Appendix A—Methodology

A workgroup was convened in 1994 to develop an approach for determining the drinking water infrastructure need for community water systems nationwide. The workgroup included staff and representatives of State drinking water agencies, American Indian and Alaska Native water systems, the Indian Health Service, and EPA regions and headquarters. The workgroup met in January 1994, August 1994, June 1995, and September 1995 to develop the survey methodology and design the resulting Report to Congress.

The methodology took into account the strengths and resource constraints of the different sizes of drinking water systems and developed different processes for collecting information from each one. Systems were broken down into three size classifications: large (those serving more than 50,000 people), medium (those serving from 3,301 to 50,000 people), and small (those serving 3,300 and fewer people). Exhibit A-1 shows the data collection method used, target precision levels, and number of systems surveyed for each size classification. American Indian and Alaska Native water systems were surveyed separately.

Estimating Needs for Water Systems in the States: Large and Medium Systems. All 794 large community water systems and 2,760 of the 6,800 medium systems in the States received a mailed questionnaire package. Systems were asked to complete a matrix identifying those capital projects needed to continue supplying safe drinking water to their customers. The matrix included descriptions of each need, cost estimates for the project, and documentation. The questionnaire also requested information that could be used to model costs for those infrastructure projects that did not include a cost estimate.

Exhibit A-1: Approach to Statistical Survey in the States

Small Systems	Medium Systems	Large Systems
Up to 3,300 people	3,301 - 50,000 people	More than 50,000 people
Site Visit	Questionnaire	Questionnaire
Sample	Sample	Census
95% ± 10% Precision Nationally	95% ± 10% Precision by State	
540 Sampled 537 Completed	2,760 Sampled 2,563 Completed	794 Sampled 784 Completed

All questionnaires completed by water systems in States were sent to State drinking water staff for review. State staff reviewed the needs of the systems to ensure that all documentation was adequate, and forwarded the questionnaires to EPA headquarters for final review. Following this review, responses were entered into a database containing drinking water infrastructure needs from all systems surveyed.

Acceptable Documentation

The following types of documents were used to justify the need for projects. Asterisks indicate documents that also provide acceptable cost estimates.

- Capital Improvement Plan*
- Master Plan*
- Facilities Plan*
- Preliminary Engineer's Estimate*
- State Priority List
- Bilateral Compliance Agreement
- Administrative Order/Court Order/Consent Decree
- EPA or State Filtration or Ground Water Under Direct Influence Determination
- Documentation of a Maximum Contaminant Level Violation, Treatment Technique Violation, or Lead and Copper Rule Exceedance
- Grant or Loan Application Form*
- Comprehensive Performance Evaluation Results
- State-Approved Local/County Comprehensive Water and Sewer Plan
- Sanitary Survey
- Signed and dated statement from State, site-visit contractor, or system engineer clearly detailing infrastructure needs.

Many large and medium drinking water systems were able to provide high-quality documented estimates of the cost of the infrastructure need they had identified. If documented cost estimates were not provided, EPA used cost models to generate costs for documented projects. Cost models were developed from the estimates provided by other large and medium water systems. For a limited number of infrastructure needs, the survey collected insufficient information to develop cost models. Costs for these needs were modeled based on engineers' reports for similar projects around the country. All costs were converted to January 1995 dollars.

State-by-State and national needs for large drinking water systems were determined by summing the documented costs and modeled costs for all large systems. Large systems that did not respond were assigned a need of zero. For medium water systems, EPA calculated each State's need by extrapolating the results from the sample to the State as a whole. To assure accurate estimates of total State costs, EPA visited States to verify the number and size of the water systems in each State's database. This process allowed EPA to extrapolate with confidence to arrive at a total medium-system need for each State.

Estimating Needs for Systems in the States: Small Systems. The workgroup estimated small water system needs using a national statistical model. To identify needs, EPA staff visited 537 of the over 46,500 small water systems to determine needs through on-site assessments. In most cases, State representatives accompanied EPA staff on the visits. Information collected during these assessments was reviewed by State and EPA staff and then entered into the national database.

Most small systems did not have documented cost estimates for the projects identified. Because of this, data provided by States, engineering firms, and larger systems were used to develop cost models for small water system needs. The costs derived from these models were used to extrapolate total costs from the systems surveyed to the nation as a whole. State inventories of small systems were checked for accuracy.

Estimating Needs for American Indian and Alaska Native Water Systems. American Indian and Alaska Native water systems fall into two size categories: medium and small. There are 15 medium American Indian systems. All 15 were sent questionnaire packages. These systems and their Tribal governments completed the questionnaires in the same manner as the large and medium systems in the States. The completed questionnaires were sent to the appropriate EPA region and then to EPA headquarters for review. In cases in which project costs were unavailable, EPA estimated costs using models developed for medium systems in the States. Responses and modeled costs represent the total needs for medium American Indian water systems.

Over 98 percent of American Indian and all Alaska Native systems are small. The workgroup's procedure for estimating needs for these systems used existing IHS databases and information collected from a sample of water systems. The IHS databases provided system-by-system information on the need, taking into account the individual characteristics of each one. These databases, however, did not contain information on all the needs collected by the survey. Therefore, data from sampled systems were used to develop adjustment factors for the IHS data. These adjustment factors reflect the difference between the IHS costs and the costs reported by the systems surveyed. Separate adjustment factors were developed for American Indian and Alaska Native systems. Total needs for American Indian and Alaska Native water systems were derived from the IHS data and the adjustment factors.

For small American Indian systems, information was collected from 57 of the 682 systems nationwide. EPA staff or contractors, often accompanied by Tribal representatives, EPA regional Indian Coordinators, and Indian Health Service representatives, made on-site assessments at each of these systems and identified needs. Project costs were estimated using the models developed for small systems in the States.

Drinking water infrastructure needs for the 187 Alaska Native communities were estimated by a roundtable of the Alaska Native Health Board, the Alaska Area Native Health Service (part of the IHS), the Alaska Department of Environmental Conservation (Village Safe Water), and EPA. This group selected 20 representative Alaska Native water systems and identified needs for those systems. Five of the 20 systems were then visited to verify the accuracy of the needs assigned by the roundtable.

Needs Associated with the Safe Drinking Water Act. A portion of the needs collected in the survey are attributable to the SDWA. For existing regulations, systems were able to identify projects needed for compliance. In these cases, survey responses were used to derive the SDWA need. However, most systems were unable to identify projects needed to comply with proposed and recently promulgated regulations. Needs for these SDWA regulations are based on the national cost estimates published in the Federal Register when the regulations were proposed. Needs for other future regulations were taken from preliminary economic analyses prepared in anticipation of promulgating regulations.

Alaska Area Native Health Service, OEHE

Rudimentary roof catchments provide drinking water for some households in the United States.

Appendix B—Summary of Findings

Needs for Water Systems in the States*

Exhibit B-1—Total Need by Category
Exhibit B-2—Current Need by Category
Exhibit B-3—Total Need by System Size
Exhibit B-4—Current Safe Drinking Water Act Need
Exhibit B-5—Total SDWA and SDWA-Related Need

Needs for American Indian and Alaska Native Water Systems

Exhibit B-6—Total Need for American Indian and Alaska Native Water Systems by EPA Region
Exhibit B-7—Need by Category for American Indian and Alaska Native Water Systems
Exhibit B-8—Total SDWA and SDWA-Related Need for American Indian and Alaska Native Water Systems

* Needs for water systems in the States do not include needs for American Indian and Alaska Native water systems. Needs for Palau (approximately $17.2 million) are not included in this report because Palau is not eligible to participate in the Drinking Water State Revolving Fund.

Distribution and transmission line breaks result in loss of service and can lead to contamination. Breaks can sometimes be dramatic. The road collapsed under these cars, at right, after a water main break in Fort Lauderdale. Below, a work crew repairs a water main break in San Francisco.

Courtesy of the Fort Lauderdale Sun-Sentinel

San Francisco Chronicle

Exhibit B-1: (facing page)

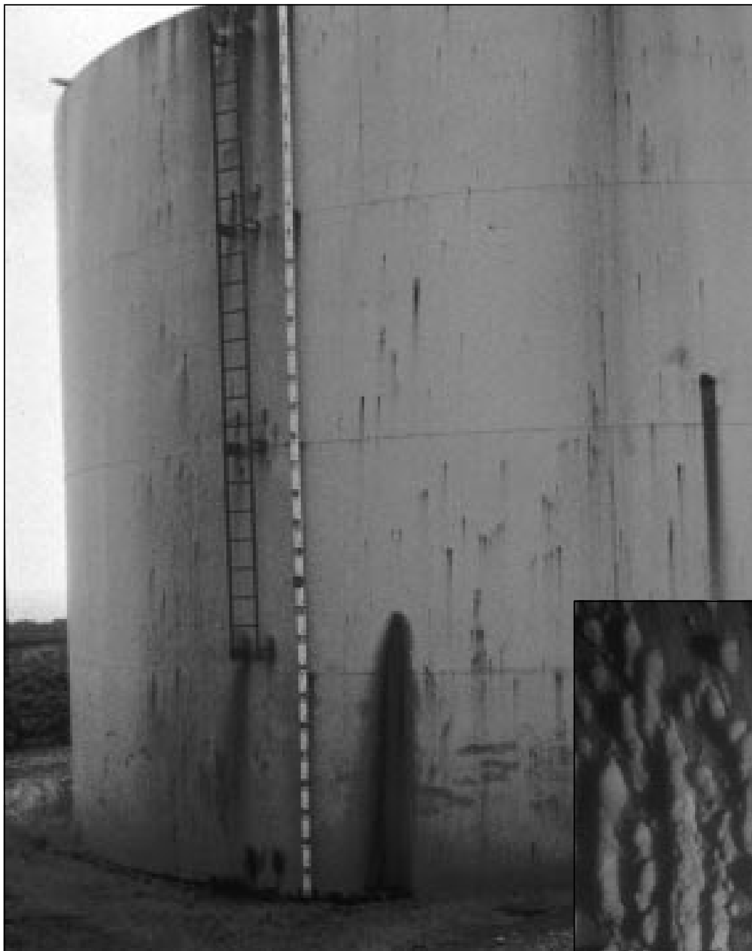
Total Need by Category

The total infrastructure need for water systems regulated by the States is $137.1 billion.

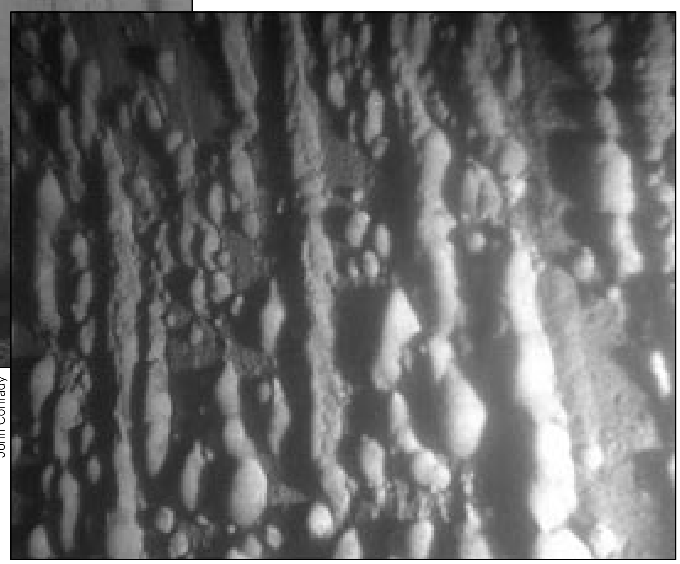
Exhibit B-1: Total Need by Category (20-year need in millions of Jan. '95 dollars)

State	Transmission and Distribution	Treatment	Storage	Source	Other	Total
Alabama	869.8	483.4	189.9	111.2	4.9	1,659.2
Alaska	478.3	143.5	93.3	49.5	6.6	771.2
Arizona	522.5	640.7	112.4	70.9	7.3	1,353.7
Arkansas	1,012.6	780.8	144.2	83.0	3.9	2,024.5
California	8,833.8	4,979.1	1,544.1	2,812.3	644.5	18,814.0
Colorado	929.2	631.7	149.3	199.4	39.5	1,949.1
Connecticut	805.6	352.3	104.0	83.6	11.2	1,356.7
Delaware	248.3	62.4	30.3	27.6	3.0	371.6
District of Columbia	110.8	12.7	8.2	0.0	0.0	131.6
Florida	2,170.5	1,317.3	402.1	362.5	82.9	4,335.3
Georgia	1,897.7	895.4	229.8	265.5	6.4	3,294.8
Hawaii	137.3	152.4	46.9	93.1	1.2	430.9
Idaho	337.9	111.2	70.1	69.3	1.7	590.2
Illinois	3,067.9	1,502.0	469.8	228.9	80.9	5,349.7
Indiana	925.2	470.9	173.5	79.7	25.4	1,674.7
Iowa	1,612.9	368.4	167.5	91.6	15.5	2,255.9
Kansas	1,181.5	521.7	169.3	97.3	6.6	1,976.5
Kentucky	1,349.9	575.9	136.7	152.1	9.6	2,224.2
Louisiana	1,046.5	573.7	190.7	131.3	11.2	1,953.5
Maine	545.6	199.1	83.3	32.5	4.9	865.5
Maryland	721.3	302.7	143.5	69.6	47.7	1,284.7
Massachusetts	3,636.8	1,536.8	442.0	281.5	47.9	5,945.1
Michigan	2,751.1	1,252.3	222.7	171.9	38.9	4,436.8
Minnesota	1,374.4	537.0	222.6	275.4	28.3	2,437.6
Mississippi	1,031.2	251.4	170.4	118.2	4.9	1,576.1
Missouri	938.1	520.8	242.7	113.8	63.5	1,878.9
Montana	378.5	165.2	71.6	44.8	2.5	662.6
Nebraska	471.3	306.4	78.1	90.7	6.3	952.9
Nevada	252.6	162.7	42.0	58.6	9.0	524.9
New Hampshire	402.6	170.0	94.3	47.9	2.2	717.0
New Jersey	2,469.8	658.2	290.5	163.5	31.2	3,613.2
New Mexico	589.0	168.9	95.2	176.3	13.3	1,042.7
New York	6,600.3	2,057.0	535.4	760.0	129.8	10,082.5
North Carolina	1,491.8	738.3	255.4	218.8	9.8	2,714.1
North Dakota	321.4	179.7	53.5	30.1	2.2	586.9
Ohio	2,680.6	1,316.7	538.1	271.2	99.7	4,906.3
Oklahoma	1,083.1	670.7	177.8	85.1	14.7	2,031.4
Oregon	1,063.9	550.6	266.1	255.8	11.8	2,148.2
Pennsylvania	2,854.7	1,269.2	428.1	179.1	25.0	4,756.0
Puerto Rico	1,172.6	591.2	217.5	271.9	0.8	2,254.0
Rhode Island	429.2	170.5	31.3	17.9	7.7	656.7
South Carolina	718.9	511.9	122.4	103.4	4.2	1,460.8
South Dakota	306.4	141.4	63.8	53.0	4.2	568.7
Tennessee	972.7	661.2	179.6	44.7	13.0	1,871.2
Texas	7,157.6	3,078.5	995.5	1,018.1	114.9	12,364.6
Utah	536.4	316.1	105.7	75.1	12.1	1,045.4
Vermont	267.8	108.9	48.8	31.6	2.2	459.3
Virginia	1,416.9	965.8	218.7	275.6	66.9	2,943.9
Washington	2,345.8	732.0	607.1	240.5	105.4	4,030.8
West Virginia	576.7	340.8	105.7	63.7	3.3	1,090.2
Wisconsin	1,025.3	525.4	177.5	125.2	13.9	1,867.2
Wyoming	213.4	113.2	29.4	33.0	1.8	390.7
Subtotal	**76,336.0**	**35,846.0**	**11,788.6**	**10,807.3**	**1,906.2**	**136,684.2**
American Samoa	12.2	4.8	3.3	1.9	0.3	22.5
Guam	33.3	5.6	10.6	57.1	0.0	106.7
Northern Mariana Is.	10.5	18.7	2.4	2.6	1.0	35.1
Virgin Islands	139.5	44.4	34.0	5.1	0.2	223.1
Subtotal	**195.4**	**73.4**	**50.4**	**66.6**	**1.5**	**387.3**
Total	**76,531.5**	**35,919.4**	**11,839.0**	**10,873.9**	**1,907.7**	**137,071.5**

Dan Fraser



John Conrady



Periodically, storage tanks must be drained, sandblasted, and covered with epoxy paint. If this refurbishment is not done, water quality can deteriorate and microbiological contamination can occur. Pictured above is an outside view of a storage tank needing rehabilitation. The insert is an underwater photo of the inside wall of a water storage tank that is overdue for rehabilitation. These are rust deposits that can harbor bacteria and lower water quality. Over one third of the water systems in the country need to rehabilitate storage tanks.

Exhibit B-2: (facing page)

Current Need by Category

Approximately $75.7 billion is for projects needed now to protect public health at water systems regulated by the States.

Exhibit B-2: Current Need by Category (in millions of Jan. '95 dollars)

State	Transmission and Distribution	Treatment	Storage	Source	Other	Total
Alabama	478.4	101.4	134.6	80.4	0.0	794.8
Alaska	335.3	43.0	65.8	37.1	0.0	481.3
Arizona	382.4	375.5	91.0	49.7	0.0	898.6
Arkansas	789.6	427.1	108.5	50.2	0.0	1,375.4
California	5,522.9	2,085.2	978.9	2,465.7	1.2	11,053.8
Colorado	487.1	233.7	86.3	117.0	0.0	924.1
Connecticut	265.7	82.8	47.3	38.9	0.0	434.8
Delaware	151.3	6.6	17.1	17.0	0.0	192.1
District of Columbia	101.1	0.0	8.2	0.0	0.0	109.3
Florida	1,618.1	397.0	333.5	305.3	0.0	2,654.0
Georgia	1,282.2	336.5	148.9	145.2	0.0	1,912.8
Hawaii	108.1	85.1	43.3	90.9	0.0	327.4
Idaho	188.7	26.4	40.6	43.4	0.0	299.1
Illinois	1,486.2	330.7	239.6	183.5	0.0	2,240.0
Indiana	612.0	116.9	124.3	60.9	0.0	914.1
Iowa	1,181.9	70.5	93.1	48.2	0.0	1,393.8
Kansas	866.2	256.3	131.8	60.1	0.0	1,314.4
Kentucky	674.4	134.2	90.9	38.5	0.0	938.0
Louisiana	729.7	191.5	141.9	85.4	0.0	1,148.6
Maine	392.4	66.9	52.2	19.8	0.0	531.3
Maryland	543.6	143.2	98.7	39.6	0.0	825.1
Massachusetts	2,301.7	399.3	404.5	219.7	0.0	3,325.1
Michigan	1,798.8	412.4	135.7	120.0	0.0	2,466.8
Minnesota	313.9	55.9	115.9	113.8	0.0	599.5
Mississippi	671.7	29.0	127.0	84.0	0.0	911.7
Missouri	545.2	136.5	175.1	85.5	0.0	942.3
Montana	190.3	35.9	40.3	23.4	0.0	290.0
Nebraska	254.8	176.7	48.2	69.8	0.0	549.5
Nevada	145.0	53.6	29.2	17.3	0.0	245.2
New Hampshire	210.6	42.8	34.9	22.6	0.0	310.9
New Jersey	1,409.1	149.0	153.8	94.9	0.0	1,806.8
New Mexico	475.7	92.6	75.3	164.4	0.0	807.9
New York	4,639.1	1,061.9	392.6	679.6	0.0	6,773.2
North Carolina	1,134.2	176.6	191.1	152.2	0.0	1,654.1
North Dakota	114.0	37.9	35.8	12.5	0.0	200.2
Ohio	1,419.8	418.9	356.8	182.4	0.0	2,377.9
Oklahoma	815.7	278.6	139.1	66.4	0.0	1,299.8
Oregon	525.0	178.2	161.9	89.5	0.0	954.6
Pennsylvania	1,924.1	388.8	327.9	139.0	0.0	2,779.9
Puerto Rico	680.4	312.0	67.2	258.4	0.0	1,317.9
Rhode Island	187.3	47.6	29.1	14.7	0.0	278.7
South Carolina	382.7	173.3	87.5	50.0	0.0	693.5
South Dakota	156.5	37.2	29.8	23.0	0.0	246.5
Tennessee	525.3	223.6	98.7	32.1	0.0	879.8
Texas	4,103.7	1,106.2	576.3	413.0	0.0	6,199.2
Utah	280.3	74.8	69.9	59.7	0.0	484.6
Vermont	161.1	37.8	32.6	25.0	0.0	256.6
Virginia	1,097.8	454.7	166.7	164.7	0.0	1,884.0
Washington	1,336.0	317.8	459.5	174.2	0.0	2,287.5
West Virginia	429.1	158.8	82.8	54.0	0.0	724.8
Wisconsin	488.8	164.1	132.9	83.9	0.0	869.8
Wyoming	132.6	38.2	20.9	29.3	0.0	221.1
Subtotal	**47,047.9**	**12,781.0**	**7,875.6**	**7,696.4**	**1.2**	**75,402.1**
American Samoa	9.5	1.7	2.7	1.6	0.0	15.6
Guam	31.1	0.7	10.4	57.0	0.0	99.2
Northern Mariana Is.	7.7	1.3	2.3	2.5	0.0	13.7
Virgin Islands	108.6	12.2	24.0	3.3	0.0	148.1
Subtotal	**156.9**	**15.9**	**39.4**	**64.4**	**0.0**	**276.6**
Total	**47,204.8**	**12,796.9**	**7,915.0**	**7,760.7**	**1.2**	**75,678.7**

New York City is in the process of constructing tunnels designed to add redundancy and deliver hundreds of millions of gallons of water per day to city residents. Workers, at right, are drilling holes for dynamiting. A worker, below, inspects a recently concreted tunnel to ensure it is ready to be put on line. Redundancy will help the city ensure an adequate water supply in the event of a tunnel failure and will enable inspections and maintenance of the city's two other main tunnels.

Carl Ambrose, New York City DEP

Carl Ambrose, New York City DEP

Exhibit B-3: (facing page)

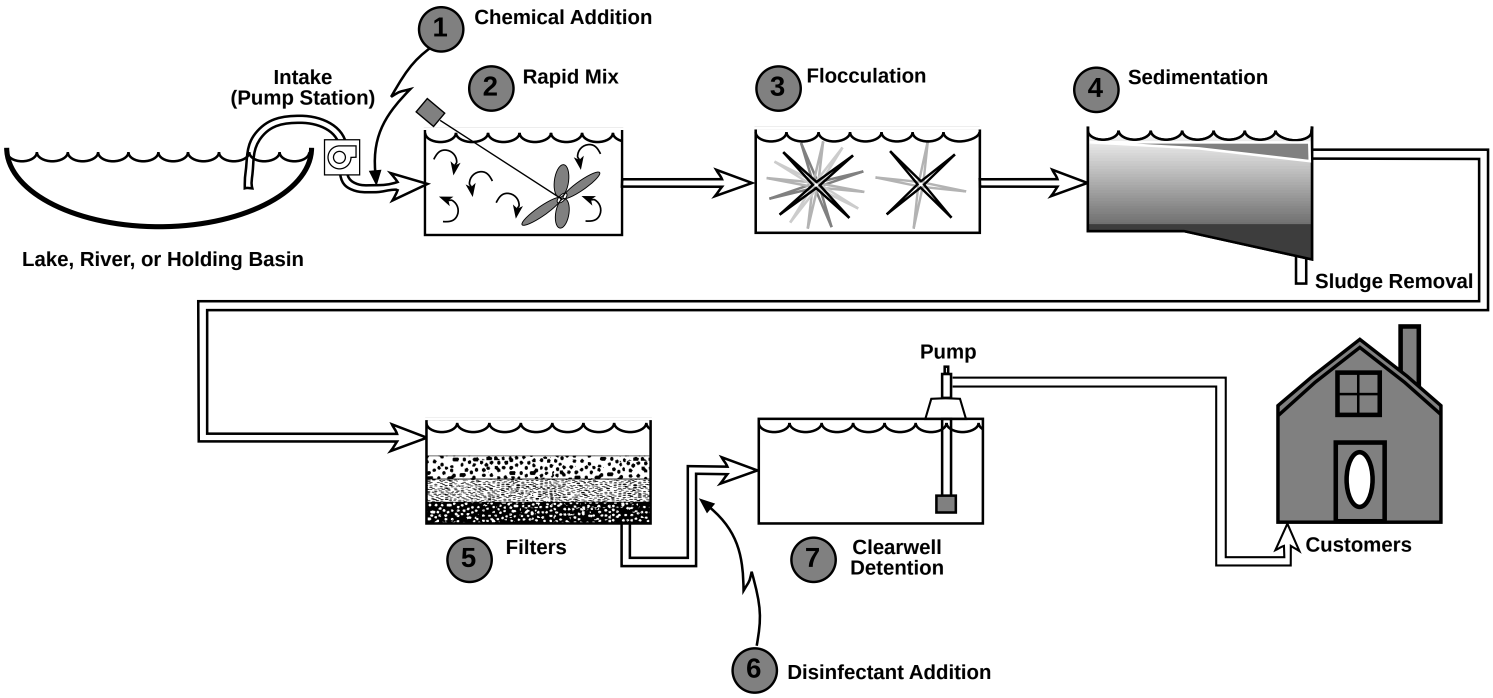
Total Need by System Size

The largest share of the total need is for infrastructure improvements at large water systems, those serving more than 50,000 people.

Exhibit B-3: Total Need by System Size (20-year need in millions of Jan. '95 dollars)

State	Large Systems	Medium Systems	Small Systems	Total
Alabama	387.4	687.9	584.0	1,659.2
Alaska	90.7	136.4	544.1	771.2
Arizona	584.5	344.2	425.0	1,353.7
Arkansas	257.6	1,101.5	665.4	2,024.5
California	13,475.1	3,306.0	2,032.9	18,814.0
Colorado	679.1	627.6	642.4	1,949.1
Connecticut	541.7	466.1	348.9	1,356.7
Delaware	189.2	21.7	160.7	371.6
District of Columbia	131.6	0.0	0.0	131.6
Florida	1,960.9	1,182.8	1,191.6	4,335.3
Georgia	946.3	1,429.8	918.8	3,294.8
Hawaii	17.8	326.2	86.9	430.9
Idaho	81.4	105.2	403.6	590.2
Illinois	1,791.9	2,178.4	1,379.4	5,349.7
Indiana	337.2	656.9	680.6	1,674.7
Iowa	306.9	1,168.2	780.8	2,255.9
Kansas	519.3	614.5	842.7	1,976.5
Kentucky	612.2	1,015.7	596.3	2,224.2
Louisiana	473.2	659.4	820.9	1,953.5
Maine	230.2	326.6	308.6	865.5
Maryland	746.5	273.9	264.4	1,284.7
Massachusetts	3,266.8	2,425.2	253.0	5,945.1
Michigan	1,817.4	1,711.4	908.1	4,436.8
Minnesota	519.4	1,257.6	660.7	2,437.6
Mississippi	25.0	573.8	977.3	1,576.1
Missouri	476.4	369.9	1,032.6	1,878.9
Montana	82.4	203.7	376.6	662.6
Nebraska	230.6	250.1	472.2	952.9
Nevada	287.1	90.7	147.1	524.9
New Hampshire	72.5	225.0	419.4	717.0
New Jersey	1,905.4	1,383.2	324.6	3,613.2
New Mexico	273.3	426.1	343.3	1,042.7
New York	6,388.4	1,645.4	2,048.7	10,082.5
North Carolina	621.7	823.2	1,269.3	2,714.1
North Dakota	129.5	227.5	229.9	586.9
Ohio	2,252.3	1,521.5	1,132.5	4,906.3
Oklahoma	399.5	543.9	1,088.0	2,031.4
Oregon	655.6	828.2	664.4	2,148.2
Pennsylvania	1,896.9	1,258.1	1,601.0	4,756.0
Puerto Rico	1,103.4	786.2	364.3	2,254.0
Rhode Island	449.6	159.9	47.1	656.7
South Carolina	350.4	674.8	435.6	1,460.8
South Dakota	76.7	176.4	315.6	568.7
Tennessee	231.9	1,162.0	477.4	1,871.2
Texas	6,195.8	2,782.1	3,386.7	12,364.6
Utah	448.2	317.1	280.0	1,045.4
Vermont	21.2	129.9	308.2	459.3
Virginia	1,626.8	589.8	727.4	2,943.9
Washington	1,282.9	1,232.0	1,515.9	"4,030.8
West Virginia	114.8	281.5	693.8	1,090.2
Wisconsin	725.4	456.1	685.7	1,867.2
Wyoming	91.8	94.1	204.8	390.7
Subtotal	**58,379.6**	**41,235.2**	**37,069.5**	**136,684.2**
American Samoa	—	6.2	16.2	22.5
Guam	79.1	20.0	7.6	106.7
Northern Mariana Is.	—	31.4	3.7	35.1
Virgin Islands	—	111.7	111.3	223.1
Subtotal	**79.1**	**169.3**	**138.9**	**387.3**
Total	**58,458.7**	**41,404.5**	**37,208.4**	**137,071.5**

TREATMENT OF SURFACE WATER



Usually, surface water is treated using a conventional filtration process designed to remove suspended solids, organic and inorganic contaminants, pathogenic organisms, and tastes and odors. Almost 40 percent of water systems with surface water sources have a need to build, rebuild, or improve surface water treatment plants. This schematic shows how these plants work.

1. Chemical Addition: Chemicals, usually coagulants and disinfectants, are added to untreated surface water to make contaminants, including pathogenic organisms, easier to remove.

2. Rapid Mix: In this stage, chemicals are quickly blended with untreated water to facilitate chemical reactions.

3. Flocculation: The water is slowly mixed in flocculation basins. The slow, gentle mixing allows chemically destabilized particles to come into contact with each other so that larger, more easily removable "floc" particles are formed.

4. Sedimentation: "Floc" particles are allowed to settle out of the water and are subsequently removed as "sludge." Many of the contaminants from the source water and chemicals added in Step 1 are removed in this process. The cleaner, "clarified" water is then transferred to the filters.

5. Filters: The remaining "floc" particles are removed as the water passes through the granular media of the filters. The clean, filtered water is collected in piping manifolds beneath the filters.

6. Disinfectant Addition: Disinfectant (usually chlorine) is added to the filtered water as it is transferred to the clearwell or finished water storage.

7. Clearwell Detention: The water is held in the clearwell long enough to allow the disinfectant to inactivate any remaining pathogens. A disinfectant residual is maintained in the distribution system to protect against contamination that might occur after the water has left the treatment plant.

Exhibit B-4: (facing page)

Current Safe Drinking Water Act Need

Approximately $12.1 billion is needed now to meet current SDWA requirements. Eighty-four percent of this need is to protect against microbiological contaminants that pose an acute risk to health.

Exhibit B-5: (pages B-10 and B-11)

Total SDWA and SDWA-Related Need

Over the next 20 years, approximately $16.2 billion is for compliance with existing SDWA regulations, and $14.0 billion is for compliance with proposed SDWA regulations. Another $35.7 billion is for SDWA-related need.

Exhibit B-4: Current Safe Drinking Water Act Need (in millions of Jan. '95 dollars)

State	SWTR	TCR	Nitrate	Lead and Copper Rule	Phase I, II, V	TTHMs	Other*	Total
Alabama	63.6	0.4	0.0	4.1	0.4	3.1	2.9	74.6
Alaska	27.3	1.7	0.2	6.8	0.0	0.0	0.5	36.6
Arizona	181.4	1.5	6.6	5.0	0.0	0.0	0.4	195.0
Arkansas	376.9	0.8	0.1	2.2	0.4	32.8	3.0	416.1
California	1,318.7	6.2	171.8	15.0	232.6	67.6	4.1	1,816.0
Colorado	213.4	1.2	0.1	2.0	0.3	0.1	2.3	219.4
Connecticut	72.1	1.4	0.2	4.3	1.5	0.0	0.8	80.3
Delaware	2.8	0.6	0.1	1.1	0.0	0.0	0.1	4.6
District of Columbia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Florida	266.9	3.7	0.4	42.3	2.0	12.2	0.6	328.1
Georgia	301.0	2.7	0.3	6.1	0.2	0.1	1.6	311.9
Hawaii	37.9	0.2	0.0	0.4	0.1	0.0	0.0	38.7
Idaho	17.2	1.5	0.2	0.9	0.4	0.0	0.6	20.7
Illinois	207.2	2.3	13.1	62.1	28.9	2.3	13.9	329.9
Indiana	98.5	2.7	0.2	26.5	7.8	0.1	1.2	136.9
Iowa	61.7	2.0	0.2	2.4	0.4	0.1	1.1	67.8
Kansas	226.7	1.2	7.3	2.3	3.7	0.4	3.2	244.8
Kentucky	108.8	0.3	0.0	1.8	0.6	0.3	4.9	116.7
Louisiana	69.9	2.9	0.2	6.5	47.7	0.7	48.2	176.1
Maine	52.8	0.7	0.1	3.4	0.1	0.1	1.3	58.5
Maryland	118.1	0.9	0.1	0.6	0.0	0.0	1.1	120.8
Massachusetts	378.8	0.6	0.1	32.0	18.1	0.6	0.9	431.0
Michigan	379.0	2.4	0.2	29.1	1.6	0.1	2.2	414.7
Minnesota	37.5	8.4	0.8	8.5	0.0	0.0	0.4	55.8
Mississippi	1.1	4.4	0.2	2.2	0.0	0.0	0.2	8.0
Missouri	104.2	3.4	0.2	4.0	4.4	23.8	2.5	142.6
Montana	26.7	1.3	0.2	0.9	0.1	0.0	0.6	29.8
Nebraska	156.1	1.1	8.4	2.3	1.1	0.0	0.2	169.2
Nevada	31.1	0.5	0.1	0.6	0.3	0.5	8.4	41.5
New Hampshire	30.0	1.7	0.2	1.1	1.7	0.1	1.2	36.0
New Jersey	45.9	0.9	0.1	103.8	11.2	0.3	13.4	175.6
New Mexico	28.1	1.3	0.2	3.6	0.0	0.0	0.5	33.7
New York	1,064.3	5.4	0.9	139.9	27.3	1.1	6.1	1,245.0
North Carolina	137.0	4.1	0.5	5.6	0.4	1.0	3.8	152.4
North Dakota	15.8	0.5	0.1	0.7	0.0	13.1	0.4	30.6
Ohio	358.1	2.4	0.3	221.1	14.3	0.1	2.5	598.7
Oklahoma	233.5	1.1	3.0	11.2	0.6	3.2	10.4	263.0
Oregon	143.4	3.0	0.2	7.4	6.7	0.1	2.3	163.1
Pennsylvania	315.8	4.1	0.5	77.8	1.3	0.3	4.7	404.4
Puerto Rico	285.9	0.3	0.0	1.9	0.2	8.5	1.7	298.6
Rhode Island	40.1	0.1	0.0	4.3	0.0	0.0	0.1	44.8
South Carolina	154.7	3.2	0.1	6.8	0.3	0.2	1.6	166.9
South Dakota	26.5	0.8	1.9	1.7	0.1	0.0	0.7	31.7
Tennessee	159.8	0.3	0.0	2.3	0.3	0.2	2.6	165.5
Texas	999.6	6.6	0.7	12.4	1.2	6.5	10.6	1,037.6
Utah	51.8	0.6	5.9	0.6	0.6	0.0	7.4	66.9
Vermont	29.5	0.8	0.1	2.0	0.1	0.0	0.8	33.4
Virginia	335.6	2.2	0.3	20.1	0.2	0.2	2.2	360.8
Washington	269.0	7.5	0.6	10.6	0.4	0.2	3.2	291.5
West Virginia	125.5	3.3	0.1	5.7	2.5	0.3	4.6	141.9
Wisconsin	143.4	2.8	0.2	20.0	5.8	0.0	0.4	172.7
Wyoming	36.7	0.4	0.1	0.5	0.1	0.0	0.6	38.3
Subtotal	**9,967.8**	**110.2**	**227.6**	**936.4**	**428.1**	**180.5**	**188.7**	**12,039.3**
American Samoa	1.4	0.0	0.0	0.0	0.0	0.0	0.0	1.5
Guam	0.5	0.0	0.0	0.0	0.0	0.0	0.0	0.6
Northern Mariana Is.	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Virgin Islands	10.2	0.0	0.0	1.2	0.0	0.0	0.0	11.4
Subtotal	**13.3**	**0.0**	**0.0**	**1.2**	**0.0**	**0.0**	**0.1**	**14.7**
Total	**9,981.1**	**110.2**	**227.6**	**937.7**	**428.1**	**180.5**	**188.8**	**12,053.9**

* Includes arsenic, barium, cadmium, chromium, fluoride, mercury, selenium, combined radium-226, -228, and gross alpha particle activity.

Exhibit B-5: Total SDWA and SDWA-Related Need (20-year need in millions of Jan. '95 dollars)

	Existing Regulations							
State	SWTR	TCR	Nitrate	Lead and Copper Rule	Phase I, II, V	TTHMs	Other*	Subtotal
Alabama	122.0	2.1	0.0	4.4	0.4	3.1	2.9	134.8
Alaska	33.4	2.0	0.2	11.4	0.0	0.0	0.5	47.6
Arizona	182.8	1.7	6.6	5.4	0.0	0.0	0.4	197.1
Arkansas	471.4	1.0	0.1	2.5	0.4	32.8	3.0	511.1
California	1,694.1	7.6	172.0	18.1	250.4	79.4	4.1	2,225.8
Colorado	277.3	1.4	0.1	4.8	0.3	0.1	2.3	286.4
Connecticut	111.7	1.6	0.2	10.8	1.5	0.0	0.8	126.6
Delaware	6.3	0.7	1.6	1.3	0.0	0.0	0.1	9.9
District of Columbia	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Florida	283.3	4.5	0.4	43.5	2.0	12.2	0.6	346.5
Georgia	383.6	3.2	0.3	10.5	0.2	0.1	1.6	399.5
Hawaii	38.1	0.2	0.0	0.5	0.1	0.0	0.0	38.9
Idaho	28.5	1.7	0.2	1.2	0.4	0.0	0.6	32.7
Illinois	320.2	6.9	13.1	85.4	55.1	2.3	13.9	497.0
Indiana	108.9	6.2	0.2	27.9	7.8	0.1	1.2	152.2
Iowa	114.6	2.4	0.2	3.2	0.4	0.1	1.1	122.0
Kansas	249.0	1.4	7.3	6.0	3.7	0.4	3.2	271.1
Kentucky	180.2	0.3	0.0	32.2	0.6	0.6	4.9	218.9
Louisiana	85.5	3.5	0.2	7.2	47.7	1.8	48.2	194.0
Maine	96.3	0.8	0.1	5.9	0.1	0.1	1.3	104.6
Maryland	145.4	1.0	0.1	1.0	0.0	0.0	1.1	148.7
Massachusetts	894.4	0.7	0.1	48.8	18.1	0.6	0.9	963.6
Michigan	412.1	2.9	0.2	102.3	7.8	0.1	2.2	527.6
Minnesota	96.9	8.8	0.8	188.1	0.0	0.0	0.4	295.1
Mississippi	1.3	7.5	0.2	4.0	0.0	0.0	0.2	13.0
Missouri	146.0	3.9	0.2	4.7	4.4	23.8	2.5	185.6
Montana	66.3	1.6	0.2	1.4	0.1	0.0	0.6	70.0
Nebraska	168.7	1.4	8.4	4.3	1.1	0.0	0.2	184.1
Nevada	34.2	0.6	0.1	0.7	9.5	0.5	8.4	54.1
New Hampshire	59.2	1.9	0.2	2.1	1.7	0.1	1.2	66.3
New Jersey	62.0	1.1	0.1	124.1	11.2	0.3	13.4	212.1
New Mexico	38.7	1.5	0.2	3.9	0.0	0.0	0.5	44.8
New York	1,142.2	6.4	0.9	217.4	47.0	1.1	6.1	1,421.1
North Carolina	194.5	4.8	0.5	13.7	0.4	1.0	3.8	218.6
North Dakota	67.8	0.6	0.1	1.0	0.0	13.7	0.4	83.5
Ohio	524.4	2.9	0.3	229.4	14.3	0.1	2.5	773.8
Oklahoma	304.4	1.3	11.4	12.3	0.6	3.2	10.4	343.6
Oregon	296.3	3.3	0.2	7.8	6.7	0.1	2.3	316.6
Pennsylvania	353.7	4.9	0.5	288.3	4.3	0.3	4.7	656.7
Puerto Rico	314.9	0.4	0.0	2.0	0.2	8.5	1.7	327.8
Rhode Island	63.4	0.2	0.0	45.5	0.0	0.0	0.1	109.2
South Carolina	200.2	3.4	0.1	7.1	0.3	0.2	1.6	212.9
South Dakota	53.6	0.9	1.9	1.9	0.1	0.0	0.7	59.2
Tennessee	230.0	0.4	0.0	2.5	10.0	0.2	2.6	245.7
Texas	1,371.6	8.1	0.7	14.7	1.6	6.5	10.6	1,413.8
Utah	63.9	0.8	5.9	1.4	0.6	0.0	7.4	80.0
Vermont	33.3	1.0	0.1	2.2	0.1	0.0	0.8	37.5
Virginia	374.8	2.6	0.3	20.6	0.2	0.2	2.2	400.9
Washington	318.6	8.5	0.6	12.2	0.4	0.2	3.2	343.7
West Virginia	144.1	3.4	0.1	5.9	2.5	0.3	4.6	160.8
Wisconsin	169.7	3.2	0.2	110.6	5.8	0.0	0.4	290.0
Wyoming	40.4	0.5	0.1	0.6	0.1	0.0	0.6	42.2
Subtotal	**13,174.3**	**140.0**	**237.7**	**1,764.5**	**520.4**	**194.3**	**188.7**	**16,219.8**
American Samoa	1.8	0.0	0.0	0.0	0.0	0.0	0.0	1.9
Guam	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.7
Northern Mariana Is.	1.2	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Virgin Islands	14.0	0.0	0.0	1.2	0.0	0.0	0.0	15.2
Subtotal	**17.6**	**0.0**	**0.0**	**1.2**	**0.0**	**0.0**	**0.1**	**19.0**
Total	**13,191.9**	**140.0**	**237.7**	**1,765.7**	**520.4**	**194.3**	**188.8**	**16,238.8**

* Includes arsenic, barium, cadmium, chromium, fluoride, mercury, selenium, combined radium-226, -228, and gross alpha particle activity.

Exhibit B-5: Total SDWA and SDWA-Related Need (cont.)

	Proposed Regulations				SDWA-Related Need
State	**D/DBPR**	**ESWTR**	**Information Collection Rule**	**Subtotal**	**Distribution Improvement (TCR)**
Alabama	174.2	97.8	0.7	272.7	372.7
Alaska	25.4	17.5	0.1	43.0	226.8
Arizona	94.3	46.8	0.7	141.8	271.2
Arkansas	116.7	73.9	0.5	191.2	643.6
California	1,037.3	593.7	10.1	1,641.1	3,868.9
Colorado	157.9	108.6	1.1	267.6	421.8
Connecticut	113.9	71.1	0.8	185.9	531.4
Delaware	24.1	11.2	0.2	35.5	153.2
District of Columbia	7.3	5.2	0.1	12.7	75.6
Florida	280.6	56.8	3.1	340.5	1,135.3
Georgia	260.2	148.9	1.8	410.8	769.5
Hawaii	14.7	1.7	0.1	16.5	59.4
Idaho	28.1	10.4	0.1	38.5	183.6
Illinois	488.3	295.1	2.8	786.2	1,455.3
Indiana	148.0	70.8	0.9	219.7	619.6
Iowa	95.4	41.8	0.6	137.8	486.8
Kansas	92.1	61.1	0.5	153.7	632.8
Kentucky	193.4	143.0	1.0	337.4	484.8
Louisiana	174.1	75.0	1.1	250.1	626.8
Maine	39.9	25.4	0.2	65.5	371.0
Maryland	66.1	35.3	0.5	101.9	332.5
Massachusetts	314.3	183.6	2.1	499.9	1,816.3
Michigan	362.8	221.4	2.5	586.7	1,335.4
Minnesota	91.9	26.8	0.4	119.1	536.9
Mississippi	77.6	7.4	0.1	85.0	637.2
Missouri	131.7	63.9	0.6	196.2	557.4
Montana	34.0	19.4	0.2	53.5	251.9
Nebraska	33.0	7.2	0.1	40.3	262.9
Nevada	49.0	30.8	0.4	80.2	75.8
New Hampshire	41.2	24.2	0.2	65.6	237.3
New Jersey	233.6	113.2	1.6	348.4	1,127.8
New Mexico	27.4	7.2	0.1	34.7	267.2
New York	390.7	241.1	2.4	634.3	2,485.9
North Carolina	244.3	149.3	1.4	395.0	737.9
North Dakota	36.1	21.0	0.3	57.3	220.1
Ohio	349.1	184.5	2.4	535.9	1,321.3
Oklahoma	140.0	106.6	0.8	247.3	604.7
Oregon	106.0	65.2	0.5	171.6	455.4
Pennsylvania	438.9	277.9	2.8	719.7	1,661.5
Puerto Rico	134.2	85.9	0.8	220.8	137.6
Rhode Island	56.3	36.8	0.5	93.6	238.3
South Carolina	154.0	93.8	0.8	248.6	261.1
South Dakota	29.6	15.6	0.1	45.3	146.3
Tennessee	182.5	118.0	0.8	301.4	363.2
Texas	793.4	482.8	5.3	1,281.6	2,700.8
Utah	120.7	74.5	0.9	196.1	317.8
Vermont	28.5	17.7	0.1	46.3	159.3
Virginia	236.8	159.7	1.8	398.3	524.8
Washington	166.1	72.1	0.8	238.9	1,281.4
West Virginia	74.8	60.2	0.3	135.3	330.3
Wisconsin	142.9	60.6	1.0	204.5	582.8
Wyoming	33.2	24.4	0.2	57.7	104.3
Subtotal	**8,886.3**	**5,043.9**	**59.2**	**13,989.4**	**35,463.5**
American Samoa	0.8	0.7	0.0	1.4	4.9
Guam	3.3	1.1	0.0	4.4	30.2
Northern Mariana Is.	0.5	0.0	0.0	0.5	3.4
Virgin Islands	4.0	7.6	0.0	11.6	58.4
Subtotal	**8.5**	**9.3**	**0.0**	**17.9**	**96.9**
Total	**8,894.9**	**5,053.2**	**59.2**	**14,007.3**	**35,560.4**

Permafrost conditions and arctic temperatures make water system construction in Alaska Native communities challenging. A utilidor, shown to the right, houses drinking water distribution mains. Often distribution mains cannot be placed underground because ice-rich permafrost soils can be unstable and burying the lines is not cost effective. Above ground, piping must be insulated from arctic conditions. Even when pipes are insulated, the water must be circulated and heated with diesel boilers to prevent freezing. When a community does not have a distribution system that delivers water to households, residents must haul water from a watering point like the one shown below. The danger of contamination is significant because the water is hauled on the same board walk used to carry away human waste.

Dan Fraser

Dan Fraser

Alaska Area Native Health Service, OEHE

Exhibit B-6: (facing page)

Total Need for American Indian and Alaska Native Water Systems by EPA Region

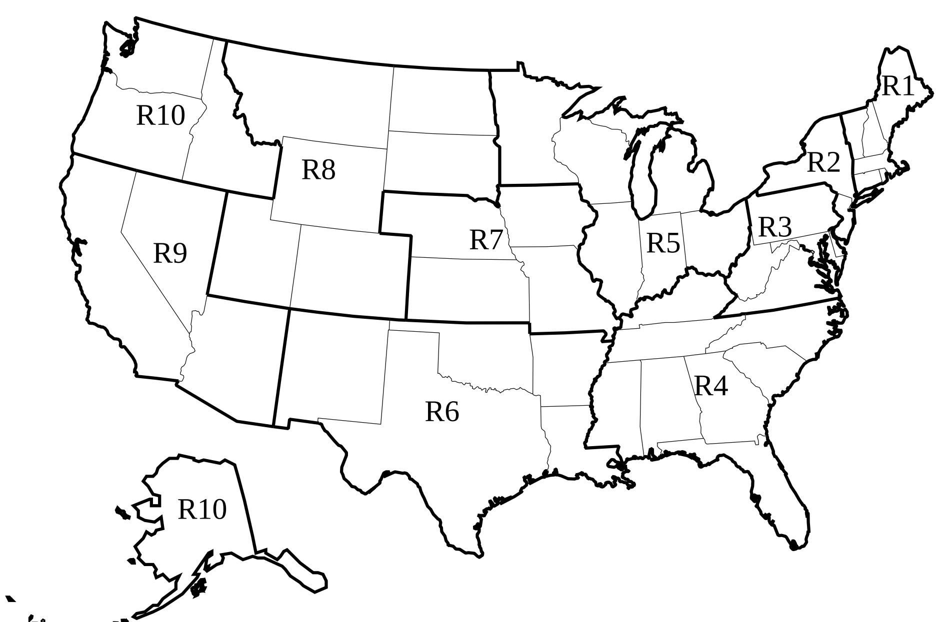
The needs for American Indian and Alaska Native water systems totals $1.3 billion.

Exhibit B-6: Total Need for American Indian and Alaska Native Water Systems by EPA Region (20-year need in millions of Jan. '95 dollars)

EPA Region	Total Need
Region 1	0.3
Region 2	1.8
Region 3 [1]	– –
Region 4	15.6
Region 5	41.2
Region 6	34.5
Region 7	5.7
Region 8	95.5
Region 9 [2]	320.5
Region 10 [3]	45.5
Alaska Native Systems	772.0
Total	**1,332.6**

Note: Numbers may not total due to rounding.

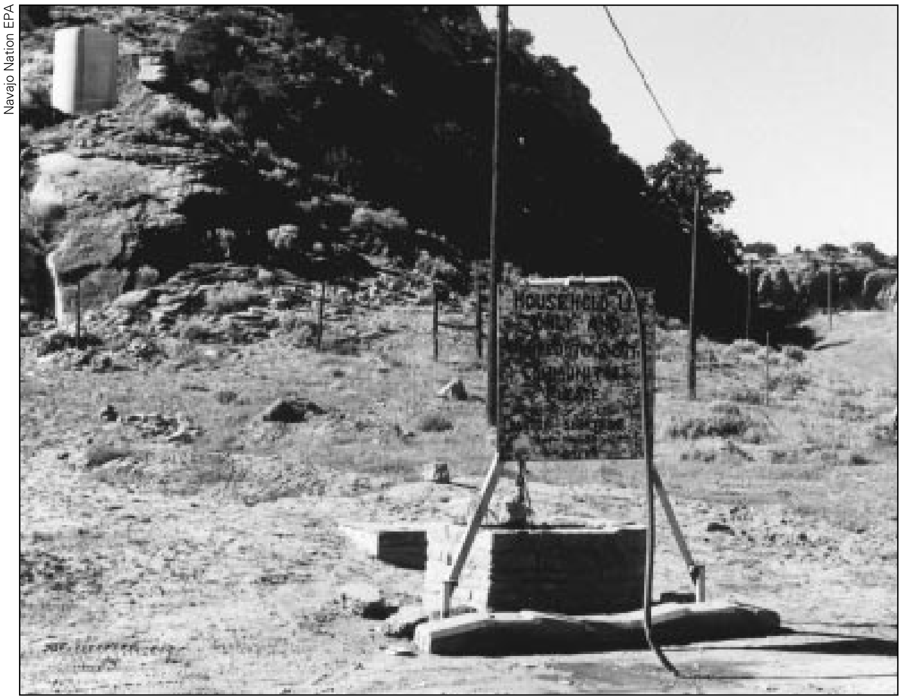
[1] There are no American Indian water systems in EPA Region 3.
[2] Navajo water systems are located in EPA Regions 6, 8, and 9, but for the purposes of this report, all Navajo needs are shown in EPA Region 9.
[3] Needs for Alaska Native water systems are not included in the EPA Region 10 total.



Locations of EPA Regions

Many American Indians get their drinking water from watering points. The Shonto watering point, pictured to the right, provides water to over 400 Navajo people. Residents use trucks to haul water to their homes up to 15 miles away. The sign at the watering point states that there is a water shortage and asks that the water be used for household purposes only. Hauled water is vulnerable to microbiological contamination. The fill hose, as well as containers for storage and transport, can cause contamination. The pump jack at Burnham, shown below, operates a watering point that serves 150 Navajo people. The pump jack is solar powered, but has a diesel backup for cloudy days. Fuel stored in the metal tank poses a direct threat of contamination to the aquifer and the well. The Navajo Nation EPA is working with both communities to improve sanitary conditions and safety precautions.

Navajo Nation EPA



Navajo Nation EPA

Exhibit B-7: (facing page)

Need by Category for American Indian and Alaska Native Water Systems

Approximately $1.1 billion is needed now to address problems that pose public health risks. Almost $0.2 billion is needed in the future to ensure the availability of safe drinking water over the next 20 years.

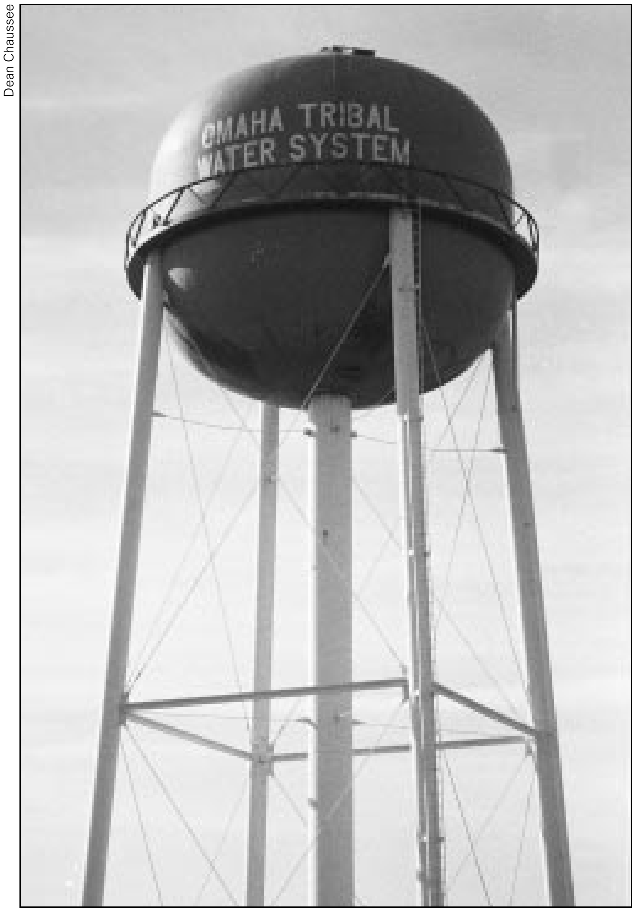
Exhibit B-7: Need by Category for American Indian and Alaska Native Water Systems (20-year need in millions of Jan. '95 dollars)

Category of Need	Current Need	Future Need	Total Need
Transmission and Distribution	606.8	42.5	649.3
Treatment	186.2	92.8	279.0
Storage	239.2	34.4	273.7
Source	72.7	25.3	98.0
Other	31.2	1.5	32.7
Total	**1,136.1**	**196.5**	**1,332.6**

Note: Numbers may not total due to rounding.

If adequate storage is not available, the distribution system can lose pressure. This condition is dangerous because it can lead to contaminants being drawn into the distribution system. The elevated tank, shown to the right, is severely corroded and should be replaced. In some cases, systems replace elevated storage tanks with stand pipes, pictured below. These stand pipes have recently been constructed on a hillside at Polacca, a Hopi community in Arizona. Even without the hillside location, these cost-effective tanks can be tall enough to pressurize a water system and hold substantial reserves of water.

Dean Chaussee



Dan Fraser

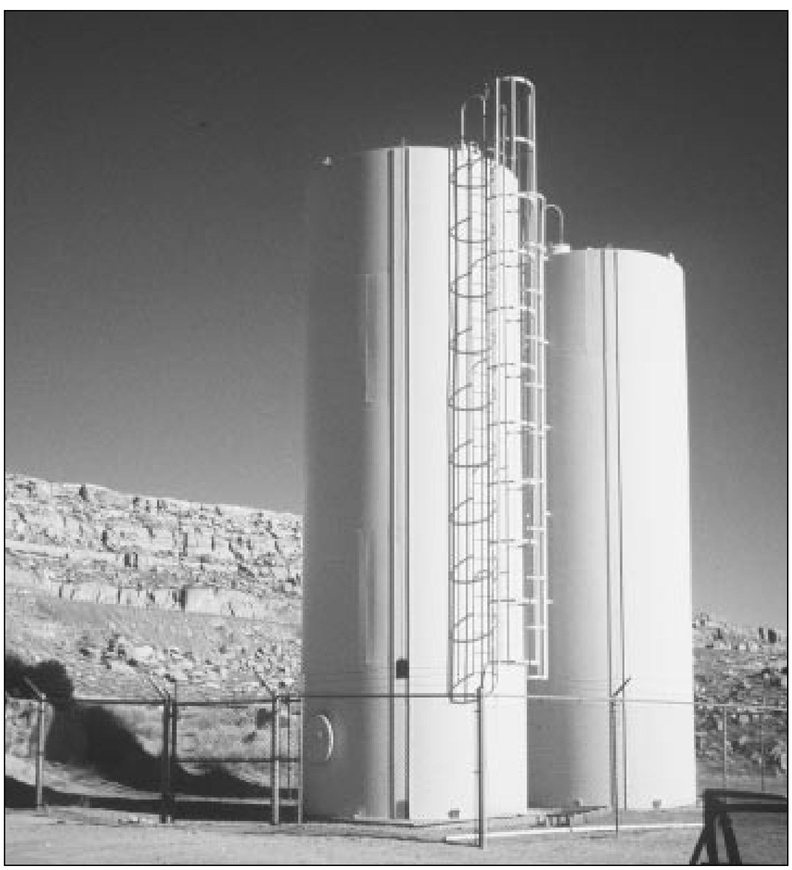


Exhibit B-8: (facing page)

Total SDWA and SDWA-Related Need for American Indian and Alaska Native Water Systems

For American Indian and Alaska Native water systems, the need for compliance with existing SDWA regulations is $96.6 million, approximately $75.6 million of which is needed now. A total of $26 million is for compliance with proposed SDWA regulations. Another $185 million is for SDWA-related need.

Exhibit B-8: Total SDWA and SDWA-Related Need for American Indian and Alaska Native Water Systems (20-year need in millions of Jan. '95 dollars)

Regulation	Current Need	Future Need	Total Need
Existing Regulations			
Regulations for Contaminants with Acute Health Effects [1]	74.8	21.0	95.8
Regulations for Contaminants with Chronic Health Effects [2]	0.8	—	0.8
Subtotal	**75.6**	**21.0**	**96.6**
Proposed Regulations			
Disinfectants and Disinfection Byproducts Rule	—	18.0	18.0
Enhanced Surface Water Treatment Rule	—	8.0	8.0
Information Collection Rule [3]	—	—	—
Subtotal	**—**	**26.0**	**26.0**
SDWA-Related Need			
Distribution Improvements (TCR)	174.4	10.9	185.3

Note: Numbers may not total due to rounding.

[1] Regulations for contaminants with acute health effects include the Surface Water Treatment Rule, the Total Coliform Rule, and the nitrate standard.
[2] Regulations for contaminants with chronic health effects include the Lead and Copper Rule, the Phase I, II, and V rules, and safety standards for TTHMs, arsenic, barium, cadmium, chromium, fluoride, mercury, selenium, combined radium-226, -228, and gross alpha particle activity.
[3] No capital costs are associated with the ICR for American Indian and Alaska Native water systems.

Portland Water Bureau

The Bull Run watershed is Portland, Oregon's drinking water source.

Appendix C—Future Regulations Not Included in the Total Need

In the future, EPA may set new or revised safety standards for additional contaminants. Future regulations being considered under the SDWA are for radon and other radionuclides, arsenic (revision), and sulfate. Needs for these future regulations are not included as part of the total need in this report because regulatory scenarios and cost estimates have not been finalized. New or revised standards for these contaminants may result in needs ranging between $1.7 billion and $14.8 billion, depending on how they are regulated. Exhibit C-1 shows the estimated range of need by regulation. Needs for the Ground Water Disinfection Rule, which is a priority for regulation, are not included in this report because cost estimates have not been developed.

Exhibit C-1: Estimated Need for Future Regulations Not Included in the Total Need (in millions of Jan. '95 dollars)

Regulation/ Contaminant	Range of Options		Range of Need Estimate	
	Least Stringent	**Most Stringent**	**Low Estimate**	**High Estimate**
Radon	3,000 pCi/l	200 pCi/l	$102.1	$2,594.9
Radionuclides other than Radon	varies by contaminant	varies by contaminant	$1,270.8	$4,587.1
Arsenic	20 µg/l	2 µg/l	$278.9	$7,126.8
Sulfate	500 mg/l, alt. source for infants/public ed.	500 mg/l, central treatment required	$27.9	$460.3
Total			**$1,679.7**	**$14,769.1**

EPA has analyzed a range of alternatives for regulating radon and the other radionuclides—radium-226, radium-228, uranium, adjusted gross alpha, and beta and photon emitters. The high and low cost estimates in Exhibit C-1 reflects costs for regulating radon at 200 pCi/l and 3,000 pCi/l. Exhibit C-1 also shows cost estimates for regulating radium-226 and radium-228 at 5 pCi/l and 20 pCi/l, uranium at 20 µg/l and 80 µg/l, and adjusted gross alpha at 15 pCi/l. No capital costs are expected to be associated with beta and photon emitters.

Arsenic is currently regulated at 50 µg/l, but EPA has analyzed the cost of regulating this contaminant at a more stringent level. Exhibit C-1 shows estimated costs for regulating arsenic at levels of 2 µg/l and 20 µg/l.

EPA has proposed four alternatives for regulating sulfate at 500 mg/l. The least capital-intensive options (reflected in the low cost on Exhibit C-1) require water systems with high sulfate levels to provide alternative sources of water to infants and, under one scenario, provide public education to exposed adults. The most capital-intensive option (reflected in the high cost on Exhibit C-1) requires central treatment, which is usually reverse osmosis.

Dean Chaussee

The small system operator shown above is flushing iron from the water system's distribution system. More than 3,100 small systems have an unmet need to treat for iron and manganese. These secondary contaminants make water reddish-brown and stain sinks and laundry.

Appendix D—Separate State Estimates

The Drinking Water Infrastructure Needs Survey did not include some types of need. Two States felt it was important to report costs associated with these needs. In response, EPA provided States with the opportunity to submit separate estimates of need that include these costs. Exhibit D-1 shows each State's estimate. Maine's estimate is for refinancing existing loans for filtration plants. New Mexico's need estimate is for planned growth in Albuquerque. These estimates were not included in estimates of need listed elsewhere in the report.

Exhibit D-1: Separate State Estimates

State	Separate State Estimate (in millions)
Maine	$97.2
New Mexico	$100.1

Indian Health Service

Nitrate contamination can cause "blue baby syndrome" and lead to the death of infants. When their well became contaminated with nitrate, residents of Sil Nakya, a Tohono O'Odham community, were forced to find another source of water. The pictured transmission line now brings water from a neighboring community 11 miles away.

Indian Health Service

Appendix E–Glossary

Acute health effects: health effects resulting from exposure to a contaminant that causes severe symptoms to occur quickly—often within a matter of hours or days. Examples include gastrointestinal illness and "blue baby syndrome."

"Blue baby syndrome": a potentially fatal condition for infants where nitrate reduces the blood's ability to carry oxygen.

Capital improvement plan (CIP): a document produced by a local government, utility, or water system that thoroughly outlines, for a specified period of time, all needed capital projects, the reason for each project, and their costs.

Chafee-Lautenberg Report to Congress: a Report to Congress prepared in response to a request in EPA's 1993 Appropriation Act. The Chafee-Lautenberg Report included a figure of $8.6 billion in 1991 dollars for capital costs for SDWA compliance. Inflated to the 1995 dollars used in the Needs Survey, this equates to $9.7 billion. (EPA Publication Number 10-R-93-000, September 1993)

Chronic health effects: health effects resulting from long-term exposure to low concentrations of certain contaminants. Cancer is one such health effect.

Coliform bacteria: a group of bacteria whose presence in a water sample indicates the water may contain disease-causing organisms.

Community water system: a public water system that serves at least 15 connections used by year-round residents or that regularly serves at least 25 residents year-round. Examples include cities, towns, and communities such as retirement homes.

***Cryptosporidium parvum*:** a protozoan parasite (often referred to as *Cryptosporidium)* that causes the disease cryptosporidiosis. This pathogenic organism is ubiquitous in surface water, including surface water used as a drinking water source. *Cryptosporidium* lives in the digestive tract of warm-blooded animals and most often reaches surface water bodies through contamination from sewage, agriculture (e.g., run-off from cattle feed lots and pastures), or wildlife activity.

Current infrastructure needs: new facilities or deficiencies in existing facilities identified by the State or system. Water systems should begin construction for current needs as soon as possible to avoid a threat to public health.

Engineer's report: a document produced by a professional engineer that outlines the need and cost for a specific infrastructure project.

Existing regulations: drinking water regulations promulgated under the authority of the Safe Drinking Water Act by EPA before publication of this report; existing regulations can be found in the Code of Federal Regulations (CFR) at 40 CFR 141.

Finished water: water that is considered safe and suitable for delivery to customers.

Future infrastructure needs: infrastructure deficiencies that a system expects to address in the next 20 years due to predictable deterioration of facilities. Future infrastructure needs do not include current infrastructure needs. Examples are storage facility and treatment plant replacement where the facility currently performs adequately, but will reach the end of its useful life in the next 20 years. Needs solely to accommodate future growth are not included in the report.

***Giardia lamblia*:** a protozoan parasite (often referred to as *Giardia*) that causes the disease giardiasis. This pathogenic organism is ubiquitous in surface water, including surface water used as a drinking water source. *Giardia* lives in the digestive tract of warm-blooded animals and most often enters surface water bodies through contamination from sewage, run-off from cattle feed lots, or wildlife activity.

Ground water: any water obtained from a source beneath the surface of the ground.

Ground water under the direct influence of surface water: any water obtained from a source beneath the surface of the ground that has vulnerabilities to contamination similar to surface water. For regulatory purposes, direct influence is determined for individual sources in accordance with State law, regulation, and policy.

Growth: expansions of population, service area, or industrial uses projected to occur after the time of the survey. Capital improvement needs planned solely to accommodate projected future growth are not included in the survey. Projects can, however, be designed for growth expected during the design-life of the project. For example, the survey would allow a treatment plant needed now and expected to treat water for 20 years. Such a plant could be designed for the population anticipated to be served at the end of the 20-year period.

Infrastructure needs: the capital costs associated with ensuring the continued protection of public health through rehabilitating or building facilities needed for provision of safe drinking water. Categories of need include source development and rehabilitation, treatment, storage, and transmission and distribution. Operation and maintenance needs are not considered infrastructure needs and are not included in this report. A portion of infrastructure needs is for SDWA compliance.

Large water system: in this report, this phrase refers to a community water system serving more than 50,000 people.

Medium water system: in this report, this phrase refers to a community water system serving from 3,301 to 50,000 people.

Microbiological contamination: the significant occurrence in a water supply of protozoan, bacteriological, or viral contaminants.

Non-community water system: a public water system that is not a community water system and that serves a non-residential population of at least 25 individuals or 15 service connections daily for at least 60 days of the year. Examples include schools and churches.

Pathogen: a disease causing organism.

Public water system: a system for the provision of water for human consumption, if the system has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

Safe Drinking Water Act (SDWA): a law passed by Congress in 1974 and amended in 1986 and 1996 to ensure that public water systems provide safe drinking water to consumers. (42 U.S.C.A. §§300f to 300j-26)

SDWA need: a capital expenditure required for compliance with SDWA regulations.

SDWA-related need: a capital expenditure required for distribution piping replacement. Distribution piping replacement is considered a SDWA-related need because the monitoring required under the TCR helps to identify problems in the distribution system.

Small water system: in this report, this phrase refers to a community water system serving 3,300 people or fewer. This definition was chosen based on resource constraints and system capabilities. Other definitions have been used. For example, the SDWA at §1452(a)(2) defines a small system as a system that serves fewer than 10,000 people.

Source rehabilitation and development: a category of need that includes the costs involved in developing or improving sources of water for communities.

State: in this report, this term refers to all 50 States of the United States, Puerto Rico, the District of Columbia, American Samoa, Guam, the Northern Mariana Islands, and the Virgin Islands. (See definition of "Water systems in the States.")

Storage: a category of need that addresses finished water storage needs faced by community water systems.

Surface water: all water which is open to the atmosphere and subject to surface run-off including streams, rivers, and lakes.

Transmission and distribution: a category of need that includes replacement or rehabilitation of transmission or distribution lines which carry drinking water from the source to the treatment plant or from the treatment plant to the home.

Treatment: a category of need that includes conditioning water or removing microbiological and chemical contaminants. Filtration of surface water sources, pH adjustment, softening, and disinfection are examples of treatment.

Waterborne disease outbreak: the significant occurrence of acute infectious illness, epidemiologically associated with the ingestion of water from a public water system.

Water systems in the States: in this report, this phrase refers to water systems regulated by any of the 50 States of the United States, Puerto Rico, the District of Columbia, American Samoa, Guam, the Northern Mariana Islands, and the Virgin Islands. This includes those States and territories for which the EPA serves as the primary regulatory body. This group does not include American Indian or Alaska Native water systems.

Watering point: a central source from which people without piped water can draw drinking water and transport it to their homes.