, energy audits, and mentoring or “twinning” to facilitate training and information exchange. More than 85 percent of 104(g)(1) grantees offer complementary training and technical assistance for environmental professionals.

A large, stable, well-networked bank of providers has been developed to offer training for publicly-owned facilities. The average assistance provider in the program has many years of operations experience, much of it with small systems. Many technical assistance providers have worked in this program for more than a decade, and some have been involved since the program's beginning. The educational background of providers varies from high school to doctorate, but most providers have at least a bachelor's degree. Length of service in the program, educational background, experience, and networking capabilities all represent a significant investment in development of technical expertise.

The unique technical qualifications of 104(g)(1) assistance providers, coupled with their long-term experience in the program and, therefore, substantial expertise with small systems, make their assistance cost effective. This expertise enables 104(g)(1) trainers to help system operators optimize plant operation, sometimes deferring costs for engineering services and expensive upgrades, while extending the design life of older plants.

### **Partnerships Between Agencies to Meet Water Quality Goals**

Regulatory agencies often lack staffing, expertise, and funding to address the many responsibilities facing them—addressing non-compliance, developing of regulations, and assisting industry. For example, it has been well documented that some regulatory agencies perform facility inspections and other interventions almost exclusively in response to public complaints, violations noted in monitoring reports, or other crises. However, a proactive approach to compliance is more effective than a reactive one. Early referral of non-complying systems and at-risk plants to the 104(g)(1) program enables timely and

appropriate intervention to correct and prevent compliance problems.

Referrals to the 104(g)(1) program from state and local regulators, via inspection referrals and review of discharge monitoring reports, result in increased regional capacity to address small communities' wastewater treatment problems. Regulatory inspectors and permit writers rarely have the funding or time to provide assistance needed at small systems. The close partnership that often exists between regulators and 104(g)(1) technical assistance providers contributes to effective problem solving and resolution of compliance difficulties. The assistance providers work with regulators to pinpoint problems and devise appropriate solutions. In some cases, a system's agreement to accept technical assistance is a component of an enforcement action against a system and results in reduced or suspended fines, delivery of appropriate assistance to system operators, and protection of public health and water quality within the community.

Much of the success of the 104(g)(1) program hinges on these partnerships between federal, state, and local regulatory agencies, the regulated communities, assistance providers, and other interested parties. Although the 104(g)(1) program has limited EPA staffing at regional and national levels, EPA regional coordinators provide a wide range of services, including collection of data, monitoring of referrals, reporting, follow-up, and even a modest amount of direct delivery of technical assistance. The regions are given flexibility in the way that they administer their own programs, so that they can set up delivery systems that most effectively meet the needs of small systems in their areas. Current efforts to standardize regional and national data collection will facilitate 104(g)(1) program

reporting and evaluation and enable the use of environmental outcome measures to determine which technical assistance methods are working and why. EPA's national and regional 104(g)(1) coordinators were recognized with a commendable service award from EPA in 1999 for their accomplishments in this program.

Adequate and effective communication seems to be one of the keys to the program's success. Each year one of the EPA regions and its states host the National Wastewater Operator Trainers' Conference, which brings together key people working in the program to network and exchange information. Periodic program evaluations and community surveys are also used to gather data and report program successes and needs.

### **Community Assistance**

One of the 104(g)(1) program's greatest successes is helping communities stretch their limited financial resources. The program helps communities protect their significant investments in system infrastructure and keep their utility service rates low. Communities also receive unbiased advice about system operation, maintenance, capital improvement planning, rate setting, and plant upgrades. Assistance providers, who often have worked with operators for extended periods and who are familiar with specific plants and the needs of their owner-communities, often are able to provide impartial assistance in devising engineering procurement documents such as requests for proposals.

Another way the program helps communities is to ensure that their systems are operating optimally, so that they can accept increased flows of waste from residential and business growth. Technical assistance enhances management of treatment facilities and their

relationships with industrial dischargers. The 104(g)(1) program teaches operators ways to avoid negative impacts from industrial discharges, so that an inability to effectively treat industrial wastes does not limit economic development in the community. The program's technical assistance providers work with industrial pretreatment programs to ensure effective treatment and local protection of public health, water quality, and economic development.

**The 104(g)(1) program teaches operators ways to avoid potential negative impacts from industrial discharges. This is important because the ability to effectively treat wastes from industry may enhance economic development in the community.**

In many cases, the 104(g)(1) technical assistance has increased the ability of the community to accommodate industrial and residential growth without expansion of existing treatment facilities. Communities have testified that the program's technical assistance often helps to improve existing sewer infrastructure capacity, which enhances development opportunities in small communities. Optimized plants can accommodate additional flow from new residential and commercial sewer hookups. Thus, assisted communities have voiced strong support for the program. Many of the 104(g)(1) grantees surveyed during the program evaluation sent letters of support and appreciation from the communities they helped.

The 104(g)(1) program's technical assistance is uniquely structured to provide tools so that the community can solve its own problems. Assistance providers work not only on-site at



the plants with operations staff—they also work with local officials and the public to ensure that problems are solved in an effective and sustainable manner. They may attend town meetings and work with local officials, planners, and financial experts to ensure long-term system viability and optimized operation.

Descriptions of 104(g)(1) technical assistance projects, approaches, successes, and challenges are included in the ten regional sections which follow this overview. More information about the 104(g)(1) Operator Training Program can be obtained from the national coordinator and from regional coordinators throughout the country.

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