

OVERVIEW OF SURVEY METHODS

The second Drinking Water Infrastructure Needs Survey involved the collective efforts of the States, American Indian and Alaska Native Village representatives, the Indian Health Service, EPA, and thousands of water systems—all of which participated in identifying and documenting infrastructure needs. This chapter provides an overview of the methods used by these participants to assess drinking water needs. It also describes the refinements made to the methods used in the 1995 survey to improve the accuracy of this survey's results.

Scope of the Survey

Goal and Purpose. The goal of the 1999 Drinking Water Infrastructure Needs Survey was to estimate the documented 20-year national infrastructure need for the approximately 55,000 community and 21,400 not-for-profit noncommunity public water systems eligible to receive DWSRF assistance. A total of approximately 4,000 public water systems participated in the survey.

The 1996 Safe Drinking Water Act (SDWA) Amendments direct EPA to use the results from the latest needs survey to allocate DWSRF funds. For this purpose, the survey was designed to provide statistically precise estimates of need for each of the States. The DWSRF funds are allocated based on each State's share of the total national need (although, under SDWA, each State receives a minimum allotment of 1 percent).

The results of the survey are also used to allocate the set-aside—up to 0.33 percent of the DWSRF—for the U.S. Territories. Therefore, the survey generated separate estimates of need for Guam, American Samoa, the Commonwealth of Northern Mariana Islands, and the U.S. Virgin Islands.

For American Indian and Alaska Native Village water systems, EPA calculated the total infrastructure need for each EPA Region. The results are used to allocate the Tribal Set-Aside of up to 1.5 percent of the DWSRF to the Regions based in part on each Region's share of the total American Indian and Alaska Native Village need.

Infrastructure Needs. To fulfill the survey's purpose as a tool for allocating DWSRF funds, all of the infrastructure needs in the survey were required to meet the basic eligibility criteria established under the DWSRF program.¹ In general, projects eligible for funding facilitate compliance with the SDWA's National Primary Drinking Water Regulations or otherwise significantly further the health protection objectives of the Act.

Categories of Need. The survey assigned each project to one of five categories of need: source, transmission and distribution, treatment, storage, and "other." This classification allowed for an understanding of where on a broad scale the nation's water systems need to make capital investments.

¹ The survey excluded DWSRF-eligible needs which do not involve the installation, replacement, or rehabilitation of infrastructure: for example, refinancing loans, conducting studies, and acquiring other water systems.

- The source water category comprises projects necessary to obtain sufficient supplies of surface or ground water. Examples include wells, surface water intakes, and spring collectors.
- The transmission and distribution category includes the pipes that transport water to consumers. This category represents the needs associated with installing or rehabilitating raw and finished water transmission pipes, distribution water mains, flushing hydrants, valves, and backflow prevention devices.
- The treatment category consists of projects needed to address problems such as the presence of microbial pathogens and chemical contaminants.
- The storage category includes projects to construct new or rehabilitate existing finished-water tanks.
- The “other” category captures needs that cannot be assigned to one of the prior categories. Examples include laboratory equipment, emergency power generators, computer and automation projects, and improvements for flood or earthquake protection.

Current and Future Needs. The survey identifies current and future needs for the 20-year period from January 1, 1999 through December 31, 2018. Current needs address infrastructure projects which systems would implement as preventive measures to avoid water quality problems. An example of a current need is replacing an old and leaking section of distribution line that is susceptible to contamination.

Future needs are projects that a water system expects to undertake in the next 20 years. These include the routine rehabilitation of infrastructure and the replacement of a facility that performs adequately now, but will need to be replaced over the next 20 years to ensure the continued provision of safe drinking water. For example, a system may anticipate that it will need to replace its chlorinator within the next 10 years.

Credibility of the Findings. The survey required that documentation describing the purpose and scope of a project accompany each need. This requirement was necessary to verify that all of the projects submitted to the survey met the eligibility criteria for DWSRF funding. The survey established specific documentation requirements to ensure that uniform requirements would be applied to the States, U.S. Territories, and Tribes in determining the adequacy of documentation and the eligibility of needs. These requirements not only lend credibility to

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The rust on the hydropneumatic tank (foreground) signals the need for rehabilitation, while the severe corrosion on the other tank will require its replacement. Such deterioration can promote microbial growth and impair water quality.

the findings, but also address the issue of fairness when the results are used to apportion DWSRF funds. Of the 86,057 projects submitted to the survey, 14 percent were deleted for failing to meet the documentation criteria or for appearing to be ineligible for DWSRF funding.

Documented Costs and Cost Models

In addition to developing requirements for documenting needs, the survey set rigorous documentation criteria for assessing the legitimacy and scope of project costs. EPA required that each project cost submitted to the survey be supported by documentation to indicate that the cost had undergone an adequate degree of professional review. The documentation criteria also allowed EPA to review all of the components of a project that were included in a cost estimate. This enabled EPA to model portions of the project that might have been excluded from a cost estimate, or to delete DWSRF-ineligible portions of the submitted cost. For example, if a system identified a need to replace a section of old and leaking pipe, but lacked cost documentation, the system could supply the length and diameter of pipe to be replaced. Based on this information, the cost for this project could be modeled.

The number of projects submitted without cost documentation increased significantly in 1999 compared to the previous survey. Of 74,339 accepted projects, 67 percent were submitted without costs or documentation of cost. This increase necessitated a greater reliance on cost modeling.

For the 1999 survey, 59 models were developed to assign costs to 95 different infrastructure needs, from replacing broken valves to building new treatment

plants. The cost documentation submitted by water systems was the sole source of data for all but 19 of the cost models. For some types of need, the survey data proved inadequate for generating a statistically significant model. Therefore, cost data from additional sources, including engineering firms and State DWSRF programs, were obtained to supplement the data submitted by survey respondents.

Developing the Methods

The methods for the 1999 survey were developed by a workgroup consisting of State, American Indian, Alaska Native Village, Indian Health Service, and EPA representatives. The workgroup decided to adopt the general design of the first survey in 1995. However, the workgroup refined some of the methods based on lessons learned in conducting the 1995 survey, findings from a 1997 follow-up study that EPA conducted to assess the first survey, and options made available by advances in Internet communications.

Acceptable Documentation

The following types of documents were used to justify the need and/or cost of a project.

For Need and/or Cost Documentation

- Capital Improvement Plan or Master Plan
- Facilities Plan or Preliminary Engineering Report
- Grant or Loan Application Form
- Engineer's Estimate
- Intended Use Plan/State Priority List
- Indian Health Service Sanitation Deficiency System Printout

For Need Documentation Only

- Comprehensive Performance Evaluation (CPE) Results
- Sanitary Survey
- Source Water Protection Plan
- Monitoring Results
- Signed and dated statement from State, site visit contractor, or system engineer clearly detailing infrastructure needs.

For Cost Documentation Only

- Cost of Previous Comparable Construction



Water from the Charles River in Massachusetts pours into a deteriorated transmission main which the Massachusetts Water Resources Authority (MWRA) had drained after detecting a leak. MWRA replaces or rehabilitates approximately 7 miles of pipe per year, some of which is more than 100 years old. Many older water systems will find it increasingly necessary to replace substantial portions of distribution networks that were installed 50 to 100 years ago.

The workgroup developed the following improvements for the 1999 survey:

- In 1995, all systems serving more than 50,000 people were included in a census. The 1999 survey expanded the census to include systems serving more than 40,000 people. This change increased the precision of the survey's estimates for the largest systems that represent the greatest share of the nation's infrastructure needs.
- For the first survey, EPA was primarily responsible for collecting information from systems that did not respond to the survey or that submitted inadequate documentation. For the 1999 survey, this responsibility was assumed by States. The involvement of those more familiar with the surveyed systems improved the response rate and the identification of needs.

- The workgroup modified the design of the survey questionnaire by providing more examples and simplifying the forms.
- The 1999 survey created a user-friendly website that allowed the States to readily identify which projects required additional documentation of need or cost.
- The 1999 survey included the infrastructure needs of the 21,400 not-for-profit noncommunity water systems eligible for DWSRF assistance. These systems were not included in the 1995 survey.
- For the American Indian portion of the 1999 survey, the number of small systems selected to participate was increased to provide a more precise estimate of national need.
- The use of a census for Alaska Native Village water systems increased the precision of the need estimates compared to the sampling methods used for the first survey.

Conducting the State Survey

The survey used a questionnaire to collect infrastructure needs from medium and large water systems. A package containing a questionnaire, instructions, an example of a completed questionnaire, and a list of commonly asked questions was sent to each system in the survey. Packages were mailed to all 1,111 of the nation's largest systems serving more than 40,000 people and to a random sample of 2,556 medium systems serving more than 3,300 people.

The systems returned the questionnaires and accompanying documentation to their State contacts. The States reviewed each questionnaire to ensure that systems identified all of their needs and that the projects fulfilled the eligibility and documentation criteria. If these criteria were not met, the States had the option of contacting the system to obtain more information. EPA conducted a final review of each project and entered the information into a database. Web-based communications allowed the States to review the data, including any changes made by EPA. The website provided States with the information necessary to identify projects not meeting the established criteria and provided the States with an opportunity to submit additional documentation of project need or cost.

Small systems serving 3,300 or fewer people generally lacked the personnel and planning documents necessary to complete the questionnaire. Therefore, the infrastructure needs of small systems were obtained through site visits to approximately 599 systems—with at least 6 systems selected in each State. EPA conducted an additional 100 site visits to assess the needs of not-for-profit non-community water systems.

Conducting the American Indian and Alaska Native Village Surveys

Developing the American Indian Methods. The 1999 survey used the same tools (questionnaires and site visits) to estimate the needs of American Indian and Alaska Native Village water systems as were used for systems in the State portion of the survey. Exhibit 1 displays the location of the American Indian and Alaska Native Village water systems included in the survey.

U.S. EPA



All 19 American Indian systems serving more than 3,300 people completed a questionnaire. EPA offered technical support to systems that requested assistance in identifying eligible needs and preparing documentation. The questionnaires for each system contained pre-printed need and cost information derived from the Sanitation Deficiency System (SDS) of the Indian Health Service (IHS). The SDS provides information on specific needs and ranks communities' needs based on threats to public health. This information served as a baseline of needs to which the systems added projects for the survey.

The survey conducted 78 site visits to a random selection of small systems serving fewer than 3,300 people. Of the approximately 781 American Indian water systems, 762 systems are small.

All needs and costs submitted by American Indian systems were required to meet the documentation criteria established for the survey. To be considered adequate, documentation of need had to explain the

purpose of the project, while documentation of cost had to indicate that the cost had been subject to professional review. If cost documentation was unavailable, the system was asked to provide information that enabled EPA to model the cost.

Developing the Alaska Native Village Methods. The availability of key personnel and data resources (e.g., aerial photographs) allowed EPA to use a census to assess the needs of Alaska Native Village water systems. A questionnaire was mailed to the two medium-sized systems serving more than 3,300 people. Infrastructure needs for 172 small systems were identified on questionnaires by representatives from the Alaska Native Village Health Consortia, IHS, and Village Safe Water with assistance from EPA.

A round-table of IHS and EPA engineers was convened to provide guidance on developing project costs. Villages were

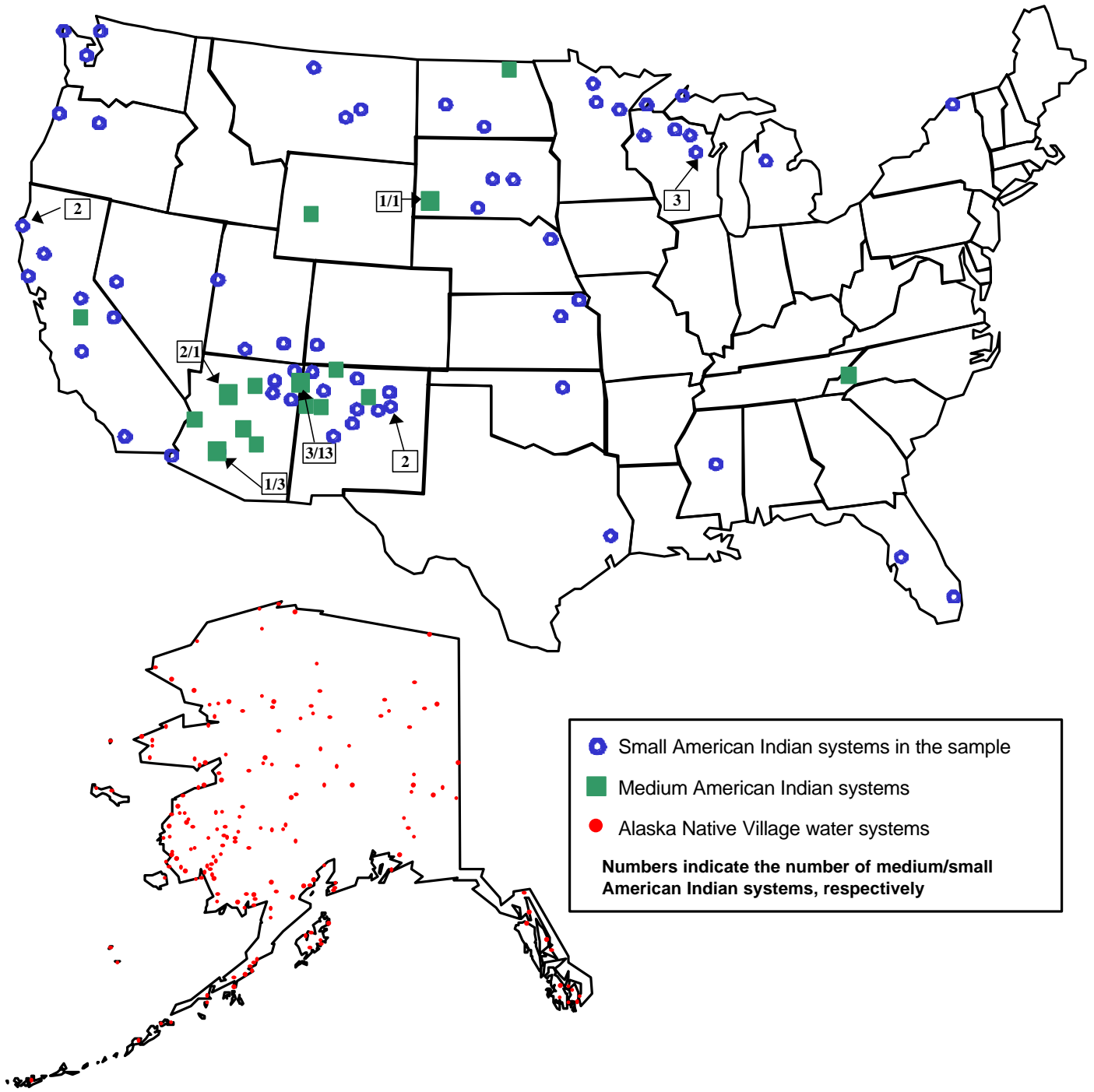
assigned to one of four geographical zones to account for distinct regional variations in costs. For most types of need, costs were established for each region. EPA developed these costs based on projects funded by IHS in Alaska Native Villages. However, the cost models that were developed from data provided by systems in the State and American Indian portions of the survey were used to assign costs to a few small-scale projects (e.g., flushing hydrants) for which IHS costs were unavailable.

Navajo Nation EPA



Many American Indians obtain their drinking water from watering points such as the one pictured here.

Exhibit 1: Location of American Indian and Alaska Native Village Water Systems In the Needs Survey Sample





Some water systems employ short-term measures to postpone the expense of replacing and rehabilitating infrastructure. Here a water system uses a broom to prop up a chemical feed line. With a \$4.4 million DWSRF loan, a neighboring water system expanded its treatment capacity to serve the community previously served by this deteriorated system.