GEOLOGICAL SURVEY CIRCULAR 288

THE INDUSTRIAL UTILITY OF PUBLIC WATER SUPPLIES IN THE NEW ENGLAND STATES, 1952

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W. E. Wrather, Director

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By E. W. Lohr and W. F. White

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ILLUSTRATION

Figure 1. Map of the United States showing sections covered by the nine circulars on the Industrial Utlilty of Public Water Supplies of the Untied States, 1952. The shaded portion represents the section of the country covered by this circular 2

THE INDUSTRIAL UTILITY OF PUBLIC WATER SUPPLIES IN THE NEW ENGLAND STATES, 1952

By E. W. Lohr and W. F. White

INTRODUCTION

The location of industrial plants is dependent on an ample water supply of suitable quality. Information relating to the chemical characteristics of the water supplies is not only essential to the location of many plants but also is an aid in the manufacture and distribution of many commodities.

Public water supplies are utilized extensively as a source of supply for many industrial plants, used either as delivered for domestic consumption or with further treatment if necessary to meet specific needs of the plant, such as water for processing, cooling, and steam generation. The industrial use of water in the United States in 1950 was estimated to be more than 75 billion gallons per day from private sources. In addition, about 6 billion gallons per day was estimated to be taken from public water supplies.

U. S. Geological Survey Water-Supply Paper 658, "The industrial utility of public water supplies in the United States, 1932" contains information pertaining to the public water supplies of 670 of the larger cities throughout the United States. This report, which is still in print and being distributed, has filled an important need in the field of water-supply engineering. The demand for more up-to-date information and more extended coverage has led to studies by the Geological Survey for revision of the information contained in the 1932 report. The revised report, which will include data pertaining to public water supplies of more than 1,200 cities in the United States, will eventually be published as a Geological Survey Water-Supply Paper. However, in order that the information might be available at the earliest possible time, nine preliminary reports are being issued which give data on the larger cities in each state. These nine reports are being released as Geological Survey Circulars, each covering a group of states as delineated by the Bureau of Census in taking the census of the population of the country. (See fig. 1). The reports give descriptive information and analytical data for approximately three-fourths of the cities that will be included in the final report for each of the states.

This circular is the ninth and last of the series and includes data for the States of Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont. (See fig. 1). The report gives the population (1950) of the city, the population supplied, ownership, sources and treatment of supplies, storage facilities of both raw and finished waters, and chemical analyses of the water for a total of 103 of the larger cities (towns and villages) in the states of the New England group. The data for each city are essentially the same as will appear in the complete report for the whole country.

Data for the supplies were collected by W. F. White, district chemist, Washington, D. C. assisted by others in the Quality of Water Branch and the district personnel of both the Surface Water Branch and the Ground Water Branch of the U. S. Geological Survey. Analyses of most of the samples collected for the report were made in the Washington, D. C. laboratory of the Quality of Water Branch, under the supervision of D. E. Weaver, chemist. Many of the analyses for supplies in Massachusetts were furnished by the Massachusetts Department of Public Health. Review and compilation of all data were made by E. W. Lohr in the Washington office under the direction of S. K. Love, Chief, Quality of Water Branch.

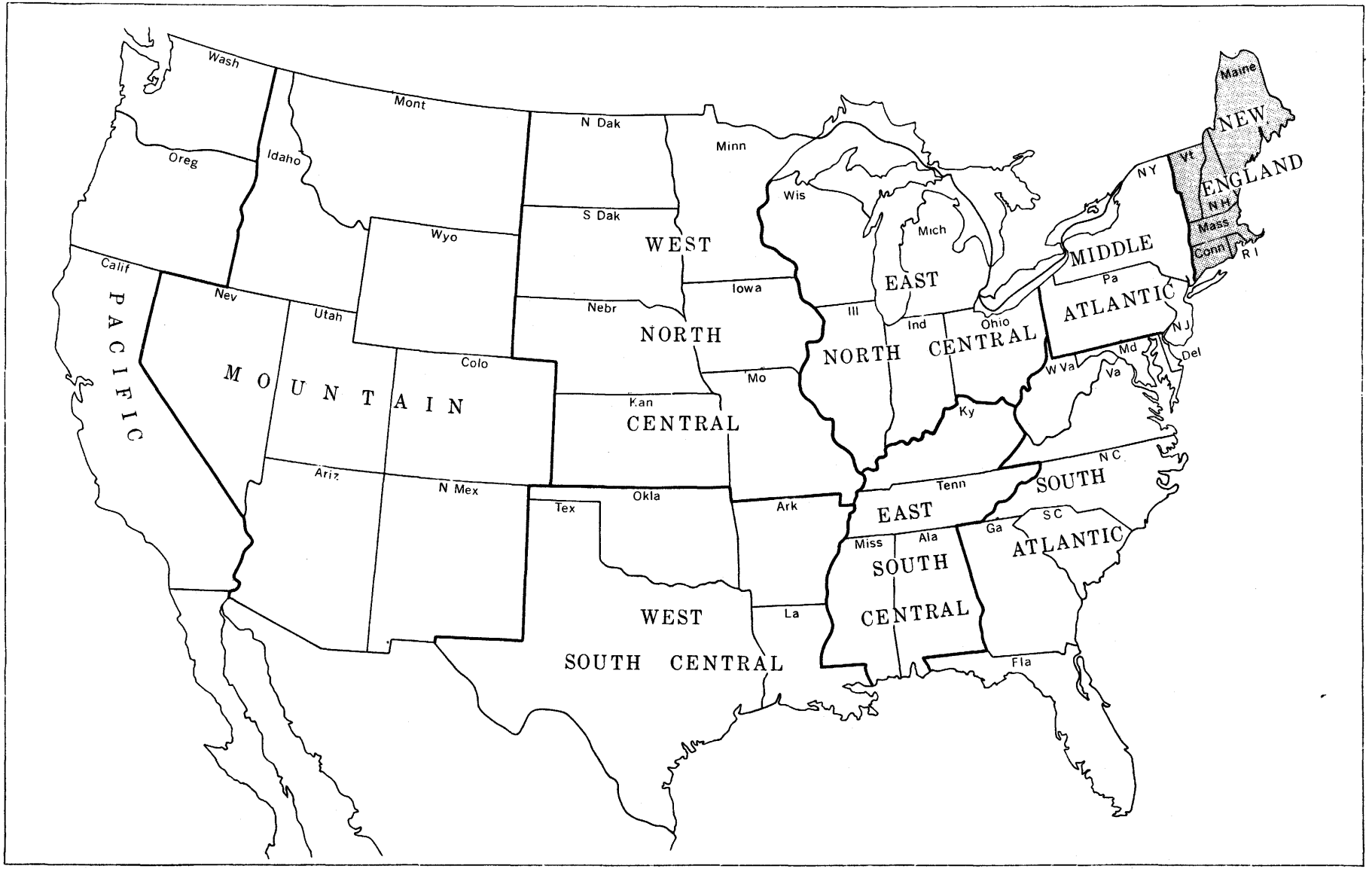

Figure 1. -Map of the United States showing sections covered by the nine circulars on the Industrial Utility of Public Water Supplies of the United States, 1952. The shaded portion represents the section of the country covered by this circular.

BRIDGEPORT
(Population, 158,709)

Ownership: Bridgeport Hydraulic Co.; also supplies wholly or in part Easton, Fairfield, Shelton, Stratford, Trumbull, and Westport towns. Total population supplied, about 250,000.
Source: 3 impounding reservoirs: Hemlocks Reservoir, about 54 percent of supply; Easton Reservoir, about 26 percent; Trap Falls Reservoir, about 20 percent.
Treatment: Chlorination, and adjustment of pH with lime.
Raw-water storage: 24,000,000,000 gal.
Finished-water storage: --

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)	Finished water [a]		Finished water (city tap)	Finished water [a]
Silica (SiO_2)	3.0	8.0	Hardness as $CaCO_3$:		
Iron (Fe)	.21	.13	Total	29	26
Manganese (Mn)	.09	.00	Noncarbonate	15	--
Calcium (Ca)	8.0	7.5			
Magnesium (Mg)	2.2	1.8	Color	15	12
Sodium (Na)	2.6	2.0	pH	6.8	7.2
Potassium (K)	.9	1.4	Specific conductance (micromhos at		
Carbonate (CO_3)	0	--	25 C.)	75.3	--
Bicarbonate (HCO_3)	17	--	Turbidity	2	0
Sulfate (SO_4)	12	13	Temperature (F.)	--	38
Chloride (Cl)	6.2	4.0	Date of collection	July 26, 1951	March, 1951
Fluoride (F)	.2	.0			
Nitrate (NO_3)	.3	.1			
Dissolved solids	46	--			

[a] Hemlocks Reservoir; average for the month of March, 1951. Analysis by Bridgeport Hydraulic Company.

BRISTOL
(Population, 35,961)

Ownership: Municipal.
Source: Reservoirs fed by surface waters. Auxiliary or emergency supply, well.
Treatment: Aeration, coagulation with alum and soda ash, sedimentation, rapid sand filtration, chlorination, and addition of Calgon.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 840,000,000 gal.
Finished-water storage: 800,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	4.3	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	11
Manganese (Mn)	.00	Noncarbonate	4
Calcium (Ca)	2.8		
Magnesium (Mg)	1.0	Color	1
Sodium (Na)	5.4	pH	6.5
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	54.8
Carbonate (CO_3)	0	Turbidity	.6
Bicarbonate (HCO_3)	9	Temperature (F.)	--
Sulfate (SO_4)	11	Date of collection	July 12, 1951
Chloride (Cl)	2.8		
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	34		

EAST HARTFORD town
(Population, 29,933)

Ownership: Supplied by Metropolitan District of Hartford County. (See Hartford.)

FAIRFIELD town
(Population, 30,489)

Ownership: Supplied by Bridgeport. (See Bridgeport.)

GREENWICH town
(Population, 40,835)

Ownership: Greenwich Water Company; also sells water wholesale to Port Chester Water Works, Inc., Port Chester, N. Y. which supplies about 38,000 people in Port Chester and Rye, N. Y. Total population supplied, about 79,000.
Source: Putnam Lake, Rockwood Lake, and Brush Dam, interconnected. The raw water intake is in Putnam Lake. Auxiliary or emergency supply, interconnections with Stamford Water Company.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 16,500,000 gpd.
Raw-water storage: Putnam Lake, 572,000,000 gal; Rockwood Lake, 500,000,000 gal; Brush Dam, 14,000,000 gal.
Finished-water storage: 1,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	5.2	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	38
Manganese (Mn)	--	Noncarbonate	19
Calcium (Ca)	12		
Magnesium (Mg)	2.0	Color	2
Sodium (Na)	3.7	pH	7.1
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	110
Carbonate (CO_3)	0	Turbidity	2.0
Bicarbonate (HCO_3)	23	Temperature (F.)	--
Sulfate (SO_4)	21	Date of collection	June 24, 1952
Chloride (Cl)	7.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	76		

Regular determinations at treatment plant, 1951

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	20	27	12	6.9	7.3	6.8	34	38	27	1	5	1
Finished water	24	36	17	8.5	8.9	6.8	46	48	40	<1	<1	<1

HAMDEN town
(Population, 29,715)

Ownership: Supplied by New Haven, Water Co. (See New Haven.)

HARTFORD
(Population, 177,397)

Ownership: Metropolitan District of Hartford County, which also includes as member towns Bloomfield, East Hartford, Newington, Rocky Hill, Wethersfield, and Windsor; and non-member towns Glastonbury and West Hartford. Total population supplied, about 322,000.
Source: Series of impounding reservoirs. Nepaug Reservoir (at present) is the principal supply reservoir.
Treatment: Aeration, slow sand filtration, and chlorination.
Rated capacity of treatment plant: 35,000,000 gpd.
Raw-water storage: 41,100,000,000 gal.
Finished-water storage: 17,800,000 gal. (Storage facilities under construction, 14,500,000 gal).

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	3.9	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	12
Manganese (Mn)	.00	Noncarbonate	6
Calcium (Ca)	3.5		
Magnesium (Mg)	.8	Color	7
Sodium (Na)	1.5	pH	6.2
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	39.7
Carbonate (CO_3)	0	Turbidity	.4
Bicarbonate (HCO_3)	7	Temperature (F.)	--
Sulfate (SO_4)	6.8	Date of collection	July 14, 1951
Chloride (Cl)	2.8		
Fluoride (F)	.1		
Nitrate (NO_3)	.6		
Dissolved solids	27		

Regular determinations at treatment plant

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	6.8	7.1	6.1	--	--	--	1.2	2.4	0.4
Finished water	7.3	8.5	6.0	6.4	6.7	6.0	15	18	10	.6	1.9	.2

MIDDLETOWN
(Population, 29,711)

Ownership: Municipal.
Source: Mt. Higby Reservoir; Laurel Brook Reservoir (not being used at present).
Treatment: Chlorination.
Raw-water storage: 600,000,000 gal.
Finished-water storage: --

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Raw water [a]	Finished water [b]		Raw water [a]	Finished water [b]
Silica (SiO_2)	.7	.7	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.07	Total	48	29
Manganese (Mn)	.0	.0	Noncarbonate	24	18
Calcium (Ca)	16	7.8			
Magnesium (Mg)	2.0	2.3	Color	4	8
Sodium (Na)	3.8	2.7	pH	7.0	6.7
Potassium (K)	.8	.2	Specific conductance (micromhos at 25 C.)	120	75.8
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	30	13			
Sulfate (SO_4)	22	13	Turbidity	2	2
Chloride (Cl)	5.5	7.8	Temperature (F.)	--	--
Fluoride (F)	.2	.0	Date of collection	July 18, 1951	July 18, 1951
Nitrate (NO_3)	.9	.1			
Dissolved solids	68	47			

[a] Laurel Brook Reservoir.
[b] Mt. Higby Reservoir, chlorinated.

MILFORD town
(Population, 26,870)

Ownership: Supplied by New Haven. (See New Haven.)

NEW BRITAIN
(Population, 73,726)

Ownership: Municipal; also supplies about 5,000 people outside the city limits. Total population supplied, about 78,700.
Source: Shuttle Meadow, Wolcott and Whigville Reservoirs (small brooks impounded or diverted); 20 White Bridge wells 40 ft deep; 66 upper White Bridge driven wells.
Treatment: Coagulation with alum and soda ash, carbon, sedimentation, rapid sand filtration, lime, chlorination, and fluoridation with sodium fluoride. Well supply: chlorination (and fluoridation planned).
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: 1,524,000,000 gal.
Finished-water storage: 4,500,000 gal.

The White Bridge pumping station is operated by two 3-mgd electric pumps, and Upper White Bridge station, by two 1-mgd electric pumps. Electric power for the pumps is generated by Fairbanks-Morse diesel generating units. The wells of the Upper White Bridge field are connected to header lines which terminate in the pumping station from which the water is pumped to a large concrete well (the caisson) 50 ft in diameter and about 28 ft deep at White Bridge. The walls of this well are perforated with 3 in. pipe openings. The well has no constructed bottom. Suction lines in each of the White Bridge wells are connected to a header line which also leads into the caisson. Ordinarily, water from the caisson is pumped into the Whigville Reservoir line leading directly to distribution lines in the city when only ground water is being carried in the line. Under these conditions about 6 mgd can be delivered. If necessary the water can be delivered to the treatment plant. With a full line from Whigville Reservoir no water can be diverted from White Bridge. Under normal operation conditions about 3.1 mgd is diverted from Whigville and about 2.6 mgd from White Bridge, all being delivered to the treatment plant through the single pipe line serving both supplies. In the year 1950 about 18.5 percent of the total of all supplies was furnished by the wells.

NEW BRITAIN--Continued

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water[a]		Finished water[a]
Silica (SiO_2)	8.2	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	29
Manganese (Mn)	.00	Noncarbonate	13
Calcium (Ca)	9.4		
Magnesium (Mg)	1.4	Color	2
Sodium (Na)	3.2	pH	9.0
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	85.1
Carbonate (CO_3)	2	Turbidity	.5
Bicarbonate (HCO_3)	16	Temperature (F.)	72
Sulfate (SO_4)	14	Date of collection	July 11, 1951
Chloride (Cl)	3.2		
Fluoride (F)	.4		
Nitrate (NO_3)	.2		
Dissolved solids	52		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	10	13	3	6.7	8.1	5.9	18	34	6	--	--	--
Finished water	14	18	10	8.5	9.1	8.1	42	76	22	0	0	0

[a] Sample collected at Shuttle Meadow treatment plant.

NEW HAVEN
(Population, 164,443)

Ownership: New Haven Water Co.; also supplies Branford, Cheshire, East Haven, Hamden, North Branford, North Haven, Orange, West Haven, and Woodbridge towns; and sells water to Milford town. Total population supplied, about 294,000.
Source: 8 collecting systems comprising 15 impounding reservoirs.
Treatment: Lake Whitney supply: slow sand filtration, and chlorination. Remaining supplies: chlorination.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: 19,683,000,000 gal.
Finished-water storage: clear well, Lake Whitney Supply, 800,000 gal.

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Lake Whitney	Woodbridge Reservoir	Lake Maltby Reservoir 1	Lake Maltby Reservoir 2
Silica (SiO_2)	8.3	5.8	4.7	4.2
Iron (Fe)	.00	.27	--	--
Manganese (Mn)	.02	.08	--	--
Calcium (Ca)	23	5.6	12	10
Magnesium (Mg)	2.9	1.5	2.2	1.9
Sodium (Na)	5.4	3.2	3.5	5.0
Potassium (K)	.3	.5		
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	58	12	29	24
Sulfate (SO_4)	14	10	11	12
Chloride (Cl)	12	5.8	8	8
Fluoride (F)	.1	.2	--	--
Nitrate (NO_3)	1.1	.4	.2	.3
Dissolved solids	96	45	[a] 56	[a] 53
Hardness as $CaCO_3$:				
Total	69	20	39	33
Noncarbonate	22	10	15	13
Color	1	15	3	3
pH	6.9	6.3	7.2	7.1
Specific conductance (micromhos at 25 C.)	165	64.5	102	92.2
Turbidity	.8	1.2	--	--
Temperature (F.)	--	--	--	--
Date of collection	July 18, 1951	July 18, 1951	July 18, 1951	July 18, 1951

[a] Sum of determined constituents.

NEW HAVEN--Continued

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Lake Gaillard	Lake Bethany	Beaver Brook Reservoir	Lake Saltonstall
Silica (SiO_2)	5.2	4.1	8.6	6.5
Iron (Fe)	.03	--	--	.02
Manganese (Mn)	.00	--	--	.00
Calcium (Ca)	9.0	6.0	14	18
Magnesium (Mg)	3.7	1.4	4.2	6.4
Sodium (Na)	2.9	3.0	6.0	5.6
Potassium (K)	.3			.4
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	26	6	25	61
Sulfate (SO_4)	13	9.0	21	18
Chloride (Cl)	4.9	9	14	8.5
Fluoride (F)	.1	--	--	.1
Nitrate (NO_3)	.2	.3	3.9	1.0
Dissolved solids	61	[a] 36	[a] 84	111
Hardness as $CaCO_3$:				
Total	38	21	52	71
Noncarbonate	16	16	32	21
Color	2	3	7	1
pH	7.0	6.0	6.8	7.8
Specific conductance (micromhos at 25 C.)	90.7	64.2	155	169
Turbidity	1.0	--	--	1.5
Temperature (F.)	--	--	--	--
Date of collection	July 17, 1951	July 18, 1951	July 16, 1951	July 18, 1951

Regular determinations at treatment plant [b]

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	32	43	25	6.8	6.9	6.7	46	54	40	.25	1	0

[a] Sum of determined constituents.

[b] Lake Whitney, quarterly determinations, Aug. 4, and Oct. 18, 1950; Jan. 10 and Apr. 6, 1951.

NEW LONDON
(Population, 30,551)

Ownership: Municipal; also supplies about 550 people in Montville and Waterford towns. Total population supplied, about 31,100.
Source: Lake Konomoc Reservoir. Auxiliary or emergency supplies, Barnes Reservoir and Bogue Brook Reservoir.
Treatment: Chlorination.
Raw-water storage: 1,046,000,000 gal.
Finished-water storage: 6,300,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water a (city tap)		Finished water a (city tap)
Silica (SiO_2)	2.4	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	11
Manganese (Mn)	.00	Noncarbonate	6
Calcium (Ca)	3.0		
Magnesium (Mg)	.8	Color	7
Sodium (Na)	3.2	pH	6.3
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	47.9
Carbonate (CO_3)	0	Turbidity	.7
Bicarbonate (HCO_3)	6	Temperature (F.)	--
Sulfate (SO_4)	5.8	Date of collection	July 16, 1951
Chloride (Cl)	6.4		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	30		

[a] Lake Konomoc.

NORWALK
(Population, 49,460)

Ownership: Municipal. The two taxing districts of the city have separate systems of supply. The first taxing district supplies about 25,000 people; the second, about 21,500.

Source: First taxing district: 4 impounding reservoirs on Silvermine River. Second taxing district: stored water from East Branch Silvermine River and North Wilton Brook.

Treatment: First taxing district: coagulation with alum, sedimentation, rapid sand filtration, lime, Calgon, and chloramine. Second taxing district: slow sand filtration, chlorination, and adjustment of pH with lime.

Rated capacity of treatment plants: First taxing district, 5,000,000 gpd; Second taxing district, 4,500,000 gpd.

Raw-water storage: First taxing district, 1,000,000,000 gal; Second taxing district, 780,000,000 gal.

Finished-water storage: First taxing district, 5,000,000 gal; Second taxing district, 3,400,000 gal.

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Finished water [a]	Finished water [b]		Finished water [a]	Finished water [b]
Silica (SiO_2)	4.0	4.0	Hardness as $CaCO_3$:		
Iron (Fe)	.21	.24	Total	32	36
Manganese (Mn)	.04	.05	Noncarbonate	19	14
Calcium (Ca)	8.7	10			
Magnesium (Mg)	2.5	2.7	Color	7	8
Sodium (Na)	2.8	2.8	pH	6.7	7.6
Potassium (K)	.6	1.0	Specific conductance (micromhos at 25 C.)	87.0	93.9
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	16	27			
Sulfate (SO_4)	15	11	Turbidity	2	2
Chloride (Cl)	6.9	7.1	Temperature (F.)	--	--
Fluoride (F)	.1	.1	Date of collection	Aug. 20, 1951	August, 1951
Nitrate (NO_3)	.2	.6			
Dissolved solids	54	54			

[a] First taxing district.
[b] Second taxing district.

STAMFORD
(Population, 74,293)

Ownership: Stamford Water Co.; also sells water to Greenwich Water Company and Noroton Water Company.
Source: Mill River and tributaries impounded in reservoirs.
Treatment: Chlorination.
Raw-water storage: 3,303,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water [a]		Finished water [a]
Silica (SiO_2)	3.1	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	31
Manganese (Mn)	.04	Noncarbonate	15
Calcium (Ca)	9.2		
Magnesium (Mg)	2.0	Color	2
Sodium (Na)	3.0	pH	6.7
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	88.3
Carbonate (CO_3)	0	Turbidity	.8
Bicarbonate (HCO_3)	20	Temperature (F.)	--
Sulfate (SO_4)	12	Date of collection	July 11, 1951
Chloride (Cl)	7.2		
Fluoride (F)	.0		
Nitrate (NO_3)	.2		
Dissolved solids	50		

[a] North Stamford Reservoir, distributing reservoir.

STRATFORD town
(Population, 33,428)

Ownership: Supplied by Bridgeport. (See Bridgeport.)

TORRINGTON
(Population, 27,820)

Ownership: Torrington Water Company.
Source: 5 reservoirs.
Treatment: Chlorination and addition of copper sulfate as required.
Raw-water storage: 1,849,000,000 gal.
Finished-water storage: None.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (composite)		Finished water (composite)
Silica (SiO_2)	1.4	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	20
Manganese (Mn)	.05	Noncarbonate	12
Calcium (Ca)	4.1		
Magnesium (Mg)	2.4	Color	8
Sodium (Na)	.9	pH	6.4
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	46.3
Carbonate (CO_3)	0	Turbidity	2
Bicarbonate (HCO_3)	10	Temperature (F.)	70
Sulfate (SO_4)	7.9	Date of collection	July 18, 1951
Chloride (Cl)	4.9		
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	29		

Regular determinations at treatment plant, 1950 [a]

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	21	30	12	6.8	7.1	6.6	37	48	26	2	3	1

[a] Results of analyses by State Department of Health.

WATERBURY
(Population, 107,477)

Ownership: Municipal, also supplies about 2,000 people outside the city limits. Total population supplied about 109,500.
Source: 4 Impounding reservoirs (Sheepaug, Morris, Pitch, and Wigwam) on mountain streams. Auxiliary or emergency supplies, Prospect and East Mountain Reservoirs.
Treatment. Chlorination and addition of lime for pH control.
Raw-water storage: 4,164,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	2.8	Hardness as $CaCO_3$.	
Iron (Fe)	.12	Total	24
Manganese (Mn)	--	Noncarbonate	10
Calcium (Ca)	7.5		
Magnesium (Mg)	1.3	Color	4
Sodium (Na)	2.0	pH	6.8
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	67.4
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	17	Turbidity	1.6
Sulfate (SO_4)	9.0	Temperature (F.)	--
Chloride (Cl)	5.5	Date of collection	June 25, 1952
Fluoride (F)	0		
Nitrate (NO_3)	.1		
Dissolved solids	42		

Regular determinations at treatment plant 1951

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	6.7	6.9	6.6	--	--	--	1.5	2.0	1.0
Finished water	--	--	--	7.1	8.3	6.7	--	--	--	1.3	1.5	1.0

WEST HARTFORD town
(Population, 44,402)

Ownership. Supplied by Hartford Metropolitan District. (See Hartford.)

WEST HAVEN town
(Population, 32,010)

Ownership: Supplied by New Haven Water Company. (See New Haven.)

AUBURN
(Population, 23,134)

Ownership: Auburn Water District (Municipal).
Source: Lake Auburn.
Treatment: Chlorination.
Raw-water storage: 7,363,000,000 gal.
Finished-water storage: Reservoir and standpipe, 8,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	1.5	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	14
Manganese (Mn)	.00	Noncarbonate	5
Calcium (Ca)	4.8		
Magnesium (Mg)	.6	Color	2
Sodium (Na)	1.5	pH	6.6
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	42.9
Carbonate (CO_3)	0	Turbidity	1.2
Bicarbonate (HCO_3)	12	Temperature (F.)	44
Sulfate (SO_4)	4.0	Date of collection	Apr. 17, 1951
Chloride (Cl)	3.2		
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	28		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	7.0	7.1	6.9	18	24	12	0	0	0
Finished water	--	--	--	7.0	7.1	6.9	18	24	12	0	0	0

AUGUSTA
(Population, 20,913)

Ownership: Augusta Water District (quasi-municipal); supplies also Manchester, Winthrop, and Veterans Administration Hospital. Total population supplied, about 23,000.
Source: Lake, Carleton Pond, in Readfield, Maine 77 percent of supply; Lake Cobbosseeconttee (Manchester and Winthrop) 23 percent of supply.
Treatment: Chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 700,000,000 gal.
Finished-water storage: 16,600,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	3.7	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	20
Manganese (Mn)	.00	Noncarbonate	11
Calcium (Ca)	4.8		
Magnesium (Mg)	1.9	Color	22
Sodium (Na)	1.6	pH	6.5
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	46.6
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	11		
Sulfate (SO_4)	9.2	Turbidity	.6
Chloride (Cl)	3.4	Temperature (F.)	44
Fluoride (F)	.0	Date of collection	Apr. 18, 1951
Nitrate (NO_3)	.4		
Dissolved solids	34		

BANGOR
(Population, 31,558)

Ownership: Municipal; also supplies an Army Airport. Total population supplied, about 35,000.
Source: Penobscot River.
Treatment: Coagulation with alum and lime, carbon, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: --
Finished-water storage: 5,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	3.2	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	36
Manganese (Mn)	.00	Noncarbonate	28
Calcium (Ca)	12		
Magnesium (Mg)	1.4	Color	12
Sodium (Na)	1.1	pH	6.7
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	89.9
Carbonate (CO_3)	0	Turbidity	2.1
Bicarbonate (HCO_3)	10	Temperature (F.)	42
Sulfate (SO_4)	20	Date of collection	Apr. 18, 1951
Chloride (Cl)	6.9		
Fluoride (F)	.2		
Nitrate (NO_3)	.3		
Dissolved solids	64		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water[a]	18	24	9	6.9	7.1	6.8	33	61	20	10	22	5

[a] City tap.

BATH
(Population, 10,644)

Ownership: Bath Water District (quasi-municipal); supplies also East Brunswick, West Bath, and Woolwich. Total population supplied, about 13,000.
Source: Nequasset Lake. Auxiliary or emergency supply, Thompson Brook.
Treatment: Ammoniation and chlorination.
Raw-water storage: --
Finished-water storage: 2,250,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	4.5	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	8
Manganese (Mn)	.00	Noncarbonate	4
Calcium (Ca)	2.0		
Magnesium (Mg)	.8	Color	20
Sodium (Na)	3.0	pH	5.9
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	42.4
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	5	Turbidity	1.7
Sulfate (SO_4)	4.0	Temperature (F.)	--
Chloride (Cl)	5.8	Date of collection	Apr. 18, 1951
Fluoride (F)	.2		
Nitrate (NO_3)	.7		
Dissolved solids	34		

BIDDEFORD
(Population, 20,836)

Ownership: Biddeford & Saco Water Company; also supplies Old Orchard, Saco, and Scarborough. Total population supplied, about 41,000; total population supplied in the summer, about 120,000.
Source: Saco River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, filtration, ammoniation, postchlorination, and addition of Calgon.
Rated capacity of treatment plant: 9,000,000 gpd.
Raw-water storage: 1,000,000 gal.
Finished-water storage: 11,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	4.7	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	25
Manganese (Mn)	.00	Noncarbonate	15
Calcium (Ca)	7.8		
Magnesium (Mg)	1.4	Color	7
Sodium (Na)	1.6	pH	8.1
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	60.4
Carbonate (CO_3)	0	Turbidity	.2
Bicarbonate (HCO_3)	12	Temperature (F.)	44
Sulfate (SO_4)	14	Date of collection	Apr. 16, 1951
Chloride (Cl)	3.1		
Fluoride (F)	.2		
Nitrate (NO_3)	.2		
Dissolved solids	41		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	4	5	3	6.6	6.7	6.5	17	--	--	5	--	--
Finished water	14	15	13	8.1	--	--	30	--	--	0	--	--

LEWISTON
(Population, 40,974)

Ownership: Municipal.
Source: Lake Auburn. Emergency supply, connections with the supply system of the City of Auburn. (See Auburn for analysis).
Treatment: Chlorination.
Rated capacity of treatment plant: 5,400,000 gpd.
Raw-water storage: --
Finished-water storage: 33,250,000 gal.

PORTLAND
(Population, 77,634)

Ownership: Portland Water District; also supplies South Portland, Westbrook, and Cape Elizabeth, Cumberland (part), Falmouth, Gorham, Scarborough, South Windham, and Windham (part) towns. Total population supplied, about 138,000. (North Windham and Standish towns are supplied by wells).
Source: Sebago Lake.
Treatment: Chlorination and ammoniation.
Raw-water storage: Sebago Lake.
Finished-water storage: Tanks and reservoirs, 33,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.9	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	14
Manganese (Mn)	.00	Noncarbonate	7
Calcium (Ca)	4.2		
Magnesium (Mg)	.8	Color	15
Sodium (Na)	1.4	pH	6.7
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	30.7
Carbonate (CO_3)	0	Turbidity	.7
Bicarbonate (HCO_3)	8	Temperature (F.)	46
Sulfate (SO_4)	7.0	Date of collection	Apr. 23, 1951
Chloride (Cl)	2.0		
Fluoride (F)	.0		
Nitrate (NO_3)	.4		
Dissolved solids	23		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	6.0	6.5	5.0	6.8	7.0	6.7	13	14	12	0	0	0
Finished water	6.0	6.5	5.0	6.8	7.0	6.7	13	14	12	0	0	0

SACO
(Population, 10,324)

Ownership: Biddeford & Saco Water Company. (See Biddeford.)

SANFORD
(Population, 11,094)

Ownership: Sanford Water District.
Source: 42 driven wells 20 to 30 ft deep, 93 percent of supply; Littlefields pond, 7 percent of supply. Auxiliary or emergency supply, Mousam River.
Treatment: Well supply: pressure sand filtration, aeration, chlorination, and addition of soda ash and Calgon. Pond supply: slow sand filtration and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	10	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	26
Manganese (Mn)	.05	Noncarbonate	17
Calcium (Ca)	7.8		
Magnesium (Mg)	1.6	Color	1
Sodium (Na)	4.2	pH	6.1
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	88.7
Carbonate (CO_3)	0	Turbidity	.9
Bicarbonate (HCO_3)	10	Temperature (F.)	--
Sulfate (SO_4)	16	Date of collection	May 18, 1951
Chloride (Cl)	7.1		
Fluoride (F)	.2		
Nitrate (NO_3)	.6		
Dissolved solids	58		

SOUTH PORTLAND
(Population, 21,866)

Ownership: Supplied by Portland. (See Portland.)

WATERVILLE
(Population, 18,287)

Ownership: Kennebec Water District; supplies the towns of Benton, Fairfield, Vassalboro, and Winslow. Total population supplied, about 28,000.
Source: China Lake.
Treatment: Chlorination.
Raw-water storage: --
Finished-water storage: 22,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	1.2	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	25
Manganese (Mn)	.00	Noncarbonate	11
Calcium (Ca)	6.5		
Magnesium (Mg)	2.1	Color	12
Sodium (Na)	2.0	pH	6.9
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	60.0
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	17	Turbidity	.5
Sulfate (SO_4)	12	Temperature (F.)	--
Chloride (Cl)	3.1	Date of collection	Apr. 17, 1951
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	38		

WESTBROOK
(Population, 12,284)

Ownership: Supplied by Portland. (See Portland.)

ARLINGTON town
(Population, 44,353)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

ATTLEBORO
(Population, 23,809)

Ownership: Municipal; also supplies about 400 people in North Attleboro and Mansfield. Total population supplied, about 24,200.
Source: 4 wells 35 ft deep.
Treatment: Addition of lime and chlorine.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage. --
Finished-water storage: 1,500,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	6.4	Hardness as $CaCO_3$:	
Iron (Fe)	.33	Total	43
Manganese (Mn)	.01	Noncarbonate	17
Calcium (Ca)	16		
Magnesium (Mg)	.8	Color	4
Sodium (Na)	3.6	pH	7.4
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	114
Carbonate (CO_3)	0	Turbidity	.7
Bicarbonate (HCO_3)	32	Temperature (F.)	--
Sulfate (SO_4)	18	Date of collection	Mar. 3, 1953
Chloride (Cl)	6.8		
Fluoride (F)	.0		
Nitrate (NO_3)	1.0		
Dissolved solids	71		

BELMONT town
(Population, 27,381)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

BEVERLY
(Population 28,884)

Ownership: Salem-Beverly Water Supply Board. (See Salem.)

BOSTON
(Population, 801,444)

Ownership: Metropolitan District Commission, Commonwealth of Massachusetts; also supplies Arlington, Belmont, Brookline, Chelsea, Chicopee, Everett, Framingham (part), Lexington, Malden, Medford, Melrose, Milton, Newton (part), Quincy, Revere, Saugus, Somerville, Waltham, Watertown, Winthrop, and other communities. Total population supplied, about 1,622,000.

Source: Swift River impounded in Quabbin Reservoir; Ware River diverted into Quabbin Reservoir through a deep, rock tunnel; South Branch of Nashua River impounded in Wachusett Reservoir. Auxiliary or emergency supply, Sudbury Reservoir (7,254,000,000 gal capacity).

Treatment: Chlorination and ammoniation. Rechlorination when distributed from open distribution reservoirs.

Raw-water storage: Quabbin Reservoir, 415,000,000,000 gal; Wachusetts Reservoir, 65,000,000,000 gal.

Finished-water storage: Reservoirs: Norumbega, 150,000,000 gal; Weston, 200,000,000 gal; Spot Pond, 1,792,000,000 gal; Fells, 85,000,000 gal; Waban Hill, 13,500,000 gal; Bear Hill, 2,500,000 gal; Arlington, 2,000,000 gal. Standpipes: Arlington (2 steel standpipes), 2,000,000 gal; Bellevue (steel standpipe), 2,500,000 gal. All of the reservoirs are open reservoirs.

Water from Quabbin Reservoir is conducted through a tunnel to Wachusetts Reservoir from which the water from both reservoirs is conveyed to Norumbega and Weston Reservoirs, the two principal distribution reservoirs. Weston reservoir supplies the low service system in downtown Boston, parts of Cambridge, Somerville, Chelsea, Medford, and Everett. Norumbega Reservoir supplies the Northern high service and southern high service systems. Water from these systems is pumped to the extra high service at various locations.

BOSTON--Continued

ANALYSES

(Analyses, in parts per million, by Water Division, Metropolitan District Comm.)

	Quabbin Reservoir [a]	Norumbega Reservoir	Spot Pond [b]	Finished water [c]
Silica (SiO_2)	0.9	1.5	0.9	2.4
Iron (Fe)	.12	.10	.08	.10
Manganese (Mn)	.00	.00	.00	.01
Calcium (Ca)	4.1	5.5	5.5	4.0
Magnesium (Mg)	.7	.7	.7	.4
Sodium (Na)	1.6	2.3	2.5	1.8
Potassium (K)	.8	1.1	1.2	.7
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	6	7	8	7
Sulfate (SO_4)	5.3	6.9	8.5	5.6
Chloride (Cl)	2.0	3.7	5.0	3.4
Fluoride (F)	.1	.2	.1	.1
Nitrate (NO_3)	.1	.1	.1	.3
Dissolved solids	33	39	42	29
Hardness as $CaCO_3$:				
Total	13	17	17	12
Noncarbonate	8	11	10	6
Color	7	14	7	12
pH	6.3	6.5	6.3	6.5
Specific conductance (micromhos at 25 C.)	--	--	--	41.3
Turbidity	1.0	.5	1.0	1.0
Temperature (F.)	37	35	38	--
Date of collection	Mar. 6, 1952	Mar. 6, 1952	Mar. 6, 1952	Mar. 17, 1953

Regular determinations at treatment plant, 1952

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	7.3	9.3	5.8	6.7	6.9	6.5	14	16	13	0.7	1.5	0.5
Finished water	6.8	9.4	5.7	6.6	6.9	6.4	14	17	13	.7	1.5	.5

[a] At reservoir outlet.
[b] At east gatehouse.
[c] Tap, Federal Bldg., Boston. Analysis by U. S. Geol. Survey.

BRAINTREE town
(Population, 23,161)

Ownership: Municipal.
Source: Great Pond.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, and corrosion correction.
Rated capacity of treatment plant: 2,500,000 gpd.
Raw-water storage: 748,000,000 gal.
Finished-water storage: 2,500,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	4.5	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	33
Manganese (Mn)	--	Noncarbonate	20
Calcium (Ca)	9.4		
Magnesium (Mg)	2.4	Color	--
Sodium (Na)	11	pH	7.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	119
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	16	Temperature (F.)	--
Sulfate (SO_4)	27	Date of collection	Feb. 25, 1952
Chloride (Cl)	11		
Fluoride (F)	.1		
Nitrate (NO_3)	.8		
Dissolved solids	85		

Regular determinations at treatment plant

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	8	10	6	6.9	7.0	6.8	26	33	25	4	6	2
Finished water	10	13	9	7.5	7.7	7.3	35	42	31	--	--	--

BROCKTON
(Population 62,860)

Ownership: Municipal; also supplies East Bridgewater, Hanson town, Pembroke town, West Bridgewater, and Whitman town. Total population supplied, about 81,000
Source. Silver Lake 96 percent of supply; Avon Reservoir (pond) 4 percent of supply
Treatment: Chlorination.
Raw-water storage: 5,250,000, gal.
Finished water storage. 8,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.7	Hardness as $CaCO_3$.	
Iron (Fe)	.14	Total	11
Manganese (Mn)	02	Noncarbonate	4
Calcium (Ca)	2.6		
Magnesium (Mg)	1.0	Color	5
Sodium (Na)	5.2	pH	6.6
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	54.3
Carbonate (CO_3)	0	Turbidity	1.5
Bicarbonate (HCO_3)	8	Temperature (F.)	--
Sulfate (SO_4)	8.4	Date of collection	Mar , 1953
Chloride (Cl)	7.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	35		

Regular determinations at treatment plant, 1952

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min		Max	Min	Av	Max	Min	Av	Max	Min
Raw water	7.4	13	.9	5.7	6.9	4.9	1	30	6	0	0	0
Finished water	9.3	8			7.0	.9	13	26	6	0		0

BROOKLINE town
(Population, 57,589)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

CAMBRIDGE
(Population, 120,740)

Ownership: Municipal.
Source: Fresh Pond, Hobbs Brook Reservoir, and Stony Brook Reservoir.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, aeration, and chlorination.
Rated capacity of treatment plant: 22,900,000 gpd.
Raw-water storage: 4,559,000,000 gal.
Finished-water storage: 43,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	1.3	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	56
Manganese (Mn)	--	Noncarbonate	15
Calcium (Ca)	16		
Magnesium (Mg)	4.0	Color	--
Sodium (Na)	9.7	pH	7.8
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	50	Temperature (F.)	--
Sulfate (SO_4)	32	Date of collection	--
Chloride (Cl)	16		
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	133		

Regular determinations at treatment plant, 1951

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	24	40	19	7.1	7.4	6.7	57	72	38	--	--	--
Finished water	26	40	22	8.2	8.4	7.8	66	98	42	.3	1.0	.1

CHELSEA
(Population, 38,912)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

CHICOPEE
(Population, 49,211)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)
Source: Auxiliary or emergency supplies: Impounded reservoirs.
Treatment: Auxiliary supply only: Aeration, coagulation, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: --
Raw-water storage: --
Finished-water storage: 3,500,000 gal.

EVERETT
(Population, 45,982)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

FALL RIVER
(Population, 111,963)

Ownership: Municipal.
Source: North Watuppa Pond. Auxiliary supply, water diverted from an adjacent watershed during a portion of some years.
Treatment: Chlorination.
Rated capacity of treatment plant: --
Raw water storage: 7,200,000,000 gal.
Finished water storage: 7,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	1.3	Hardness as $CaCO_3$:	
Iron (Fe)	.29	Total	15
Manganese (Mn)	--	Noncarbonate	6
Calcium (Ca)	4.5		
Magnesium (Mg)	.8	Color	-
Sodium (Na)	6.0	pH	7.1
Potassium (K)	.6	Specific conductance (micromhos at 25 C)	66
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)		Temperature (F.)	--
Sulfate (SO_4)	15	Date of collection	Feb. 18, 1952
Chloride (Cl)	8.4		
Fluoride (F)	.0		
Nitrate (NO_3)	1		
Dissolved solids	42		

FITCHBURG
(Population, 42,691)

Ownership: Municipal.
Source: Natural ponds, and impounding reservoirs, a gravity system of reservoirs for high and low service lines.
Treatment: Chlorination and ammoniation.
Raw-water storage: 2,516,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water[a]		Finished water[a]
Silica (SiO_2)	8.2	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	6
Manganese (Mn)	.02	Noncarbonate	3
Calcium (Ca)	1.7		
Magnesium (Mg)	.4	Color	15
Sodium (Na)	1.9	pH	5.8
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	29.5
Carbonate (CO_3)	0	Turbidity	1.0
Bicarbonate (HCO_3)	3	Temperature (F.)	--
Sulfate (SO_4)	4.4	Date of collection	Mar. 10, 1953
Chloride (Cl)	2.6		
Fluoride (F)	.6		
Nitrate (NO_3)	.2		
Dissolved solids	23		

Regular determinations at treatment plant, 1952

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	3	4	2	6.2	6.4	6.0	8	10	6	1	1	1
Finished water	3	4	2	6.2	6.4	6.0	8	10	6	1	1	1

[a] Low service system.

FRAMINGHAM town
(Population, 28,086)

Ownership: Municipal.
Source: Metropolitan District Commission, 65 percent of supply (See Boston.); 3 wells (1 to 3) 68, 78, and 68 ft deep, 35 percent of supply.
Treatment: Chlorination (Metropolitan District sources); well water, none.
Finished-water storage: 4,250,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	2.4	Hardness as $CaCO_3$:	
Iron (Fe)	.20	Total	13
Manganese (Mn)	--	Noncarbonate	1
Calcium (Ca)	4.7		
Magnesium (Mg)	.4	Color	--
Sodium (Na)	3.5	pH	6.8
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	15	Turbidity	--
Sulfate (SO_4)	9.7	Temperature (F.)	--
Chloride (Cl)	3.0	Date of collection	--
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	40		

GLOUCESTER
(Population, 25,167)

Ownership: Municipal.
Source: Babson, Dikes, Haskell, Wallace, and Fernwood Reservoirs.
Treatment: Chlorination.
Raw-water storage: 1,120,000,000 gal.
Finished-water storage: 6,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water [a]		Finished water [a]
Silica (SiO_2)	9.8	Hardness as $CaCO_3$:	
Iron (Fe)	.49	Total	28
Manganese (Mn)	.01	Noncarbonate	20
Calcium (Ca)	9.0		
Magnesium (Mg)	1.4	Color	40
Sodium (Na)	8.7	pH	7.1
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	104
Carbonate (CO_3)	0	Turbidity	1.3
Bicarbonate (HCO_3)	10	Temperature (F.)	--
Sulfate (SO_4)	17	Date of collection	Mar. 6, 1953
Chloride (Cl)	16		
Fluoride (F)	.8		
Nitrate (NO_3)	.6		
Dissolved solids	75		

[a] Babson Reservoir supplying city at time of collection of sample.

HAVERHILL
(Population, 47,280)

Ownership: Municipal; also supplies Groveland and West Newbury town. Total population supplied, about 51,200.
Source: Crystal and Kenoza Lakes, Millvale Reservoir, Round (emergency), Johnson's, Chadwick, and Hovey's Ponds.
Treatment: Chlorination. Kenoza Lake water: addition of lime and polyphosphate for corrosion control.
Raw-water storage: 1,273,000,000 gal.
Finished-water storage: 12,500,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	3.7	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	25
Manganese (Mn)	--	Noncarbonate	7
Calcium (Ca)	7.7		
Magnesium (Mg)	1.3	Color	--
Sodium (Na)	5.6	pH	7.1
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	74
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	21	Temperature (F.)	--
Sulfate (SO_4)	13	Date of collection	Feb. 15, 1952
Chloride (Cl)	7.6		
Fluoride (F)	.2		
Nitrate (NO_3)	.1		
Dissolved solids	58		

HOLYOKE
(Population, 54,661)

Ownership: Municipal.
Source: Reservoirs: Ashley, 65 percent of supply; McLain, 25 percent of supply; Whiting, 10 percent of supply.
Treatment: Chlorination.
Raw-water storage: 2,300,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	6.4	Hardness as $CaCO_3$:	
Iron (Fe)	.23	Total	26
Manganese (Mn)	.00	Noncarbonate	8
Calcium (Ca)	8.1		
Magnesium (Mg)	1.5	Color	9
Sodium (Na)	1.4	pH	6.9
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	70.6
Carbonate (CO_3)	0	Turbidity	1.1
Bicarbonate (HCO_3)	22	Temperature (F.)	--
Sulfate (SO_4)	6.0	Date of collection	Feb. 26, 1953
Chloride (Cl)	4.8		
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	50		

Regular determinations at treatment plant

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	---	--	--	--	--	--	--	--	--
Finished water	--	16	8	--	6.8	5.8	--	40	18	--	6	4

LAWRENCE
(Population, 80,536)

Ownership: Municipal; supplies also Methuen town. Total population supplied, about 105,000.
Source: Merrimack River.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, aeration, and chlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: --
Finished-water storage: 42,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	4.7	Hardness as $CaCO_3$:	
Iron (Fe)	.45	Total	22
Manganese (Mn)	--	Noncarbonate	0
Calcium (Ca)	7.0		
Magnesium (Mg)	1.2	Color	--
Sodium (Na)	13	pH	6.8
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	32	Temperature (F.)	--
Sulfate (SO_4)	12	Date of collection	Apr. 30, 1952
Chloride (Cl)	7.2		
Fluoride (F)	.2		
Nitrate (NO_3)	.7		
Dissolved solids	65		

Regular determinations at treatment plant

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	9	13	5	6.5	6.7	6.4	22	30	14	6	14	4
Finished water	11	14	8	6.9	7.1	6.7	41	46	36	0	0	0

LEOMINSTER
(Population, 24,075)

Ownership: Municipal.
Source: Impounding reservoirs (Simmond Pond, Goodfellows Pond, Rocky Pond, and No Town Reservoir) for a gravity supply system for high, intermediate, and low service.
Treatment: Coagulation with alum, addition of carbon, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 1,355,000,000 gal.
Finished-water storage: 1,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	4.6	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	28
Manganese (Mn)	.00	Noncarbonate	6
Calcium (Ca)	10		
Magnesium (Mg)	.8	Color	10
Sodium (Na)	4.8	pH	9.5
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	93.1
Carbonate (CO_3)	8	Turbidity	1.0
Bicarbonate (HCO_3)	11	Temperature (F.)	--
Sulfate (SO_4)	16	Date of collection	Mar. 10, 1953
Chloride (Cl)	2.8		
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	55		

LOWELL
(Population, 97,249)

Ownership: Municipal.
Source. A large number of relatively shallow wells ranging in depth from about 25 to 50 ft in several well fields.
Treatment: One group of wells is treated for iron removal by means of aeration, coke filtration, sedimentation and slow sand filtration; the other group of wells is treated for corrosion correction; all supplies are chlorinated.
Rated capacity of treatment plant. --
Raw-water storage: --
Finished-water storage: 7,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water[a] (city tap)		Finished water[a] (city tap)
Silica (SiO_2)	11	Hardness as $CaCO_3$:	
Iron (Fe)	.94	Total	42
Manganese (Mn)	.32	Noncarbonate	10
Calcium (Ca)	13		
Magnesium (Mg)	2.3	Color	20
Sodium (Na)	8.3	pH	6.3
Potassium (K)	2.6	Specific conductance (micromhos at 25 C.)	137
Carbonate (CO_3)	0	Turbidity	7.5
Bicarbonate (HCO_3)	39	Temperature (F.)	--
Sulfate (SO_4)	16	Date of collection	Mar. 10, 1953
Chloride (Cl)	10		
Fluoride (F)	.1		
Nitrate (NO_3)	2.9		
Dissolved solids	90		

[a] Wells, composite.

LYNN
(Population, 99,738)

Ownership: Municipal.
Source: Breeds, Birch, Hawkes, and Walden Ponds supplemented with diversion from Ipswich River.
Treatment: Chlorination.
Raw-water storage: 2,958,000,000 gal.
Finished-water storage: 21,750,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	2.6	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	40
Manganese (Mn)	--	Noncarbonate	20
Calcium (Ca)	9.5		
Magnesium (Mg)	3.9	Color	--
Sodium (Na)	6.9	pH	6.6
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	24	Turbidity	--
Sulfate (SO_4)	18	Temperature (F.)	--
Chloride (Cl)	13	Date of collection	Jan. 24, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	.4		
Dissolved solids	86		

MALDEN
(Population, 59,804)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

MEDFORD
(Population, 66,113)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

MELROSE
(Population, 26,988)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

METHUEN town
(Population, 24,477)

Ownership: Municipal. Supplied by Lawrence. (See Lawrence.)

MILTON town
(Population, 22,395)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

NEW BEDFORD
(Population, 109,189)

Ownership: Municipal; supplies also Acushnet town and Dartmouth town. Total population supplied, about 124,700.
Source: Great Quittacas and Little Quittacas Ponds.
Treatment: Chlorination and ammoniation.
Raw-water storage: 5,145,000,000 gal.
Finished-water storage: 67,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	2.7	Hardness as $CaCO_3$:	
Iron (Fe)	.21	Total	15
Manganese (Mn)	--	Noncarbonate	5
Calcium (Ca)	4.3		
Magnesium (Mg)	1.0	Color	5
Sodium (Na)	5.4	pH	6.5
Potassium (K)		Specific conductance (micromhos at 25 C.)	55.3
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	12	Temperature (F.)	--
Sulfate (SO_4)	6.0	Date of collection	May 16, 1947
Chloride (Cl)	7.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.4		
Dissolved solids	35		

NEWTON
(Population, 81,994)

Ownership: Municipal.
Source: Dug wells 68 percent of supply (1951); Metropolitan District Commission, 32 percent of supply (to be supplied completely by Metropolitan District Commission at a later date). (See Boston.)
Treatment: Corrosion correction treatment with soda ash on well supply.
Raw-water storage: --
Finished-water storage: 10,500,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	2.0	Hardness as $CaCO_3$:	
Iron (Fe)	.25	Total	45
Manganese (Mn)	--	Noncarbonate	0
Calcium (Ca)	13		
Magnesium (Mg)	3.0	Color	--
Sodium (Na)	32	pH	6.3
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	111	Turbidity	--
Sulfate (SO_4)	17	Temperature (F.)	--
Chloride (Cl)	11	Date of collection	Jan. 29, 1952
Fluoride (F)	.2		
Nitrate (NO_3)	1.1		
Dissolved solids	148		

NORTH ADAMS
(Population, 21,567)

Ownership: Municipal.
Source: Impounding reservoirs (James, Broad, and Notch Brooks): Mt. Kimball, Broad Brook, and Notch. The city at the higher elevations draws water from Notch Reservoir.
Treatment: Chlorination.
Raw-water storage: 300,000,000 gal.
Finished-water storage: None.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water[a] (city tap)		Finished water[a] (city tap)
Silica (SiO_2)	4.6	Hardness as $CaCO_3$:	
Iron (Fe)	.83	Total	52
Manganese (Mn)	.09	Noncarbonate	9
Calcium (Ca)	13		
Magnesium (Mg)	4.8	Color	20
Sodium (Na)	.9	pH	7.3
Potassium (K)	.2	Specific conductance (micromhos at 25 C.)	105
Carbonate (CO_3)	0	Turbidity	3.9
Bicarbonate (HCO_3)	53	Temperature (F.)	--
Sulfate (SO_4)	9.2	Date of collection	Mar. 6, 1953
Chloride (Cl)	1.5		
Fluoride (F)	.1		
Nitrate (NO_3)	.4		
Dissolved solids	64		

[a] Composite, Mt. Kimball and Broad Brook Reservoirs.

NORTHAMPTON
(Population, 29,063)

Ownership: Municipal.
Source: Mountain St. Reservoir. Emergency supply, 2 wells (1 and 2) 85 and 88 ft deep, reported to yield 700 and 600 gpm.
Treatment: Chlorination and fluoridation.
Raw-water storage: 505,000,000 gal.
Finished-water storage: 200,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	6.9	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	21
Manganese (Mn)	.01	Noncarbonate	6
Calcium (Ca)	6.2		
Magnesium (Mg)	1.3	Color	8
Sodium (Na)	2.1	pH	6.8
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	57.5
Carbonate (CO_3)	0	Turbidity	.5
Bicarbonate (HCO_3)	18	Temperature (F.)	--
Sulfate (SO_4)	6.0	Date of collection	Mar. 2, 1953
Chloride (Cl)	2.0		
Fluoride (F)	1.2		
Nitrate (NO_3)	.3		
Dissolved solids	41		

PEABODY
(Population, 22,645)

Ownership: Municipal.
Source: Suntaug Lake supplemented by diversion from Ipswich River and Spring Pond.
Treatment: Chlorination.
Raw-water storage: Suntaug Lake, 450,000,000 gal (available by gravity); Spring Pond, 275,000,000 gal.
Finished-water storage: 3,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	5.5	Hardness as $CaCO_3$:	
Iron (Fe)	.83	Total	39
Manganese (Mn)	.00	Noncarbonate	25
Calcium (Ca)	8.5		
Magnesium (Mg)	4.3	Color	20
Sodium (Na)	5.2	pH	6.9
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	135
Carbonate (CO_3)	0	Turbidity	1.5
Bicarbonate (HCO_3)	17	Temperature (F.)	--
Sulfate (SO_4)	16	Date of collection	Mar. 6, 1953
Chloride (Cl)	14		
Fluoride (F)	.1		
Nitrate (NO_3)	2.8		
Dissolved solids	85		

PITTSFIELD
(Population, 53,348)

Ownership: Municipal.
Source: Sackett, Hathaway, Brook, Ashley, Farnham, Millbrook, and Cleveland Brook Reservoirs; Ashley Lake; Sand Wash Brook.
Treatment: Chlorination.
Raw-water storage: --
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	1.9	Hardness as $CaCO_3$:	
Iron (Fe)	.2	Total	39
Manganese (Mn)	--	Noncarbonate	5
Calcium (Ca)	10		
Magnesium (Mg)	3.4	Color	--
Sodium (Na)	.9	pH	7.1
Potassium (K)	2.5	Specific conductance (micromhos at 25 C.)	87
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	42	Turbidity	--
Sulfate (SO_4)	10	Temperature (F.)	--
Chloride (Cl)	2.2	Date of collection	Feb. 18, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	55		

QUINCY
(Population, 83,835)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

REVERE
(Population, 36,763)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

SALEM
(Population, 41,880)

Ownership: Salem-Beverly Water Supply Board. High lift pumping and distribution is handled separately by each city.
Source: Wenham Lake, Longham Reservoir (Miles River impounded), and Ipswich River.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, corrosion correction (Calgon), chlorination, and fluoridation.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 1,200,000,000 gal.
Finished-water storage: Salem, 10,000,000 gal; Beverly, 7,500,000 gal.

Water from Longham Reservoir flows a distance of 1 mile through a 36 in. cast iron pipe to Wenham Lake, a natural pond. Water from Ipswich River is pumped to Wenham Lake. The Water Supply Board has authority to divert water from the river from June 1 to Nov. 30. An additional storage reservoir for flood flows of Ipswich River is under construction.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	4.8	Hardness as $CaCO_3$:	
Iron (Fe)	.18	Total	54
Manganese (Mn)	.12	Noncarbonate	47
Calcium (Ca)	16		
Magnesium (Mg)	3.4	Color	10
Sodium (Na)	7.4	pH	6.1
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	165
Carbonate (CO_3)	0	Turbidity	1.2
Bicarbonate (HCO_3)	9	Temperature (F.)	--
Sulfate (SO_4)	45	Date of collection	Mar. 6, 1953
Chloride (Cl)	12		
Fluoride (F)	1.0		
Nitrate (NO_3)	.9		
Dissolved solids	103		

Regular determinations at treatment plant, 1952

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	16	24	12	7.0	7.5	6.6	41	50	32	--	--	--
Finished water	15	19	10	6.9	7.0	6.7	52	60	46	--	5	--

SOMERVILLE
(Population, 102,351)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.

SPRINGFIELD
(Population, 162,399)

Ownership: Municipal; supplies also the towns of Agawam, East Longmeadow, Longmeadow, Ludlow, and Southwith. Total population supplied, about 195,000.
Source: Cobble Mountain and Ludlow Reservoirs.
Treatment: Ludlow Reservoir water: slow sand filtration, ammoniation, and chlorination. Cobble Mountain Reservoir water: coagulation with alum and lime, sedimentation, aeration, slow sand filtration, aeration, and marble contact filtration.
Rated capacity of treatment plants: --
Raw-water storage: 26,500,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	4.7	Hardness as $CaCO_3$:	
Iron (Fe)	.18	Total	12
Manganese (Mn)	--	Noncarbonate	6
Calcium (Ca)	4.2		
Magnesium (Mg)	.4	Color	8
Sodium (Na)	3.3	pH	6.7
Potassium (K)		Specific conductance (micromhos at 25 C.)	39.0
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	7	Temperature (F.)	--
Sulfate (SO_4)	8.0	Date of collection	Feb. 25, 1952
Chloride (Cl)	3.2		
Fluoride (F)	.1		
Nitrate (NO_3)	.5		
Dissolved solids	30		

TAUNTON
(Population, 40,109)

Ownership: Municipal; supplies also North Dighton and Raynham Center. Total population supplied, about 41,600.
Source: Elders Pond and Assawompsett Pond. Auxiliary or emergency supply, infiltration gallery adjacent to the river.
Treatment: Chlorination.
Raw-water storage: 8,900,000,000 gal.
Finished-water storage: None.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	7.0	Hardness as $CaCO_3$:	
Iron (Fe)	.20	Total	13
Manganese (Mn)	--	Noncarbonate	9
Calcium (Ca)	3.1		
Magnesium (Mg)	1.2	Color	--
Sodium (Na)	6.0	pH	6.3
Potassium (K)	.2	Specific conductance (micromhos at 25 C.)	58
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	5	Turbidity	--
Sulfate (SO_4)	12	Temperature (F.)	--
Chloride (Cl)	9.2	Date of collection	Feb. 18, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	.0		
Dissolved solids	42		

WALTHAM
(Population, 47,187)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

WATERTOWN town
(Population, 37,329)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)

WELLESLEY town
(Population, 20,549)

Ownership: Municipal.
Source: Wells: 1 well 40 ft deep, 25 ft in diam., and reported to yield 1,000 gpm; 1 well 70 ft deep and reported to yield 1,000 gpm; 45 driven wells 30 to 60 ft deep, and reported to yield a total of 1,200 gpm.
Treatment: None.
Storage: 4 reservoirs: Maugus Hill (new) and Pierce Hill, 2,500,000 gal; 2 , Maugus Hill (old), 2,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Wells (composite)		Wells (composite)
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	56
Manganese (Mn)	.01	Noncarbonate	21
Calcium (Ca)	16		
Magnesium (Mg)	3.9	Color	7
Sodium (Na)	6.0	pH	6.9
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	154
Carbonate (CO_3)	0	Turbidity	.6
Bicarbonate (HCO_3)	43	Temperature (F.)	50
Sulfate (SO_4)	17	Date of collection	Mar. 3, 1953
Chloride (Cl)	12		
Fluoride (F)	.1		
Nitrate (NO_3)	3.1		
Dissolved solids	95		

Regular determinations at treatment plant, 1952

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	40	52	25	6.4	7.1	6.3	57	66	38	1	2	0
Finished water	--	--	--	--	--	--	--	--	--	--	--	--

WESTFIELD
(Population, 20,962)

Ownership: Municipal.
Source: Surface supplies: Montgomery Reservoir, 46.8 percent of supply (1952); Granville Reservoir 53.2 percent of supply.
Treatment: Chlorination (on main lines into city).
Raw-water storage: 823,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	5.2	Hardness as $CaCO_3$:	
Iron (Fe)	.19	Total	7
Manganese (Mn)	.02	Noncarbonate	2
Calcium (Ca)	1.7		
Magnesium (Mg)	.7	Color	12
Sodium (Na)	1.4	pH	6.0
Potassium (K)	.1	Specific conductance (micromhos at 25 C.)	27.3
Carbonate (CO_3)	0	Turbidity	.6
Bicarbonate (HCO_3)	6	Temperature (F.)	--
Sulfate (SO_4)	4.4	Date of collection	Feb. 26, 1953
Chloride (Cl)	2.1		
Fluoride (F)	.0		
Nitrate (NO_3)	.4		
Dissolved solids	26		

WEYMOUTH town
(Population, 32,690)

Ownership: Municipal.
Source: Great Pond and gravel-packed wells.
Treatment: Surface supply: coagulation with alum and soda ash, aeration, sedimentation, rapid sand filtration, chlorination, and adjustment of pH. Well supply: chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 493,000,000 gal.
Finished-water storage: 3,600,000 gal.

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	1.8	Hardness as $CaCO_3$:	
Iron (Fe)	.25	Total	5
Manganese (Mn)	--	Noncarbonate	0
Calcium (Ca)	1.4		
Magnesium (Mg)	.4	Color	--
Sodium (Na)	9.7	pH	7.6
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	16	Temperature (F.)	--
Sulfate (SO_4)	5.6	Date of collection	--
Chloride (Cl)	6.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.7		
Dissolved solids	36		

Regular determinations at treatment plant

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	16	24	10	5.8	6.5	5.1	12	16	8	2	285	0
Finished water	20	36	15	7.2	7.6	6.9	12	15	10	0	3	0

WOBURN
(Population, 20,492)

Ownership: Municipal.
Source: 4 wells (B, D, A-2, and E) 64, 57, 90, and 39 ft deep, reported to yield 568, 851, 1,580, and 789 gpm. Auxiliary or emergency supply, wells and Horn Pond.
Treatment: None.
Storage: 1,987,000 gal (clear wells).

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Wells (composite)		Wells (composite)
Silica (SiO_2)	8.8	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	69
Manganese (Mn)	..00	Noncarbonate	23
Calcium (Ca)	22		
Magnesium (Mg)	3.5	Color	2
Sodium (Na)	8.5	pH	7.0
Potassium (K)	2.6	Specific conductance (micromhos at 25 C.)	196
Carbonate (CO_3)	0	Turbidity	.3
Bicarbonate (HCO_3)	57	Temperature (F.)	56
Sulfate (SO_4)	23	Date of collection	Feb. 27, 1953
Chloride (Cl)	14		
Fluoride (F)	.0		
Nitrate (NO_3)	1.0		
Dissolved solids	116		

WORCESTER
(Population, 203,486)

Ownership: Municipal.
Source: Holden Reservoirs 1 and 2; Kettle Brook Reservoirs 1 and 3; Mann Reservoir (Kettle Brook 2); Bottomley Reservoir (Kettle Brook 4); Kendall Reservoir; Leicester Reservoir; Pine Hill Reservoir; Quinapoxet Pond.
Treatment: Ammoniation and chlorination.
Raw-water storage: 6,260,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by Massachusetts Dept. of Public Health)

	Finished water		Finished water
Silica (SiO_2)	4.6	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	9
Manganese (Mn)	--	Noncarbonate	6
Calcium (Ca)	2.8		
Magnesium (Mg)	.6	Color	--
Sodium (Na)	3.2	pH	6.7
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	31
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	4	Temperature (F.)	--
Sulfate (SO_4)	7.3	Date of collection	--
Chloride (Cl)	3.3		
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	33		

BERLIN
(Population, 16,615)

Ownership: Municipal.
Source: Brooks. Auxiliary supply, 1 well 49 ft deep.
Treatment: Filtration and chlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: 45,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Brooks [a]		Brooks [a]
Silica (SiO_2)	8.0	Hardness as $CaCO_3$:	
Iron (Fe)	.21	Total	10
Manganese (Mn)	.00	Noncarbonate	4
Calcium (Ca)	3.0		
Magnesium (Mg)	.7	Color	27
Sodium (Na)	1.3	pH	6.6
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	28.8
Carbonate (CO_3)	0	Turbidity	.3
Bicarbonate (HCO_3)	8	Temperature (F.)	47
Sulfate (SO_4)	6.5	Date of collection	May 25, 1951
Chloride (Cl)	.8		
Fluoride (F)	.2		
Nitrate (NO_3)	.6		
Dissolved solids	29		

[a] Sample collected at filter plant before chlorination.

CONCORD
(Population, 27,988)

Ownership: Municipal.
Source: Penacook Lake. Auxiliary or emergency supply, driven wells.
Treatment: Chlorination.
Raw-water storage: 1,520,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	3.1	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	12
Manganese (Mn)	.00	Noncarbonate	5
Calcium (Ca)	3.3		
Magnesium (Mg)	.8	Color	6
Sodium (Na)	2.0	pH	6.4
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	38.1
Carbonate (CO_3)	0	Turbidity	.4
Bicarbonate (HCO_3)	8	Temperature (F.)	--
Sulfate (SO_4)	6.5	Date of collection	May 15, 1951
Chloride (Cl)	2.8		
Fluoride (F)	.2		
Nitrate (NO_3)	.3		
Dissolved solids	25		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	--	--	--	6.8	7.0	6.5	21	24	18	0	0	0

DOVER
(Population, 15,874)

Ownership: Municipal; also supplies about 1,000 people outside the city limits. Total population supplied, about 16,900.
Source: Barbadoes well 66 ft deep, 40 percent of supply; Smith well 65 ft deep, 60 percent of supply. Auxiliary or emergency supply, Willand Pond. The yield of the wells is reported to be 350 and 630 gpm, respectively.
Treatment: Barbadoes well: soda ash for adjustment of pH and corrosion control. Smith well and Willand Pond: aeration, slow sand filtration, and chlorination.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,000,000 gal.

The Barbadoes well pumps directly into the distribution system.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.13	Total	55
Manganese (Mn)	.00	Noncarbonate	44
Calcium (Ca)	17		
Magnesium (Mg)	3.1	Color	3
Sodium (Na)	5.5	pH	6.7
Potassium (K)	2.1	Specific conductance (micromhos at 25 C.)	162
Carbonate (CO_3)	0	Turbidity	24
Bicarbonate (HCO_3)	13	Temperature (F.)	--
Sulfate (SO_4)	47	Date of collection	Jan. 11, 1952
Chloride (Cl)	6.9		
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	107		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	--	--	--	7.1	7.5	6.5	40	52	30	0	0	0

KEENE
(Population, 15,638)

Ownership: Municipal.
Source: Lakes.
Treatment: Slow sand filtration. Chlorination in an emergency.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 760,000,000 gal.
Finished-water storage: 1,500,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	4.2	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	7
Manganese (Mn)	.00	Noncarbonate	4
Calcium (Ca)	1.8		
Magnesium (Mg)	.5	Color	7
Sodium (Na)	1.0	pH	6.1
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	24.9
Carbonate (CO_3)	0	Turbidity	.3
Bicarbonate (HCO_3)	3	Temperature (F.)	52
Sulfate (SO_4)	6.0	Date of collection	May 22, 1951
Chloride (Cl)	1.2		
Fluoride (F)	.1		
Nitrate (NO_3)	.5		
Dissolved solids	20		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Temperature (°F)		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	6.8	--	6.7	21	--	--	48	67	32
Finished water	--	--	--	7.2	--	6.6	19	--	--	--	--	--

LACONIA
(Population, 14,745)

Ownership: Laconia Water Company. Population supplied, about 15,000.
Source: Lake Paugus (fed by springs and brooks).
Treatment: Chlorination.
Rated capacity of treatment plant: 3,600,000 gpd.
Raw-water storage: --
Finished-water storage: 2,750,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	1.7	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	11
Manganese (Mn)	.00	Noncarbonate	4
Calcium (Ca)	3.4		
Magnesium (Mg)	.7	Color	7
Sodium (Na)	1.9	pH	6.8
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	34.3
Carbonate (CO_3)	0	Turbidity	.1
Bicarbonate (HCO_3)	9	Temperature (F.)	45
Sulfate (SO_4)	5.2	Date of collection	May 15, 1951
Chloride (Cl)	2.4		
Fluoride (F)	.2		
Nitrate (NO_3)	.3		
Dissolved solids	23		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	7.0	7.2	6.9	17	20	15	1	2	1
Finished water	--	--	--	7.0	7.2	6.9	17	20	15	1	2	1

MANCHESTER
(Population, 82,732)

Ownership: Municipal; also supplies about 3,000 people outside the city limits. Total population supplied, about 85,700.
Source: Lake Massabesic. Water is pumped at two points from the West Pond of the lake to the high and low pressure systems.
Treatment: Chlorination.
Rated capacity of treatment plant: 20,000,000 gpd.
Raw-water storage: 4,000,000,000 gal.
Finished-water storage: 33,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	1.3	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	12
Manganese (Mn)	.01	Noncarbonate	8
Calcium (Ca)	3.4		
Magnesium (Mg)	.8	Color	2
Sodium (Na)	2.7	pH	5.8
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	44.2
Carbonate (CO_3)	0	Turbidity	.9
Bicarbonate (HCO_3)	4	Temperature (F.)	--
Sulfate (SO_4)	7.2	Date of collection	May 24, 1951
Chloride (Cl)	5.8		
Fluoride (F)	.2		
Nitrate (NO_3)	.5		
Dissolved solids	36		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	--	--	--	6.5	7.0	6.3	15	--	--	0	--	--

NASHUA
(Population, 34,669)

Ownership: Pennichuck Water Works.
Source: Springs; flowing wells. Auxiliary or emergency supply, Pennichuck Brook.
Treatment: Chlorination.
Raw-water storage: Spring water, 56,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	7.5	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	25
Manganese (Mn)	.02	Noncarbonate	7
Calcium (Ca)	8.1		
Magnesium (Mg)	1.1	Color	2
Sodium (Na)	2.2	pH	6.7
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	68.4
Carbonate (CO_3)	0	Turbidity	.3
Bicarbonate (HCO_3)	22	Temperature (F.)	50
Sulfate (SO_4)	6.8	Date of collection	May 15, 1951
Chloride (Cl)	4.9		
Fluoride (F)	.0		
Nitrate (NO_3)	.7		
Dissolved solids	45		

PORTSMOUTH
(Population, 18,830)

Ownership: Municipal. Total population supplied, about 24,300.
Source: Wells: Well 1 70 ft deep, and reported to yield 350 gpm; Wells (1 to 8) Sherborne Station 45 to 52 ft deep, and reported to yield 332 gpm; Haven Well 60 ft deep, and reported to yield 350 gpm; Gosling well 50 ft deep, and reported to yield 300 gpm; Greenland Well 55 ft deep, and reported to yield 360 gpm.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 1,250,000 gal.

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Finished water [a]	Finished water [b]	Finished water [c]
Silica (SiO_2)	13	13	13
Iron (Fe)	.01	.01	.01
Manganese (Mn)	--	--	--
Calcium (Ca)	39	26	26
Magnesium (Mg)	10	11	12
Sodium (Na)	7.7	5.2	5.2
Potassium (K)	2.2	1.5	1.7
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	110	72	73
Sulfate (SO_4)	52	54	54
Chloride (Cl)	9.0	6.0	7.0
Fluoride (F)	.0	.0	.0
Nitrate (NO_3)	3.6	1.2	1.4
Dissolved solids	191	153	156
Hardness as $CaCO_3$:			
Total	139	110	114
Noncarbonate	49	51	54
Color	4	3	3
pH	7.4	7.5	7.1
Specific conductance (micromhos at 25 C.)	321	204	206
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	June 5, 1951	June 5, 1951	June 5, 1951

[a] Sherborne Station.
[b] Haven Station.
[c] Gosling Station.

ROCHESTER
(Population, 13,776)

Ownership: Municipal; also supplies about 100 people outside the city limits. Total population supplied, about 13,900.
Source: Berry Brook, 75 percent of supply; Round Pond, 25 percent of supply.
Treatment: Chlorination.
Raw-water storage: 400,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	3.1	Hardness as $CaCO_3$:	
Iron (Fe)	.35	Total	7
Manganese (Mn)	.04	Noncarbonate	4
Calcium (Ca)	1.9		
Magnesium (Mg)	.6	Color	15
Sodium (Na)	2.7	pH	5.9
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	33.3
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	4		
Sulfate (SO_4)	4.8	Turbidity	.7
Chloride (Cl)	5.0	Temperature (F.)	--
Fluoride (F)	.0	Date of collection	May 14, 1951
Nitrate (NO_3)	.3		
Dissolved solids	24		

BRISTOL
(Population, 10,335)

Ownership: Bristol County Water Dept.; also supplies Warren and Barrington towns. Total population supplied, about 26,000.
Source: Impounding Reservoirs on Kickemuit and Palmer Rivers. Emergency supply, 1 well (Bar. 111) in Barrington 83 ft deep, and reported to yield 694 gpm.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, and adjustment of pH to about 6.8 with hydrated lime.
Rated capacity of treatment plant: 5,500,000 gpd.
Raw-water storage: 385,000,000 gal.
Finished-water storage: 2,450,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	1.5	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	48
Manganese (Mn)	.06	Noncarbonate	30
Calcium (Ca)	16		
Magnesium (Mg)	1.9	Color	7
Sodium (Na)	6.0	pH	7.0
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	140
Carbonate (CO_3)	0	Turbidity	.7
Bicarbonate (HCO_3)	21	Temperature (F.)	--
Sulfate (SO_4)	28	Date of collection	July 11, 1951
Chloride (Cl)	9.8		
Fluoride (F)	.2		
Nitrate (NO_3)	.6		
Dissolved solids	84		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	12	16	8	6.6	6.7	6.5	34	44	26	0	--	--
Finished water	17	21	14	7.0	7.2	6.9	53	58	48	0	0	0

CENTRAL FALLS
(Population, 23,550)

Ownership: Purchases water from Pawtucket. (See Pawtucket.)

CRANSTON
(Population, 55,060)

Ownership: Purchases water from Providence and West Warwick town. (See Providence and West Warwick town.)

EAST PROVIDENCE town
(Population, 35,871)

Ownership: Municipal; also supplies Watchemoket section of East Providence which was formerly supplied by Pawtucket Water Company.
Source: Ten Mile River impounded in East Providence Reservoir, 80 percent of supply; 3 wells (supply for Watchemoket section) 20 percent. The wells (Epr. 76, 77, and 78) 56, 74, and 58 ft deep yield 754, 759, and 1,280 gpm, respectively.
Treatment: Aeration, coagulation with alum and soda ash, activated carbon, sedimentation, rapid sand filtration, chlorination, and adjustment of pH to about 6.9 with soda ash.
Rated capacity of treatment plant: 4,100,000 gpd.
Raw-water storage: 420,000,000 gal. (East Providence Reservoir).
Finished-water storage: 1,000,000 gal.

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Finished water [a]	Well Epr. 76	Well Epr. 77
Silica (SiO_2)	6.9	9.3	10
Iron (Fe)	.22	.03	.00
Manganese (Mn)	.53	.01	.00
Calcium (Ca)	9.8	9.3	9.8
Magnesium (Mg)	1.6	1.6	1.8
Sodium (Na)	29	4.6	5.0
Potassium (K)	2.0	.2	.4
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	22	13	15
Sulfate (SO_4)	40	20	19
Chloride (Cl)	23	5.5	5.8
Fluoride (F)	.2	.1	.0
Nitrate (NO_3)	4.7	2.6	2.7
Dissolved solids	136	63	64
Hardness as $CaCO_3$:			
Total	31	30	32
Noncarbonate	13	19	20
Color	5	0	2
pH	6.4	6.2	6.2
Specific conductance (micromhos at 25 C.)	226	99.4	103
Turbidity	4.0	1.8	.7
Temperature (F.)	74	56	51
Date of collection	July 11, 1951	July 11, 1951	June 23, 1951

[a] Surface supply.

EAST PROVIDENCE town--Continued

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water..... ...	26	41	13	6.8	7.0	6.7	42	54	29	--	--	--
Finished water...	24	30	18	6.7	6.7	6.6	42	47	39	0	0	0

NEWPORT
(Population, 37,564)

Ownership: Municipal; also supplies about 4,500 people outside the city limits. Total population supplied, about 42,000.
Source: Reservoirs: Eastons North and Eastons South Ponds, Nelsons Pond, Gardners Pond, St. Marys Pond, Sissons Pond, and Lawton Valley Reservoir. Auxiliary or emergency supply, Nonquit Pond.
Treatment: Aeration, prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 9,900,000 gpd.
Raw-water storage: 1,310,000,000 gal.
Finished-water storage: 8,000,000 gal.

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	.9	.1	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.08	Total	71	76
Manganese (Mn).....	.00	.00	Noncarbonate.....	52	54
Calcium (Ca).....	21	23			
Magnesium (Mg).....	4.5	4.4	Color.....	2	1
Sodium (Na)	12	13	pH.....	7.2	6.6
Potassium (K)	1.8	3.2	Specific conductance (micromhos at		
Carbonate (CO_3).....	0	0	25 C.).....	224	248
Bicarbonate (HCO_3)	23	26	Turbidity.....	.6	1.0
Sulfate (SO_4).....	30	42	Temperature (F.)...	72	72
Chloride (Cl).....	33	31	Date of collection...	July 11, 1951	July 10, 1951
Fluoride (F).....	.0	.1			
Nitrate (NO_3).....	.3	.2			
Dissolved solids.....	119	[a]130			

[a] Sum of determined constituents.

NEWPORT--Continued

Regular determinations at treatment plant, 1950 [b]

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water.....	29	34	25	7.9	9.3	7.1	68	92	52	--	--	0
Finished water...	24	32	20	7.6	8.2	7.4	83	94	73	0	0	0

[b] Combined Newport and Lawton Valley supplies.

PAWTUCKET
(Population, 81,436)

Ownership: Municipal; also supplies Central Falls, and parts of Cumberland town, Lincoln town, and a small part of North Providence town. Total population supplied, about 125,000.
Source: Abbott Run impounded in Diamond Hill and Arnold Mill Reservoirs. Emergencies supply, 4 wells (Cum. 339, 340; Lin. 335, 342).
Treatment: Aeration, coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, and adjustment of pH to about 7.0.
Rated capacity of treatment plant: 30,000,000 gpd.
Raw-water storage: 2,764,000,000 gal.
Finished-water storage: 20,000,000 gal.

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Finished water	Well (Lin. 342)		Finished water	Well (Lin. 342)
Silica (SiO_2)	3.4	13	Hardness as $CaCO_3$:		
Iron (Fe)	.10	.02	Total	27	56
Manganese (Mn).....	.00	.00	Noncarbonate.....	13	10
Calcium (Ca).....	8.3	17			
Magnesium (Mg).....	1.5	3.2	Color.....	20	7
Sodium (Na)	4.6	18	pH.....	6.8	6.9
Potassium (K)	.8	2.3	Specific conductance (micromhos at		
Carbonate (CO_3).....	0	0	25 C.).....	84.7	212
Bicarbonate (HCO_3)	17	56	Turbidity.....	1.1	1.0
Sulfate (SO_4).....	13	24	Temperature (F.)...	78	54
Chloride (Cl).....	6.1	18	Date of collection...	July 17, 1951	July 23, 1951
Fluoride (F).....	.2	.0			
Nitrate (NO_3).....	1.0	1.4			
Dissolved solids.....	54	128			

PAWTUCKET--Continued

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water.....	11	12	10	6.6	6.9	6.3	29	34	26	0	0	0
Finished water...	12	14	8	7.1	8.4	6.4	34	40	28	0	0	0

PROVIDENCE
(Population, 248,674)

Ownership: Municipal; also supplies most of Cranston and Warwick and parts of Johnston town, Smithfield town, and North Providence town. Total population supplied, about 372,000.
Source: Scituate Reservoir and five smaller reservoirs on North Branch of Pawtuxet River.
Treatment: Coagulation with ferric sulfate (Ferrifloc) and lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 61,600,000 gpd.
Raw-water storage: 39,746,000,000 gal.
Finished-water storage: 54,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	8.2	Hardness as $CaCO_3$:	
Iron (Fe)	.29	Total	24
Manganese (Mn)	.00	Noncarbonate	10
Calcium (Ca)	9.0		
Magnesium (Mg)	.5	Color	7
Sodium (Na)	3.2	pH	9.1
Potassium (K)	.7	Specific conductance (micromhos at 25 C.).....	74.6
Carbonate (CO_3)	2	Turbidity	.8
Bicarbonate (HCO_3)	13	Temperature (F.).....	62
Sulfate (SO_4)	13	Date of collection	July 17, 1951
Chloride (Cl)	4.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.5		
Dissolved solids	52		

PROVIDENCE--Continued

Regular determinations at treatment plant, 1949-50 [a]

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water.....	5	5	4	6.2	6.4	6.0	10	11	9	.2	.9	.1
Finished water...	15	16	13	9.4	9.5	9.2	27	30	24	.0	.0	.0

[a] Water year.

WARWICK
(Population, 43,028)

Ownership: Municipal. Purchases 87 percent of supply from Providence and 13 percent from Kent County Water Authority. (See Providence and West Warwick town.)

WEST WARWICK town
(Population, 19,096)

Ownership: Kent County Water Authority; also supplies about 1,000 people in Cranston, part of Warwick, and parts of Coventry town and North Scituate town. Total population supplied, about 27,000.

Source: Wells: 4 wells (Cov. 1 to 4) 40 to 49 ft deep; 20 wells (Cov. 5 to 13, 18 to 28) 29 to 37 ft deep; well (Egr. 3) 107 ft deep and reported to yield 1,500 gpm; well (War. 33) 118 ft deep, and reported to yield 2,700 gpm. Carr Pond, (upper and lower reservoirs). The wells furnish 60 percent of the supply and Carr Pond 40 percent. The systems are interconnected and consumers receive water from both sources.

Treatment: Chlorination; stabilization (Carr Pond).

Raw-water storage: 400,000,000 gal.

Finished-water storage: 475,000 gal.

ANALYSES

(Analyses, in parts per million, by U. S. Geological Survey)

	Wells[a]	Well (War. 33)	Tap sample[b]
Silica (SiO_2)	7.4	12	8
Iron (Fe)	.02	.01	.0
Manganese (Mn)	.04	.00	.0
Calcium (Ca)	4.7	6.5	6.4
Magnesium (Mg)	.8	1.9	1.2
Sodium (Na)	5.4	7.9	11
Potassium (K)	1.2	1.2	
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	9	13	17
Sulfate (SO_4)	7.8	15	12
Chloride (Cl)	6.5	8.2	13
Fluoride (F)	.1	.2	.0
Nitrate (NO_3)	2.8	4.6	.9
Dissolved solids	46	68	[c]61
Hardness as $CaCO_3$:			
Total	15	24	21
Noncarbonate	8	13	7
Color	7	2	5
pH	6.4	6.1	5.9
Specific conductance (micromhos at 25 C.)	66.9	105	--
Turbidity	.8	.5	0
Temperature (F.)	72	54	60
Date of collection	July 17, 1951	July 9, 1951	May 8, 1951

[a] Cov. 1 to 13, 18 to 28.

[b] Wells Cov. 1 to 13, 18 to 28; Carr Pond. Analysis by R. I. Dept. of Health.

[c] Sum of determined constituents.

WEST WARWICK town--Continued

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water.....	--	21	10	5.5	5.8	5.2	18	29	9	0	0	0
Finished water...	--	--	--	--	--	--	--	--	--	--	--	--

WOONSOCKET
(Population, 50,211)

Ownership: Municipal; also supplies parts of Lincoln town and North Smithfield town, and part of Blackstone town, Mass. Total population supplied, about 59,900.
Source: Crookfall Brook impounded in Woonsocket Reservoir.
Treatment: Chlorination.
Rated capacity of treatment plant: 6,500,000 gpd.
Raw-water storage: 910,000,000 gal.
Finished-water storage: 5,500,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Woonsocket Reservoir		Woonsocket Reservoir
Silica (SiO_2)	4.8	Hardness as $CaCO_3$:	
Iron (Fe)	.22	Total	12
Manganese (Mn)	.00	Noncarbonate	7
Calcium (Ca)	3.9		
Magnesium (Mg)	.5	Color	15
Sodium (Na)	3.2	pH	6.3
Potassium (K)	.6	Specific conductance (micromhos at 25 C.).....	45.0
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	6		
Sulfate (SO_4)	6.5	Turbidity	.8
Chloride (Cl)	4.4	Temperature (F.).....	78
Fluoride (F)	.1	Date of collection	July 16, 1951
Nitrate (NO_3)	1.1		
Dissolved solids	34		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water.....	6	7	5	6.4	6.8	6.1	20	21	18	0	--	0
Finished water...	--	--	--	---	--	--	--	--	--	--	--	--

BARRE
(Population, 10,922)

Ownership: Municipal 90 percent; private company 10 percent. Also supplies about 1,000 people outside the city limits. Total population supplied, about 11,900.
Source: Spring-fed brooks 80 percent of supply; Springs 20 percent.
Treatment: Chlorination (double).
Raw-water storage: 350,000,000 gal.
Finished-water storage: 44,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water [a]		Finished water [a]
Silica (SiO_2)	4.4	Hardness as $CaCO_3$:	
Iron (Fe)	.50	Total	61
Manganese (Mn)	.00	Noncarbonate	5
Calcium (Ca)	22		
Magnesium (Mg)	1.5	Color	20
Sodium (Na)	1.2	pH	7.2
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	131
Carbonate (CO_3)	0	Turbidity	.9
Bicarbonate (HCO_3)	68	Temperature (F.)	57
Sulfate (SO_4)	6.0	Date of collection	Aug. 20, 1951
Chloride (Cl)	3.8		
Fluoride (F)	.0		
Nitrate (NO_3)	.7		
Dissolved solids	83		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	--	--	--	7.0	7.2	6.8	--	--	--	--	1	0

[a] Orange system, representing 75 to 80 percent of total service.

BENNINGTON
(Population, 8,002)

Ownership: Municipal. Total population supplied, about 11,300.
Source: Springs. Auxiliary or emergency supply, Morgan Spring, reported to yield 500 gpm.
Treatment: None.
Storage: 7,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Mountain Springs[a]		Mountain Springs[a]
Silica (SiO_2)	5.6	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	16
Manganese (Mn)	.00	Noncarbonate	3
Calcium (Ca)	3.4		
Magnesium (Mg)	1.8	Color	5
Sodium (Na)	.7	pH	7.2
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	39.7
Carbonate (CO_3)	0	Turbidity	1.9
Bicarbonate (HCO_3)	16	Temperature (F.)	--
Sulfate (SO_4)	3.2	Date of collection	Aug. 13, 1951
Chloride (Cl)	.8		
Fluoride (F)	.0		
Nitrate (NO_3)	1.0		
Dissolved solids	27		

[a] Sample collected from village reservoir.

BURLINGTON
(Population, 33,155)

Ownership: Municipal.
Source: Lake Champlain. The 24 in. -intake pipe extends 11,300 ft into the lake toward Appletree Point, northwest of the city.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: --
Finished-water storage: 7,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	4	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	56
Manganese (Mn)	.00	Noncarbonate	21
Calcium (Ca)	15		
Magnesium (Mg)	4.4	Color	2
Sodium (Na)	2.3	pH	7.1
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	127
Carbonate (CO_3)	0	Turbidity	1.9
Bicarbonate (HCO_3)	42	Temperature (F.)	--
Sulfate (SO_4)	20	Date of collection	Aug. 17, 1951
Chloride (Cl)	3.4		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	70		

Regular determinations at treatment plant, 1951

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	40	--	--	7.0	7.2	6.8	54	56	52	1.5	3	0

MONTPELIER
(Population, 8,599)

Ownership: Municipal; also supplies 100 people outside the city limits. Total population supplied, about 8,700.
Source: Lake.
Treatment: Chlorination.
Raw-water storage: 8,000,000 gal.
Finished-water storage: None.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.7	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	74
Manganese (Mn)	.00	Noncarbonate	9
Calcium (Ca)	23		
Magnesium (Mg)	4.0	Color	6
Sodium (Na)	1.1	pH	7.5
Potassium (K)	.2	Specific conductance (micromhos at 25 C.)	144
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	79	Turbidity	2.0
Sulfate (SO_4)	6.5	Temperature (F.)	--
Chloride (Cl)	1.2	Date of collection	Aug. 11, 1951
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	83		

RUTLAND
(Population, 17,659)

Ownership: Municipal.
Source: Mendon Brook.
Treatment: Chlorination.
Raw-water storage: Reservoir, 5,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	4.9	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	42
Manganese (Mn)	.00	Noncarbonate	9
Calcium (Ca)	9.8		
Magnesium (Mg)	4.2	Color	5
Sodium (Na)	1.5	pH	7.3
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	88.6
Carbonate (CO_3)	0	Turbidity	.9
Bicarbonate (HCO_3)	40	Temperature (F.)	--
Sulfate (SO_4)	6.5	Date of collection	Aug. 17, 1951
Chloride (Cl)	3.2		
Fluoride (F)	.1		
Nitrate (NO_3)	.8		
Dissolved solids	52		

ST. ALBANS
(Population, 8,552)

Ownership: Municipal; also supplies about 1,000 people outside the city limits. Total population supplied, about 9,550.
Source: 3 reservoirs fed by brooks and springs approximately 7 miles from the city.
Treatment: Chlorination. Copper sulfate and calcium hypochlorite ("HTH") in reservoirs for the control of microorganisms.
Raw-water storage: 355,000,000 gal.
Finished-water storage: --

Gravity flow system of supply.

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	1.1	Hardness as $CaCO_3$:	
Iron (Fe)	.34	Total	40
Manganese (Mn)	.00	Noncarbonate	12
Calcium (Ca)	11		
Magnesium (Mg)	3.1	Color	5
Sodium (Na)	1.6	pH	7.2
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	91.5
Carbonate (CO_3)	0	Turbidity	1.9
Bicarbonate (HCO_3)	35	Temperature (F.)	--
Sulfate (SO_4)	9.2	Date of collection	Sept. 13, 1951
Chloride (Cl)	4.8		
Fluoride (F)	.0		
Nitrate (NO_3)	.2		
Dissolved solids	53		

ST. JOHNSBURY
(Population, 7,370)

Ownership: Municipal. Total population supplied, about 10,000.
Source: Stiles Pond. Auxiliary or emergency supply, Oak Street Well (has not been used).
Treatment: Slow sand filtration.
Rated capacity of treatment plant: --
Raw-water storage: 700,000,000 gal.
Finished-water storage: --

ANALYSIS

(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	3.1	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	36
Manganese (Mn)	.00	Noncarbonate	5
Calcium (Ca)	12		
Magnesium (Mg)	1.5	Color	7
Sodium (Na)	2.0	pH	7.1
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	83.7
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	38	Turbidity	.8
Sulfate (SO_4)	3.5	Temperature (F.)	--
Chloride (Cl)	42	Date of collection	Aug. 11, 1951
Fluoride (F)	.0		
Nitrate (NO_3)	.4		
Dissolved solids	48		