The Industrial Utility of Public Water Supplies in the United States, 1952

Part 1. States East of the Mississippi River

GEOLOGICAL SURVEY WATER-SUPPLY PAPER 1299

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Titles for figures 1 (p. 15), 2 (p. 30), and 3 (p. 33) were omitted and should read as follows:

Figure 1.--Number of persons using water in four ranges of hardness from large public supplies in the United States, 1952.

Figure 2.--Percent of population using water of different treatment from public supplies for 1,315 of the larger cities in the United States, 1952.

Figure 3.--Physical plant facilities for public water supplies for the larger cities in the United States, 1952. 69585

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By E. W. LOHR *and* S. K. LOVE

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ABSTRACT

Public water supplies are utilized extensively by industries for processing, cooling, and steam generation. The requirements as to quality of water for each industry are specific, therefore information on the quality or chemical character of the water supply is essential not only in the location of industrial plants but also is an aid in the manufacture and distribution of products.

Data are given in this report on the water supplies for 1,315 of the larger cities (or places) throughout the United States. The population of these cities represents 58.3 percent of the total population (1950 census), and more than 90 percent of the total urban population, of the United States. Part 1 of the report contains data for 819 cities east of the Mississippi River, and part 2 includes data for 416 cities west of the river. All cities of 15,000 or more population and many cities of smaller population are included.

The information given for each place includes, in most instances, population of the place; ownership, source, and treatment of supply; storage facilities for both raw and finished water; and chemical analyses of the supplies.

The chemical quality of a water affects its industrial utility. A total of 2,506 chemical analyses of the supplies for the places included are shown. Surface-water supplies, generally, are more variable in composition than ground-water supplies, but contain less mineral matter in solution. Many of the treated public supplies require further treatment to make them satisfactory for some industrial uses. Of the total of 1,315 places included in the report, 711 receive surface-water supplies; 472 receive ground-water supplies, and 132 receive mixed supplies. The population served by these supplies is about 88,000,000, of which about 71,000,000 receive surface-water supplies and 17,000,000 ground-water supplies.

Hardness of water supplies with respect to industrial use is given much attention. The hardness of the large public supplies ranges from less than 5 parts per million to about 700 parts. About 52,000,000 people are furnished with water having hardness of 100 parts per million or less.

The weighted average hardness (average hardness of supplies weighted according to the population served) of finished water of surface supplies is 82 parts per million; of ground supplies, 162 parts; and of all supplies, 97 parts. The weighted average hardnesses of raw water of surface, ground, and all supplies are 96, 200, and 116 parts per million, respectively.

The average hardness (based on the average hardness of each supply and the number of supplies) of finished water of surface supplies is 85 parts per million; of ground supplies, 164 parts; and of all supplies, 121 parts. The average hardnesses of the raw water supplies are 94, 192 and 139 parts per million, respectively.

The median hardness of finished water of all supplies is 91 parts per million, and of the raw water supplies, 90 parts.

The treatment of a public water supply is planned principally to give a water that is bacterially safe for public use, and to eliminate or minimize certain undesirable characteristics of the water. Of the supplies for the places in this report, a total of 117 (3 surface supplies and 114 ground supplies) receive no treatment; 393 supplies receive no treatment other than chlorination; and the remainder receive treatment in addition to chlorination. The supplies for 171 cities are softened. Rapid sand filter plants are in use for 533 cities, exclusive of those in use at places where the water is softened. Slow sand-filter plants are in use at 35 places. A population of about 40,000,000 is served with water from these filter plants.

The total number of treatment plants, exclusive of facilities for chlorination, for most of the places in this report is 660. The total capacity of these plants in millions of gallons per day is 10,694.

A total of 693 places report raw-water storage facilities having a total capacity of 2,460,346 millions of gallons; a total of 1,081 places report finished-water storage facilities having a total capacity of 24,557 millions of gallons.

Investigations by others have shown that a definite relationship exists between fluoride in drinking water and the incidence of dental caries in the teeth of children. A total of about 85 percent of the population served from the large public supplies receive water having a fluoride concentration in the range of 0.0 to 0.5 part per million. Few large public supplies contain fluoride in concentrations in excess of 3 parts per million. A total of 155 places of those included in the report received fluoridated water in 1952.

INTRODUCTION

The most valuable of all our natural resources, except for the land itself, is water. Generally taken for granted and considered practically inexhaustible during the 19th century, water is today one of the most actively managed of all our natural resources. Large sums of money are spent each year for surveys, reclamation, conservation, power development, and flood control.

Water is different from most minerals in that it is fluid and active. Moreover, its chemical character is ever changing, not only because of natural processes in its trip from clouds to seas but also because of the myriad activities of man. Water supply is a complex problem, and it is of extreme importance to communities, agriculture, industries, and commerce. Without water these things could not exist; nor could life itself.

An adequate water supply of either ground water or surface water, or both, is often a prime requisite in the selection of sites for industrial plants. It is estimated that American industry in 1950 used 75 billion gallons of water per day from private sources and about 6 billion gallons per day from public water supplies. Furthermore, industries require a process water of specific characteristics or standards of quality. For example, process water used in the manufacture of textiles must be practically free of suspended matter, iron, and color and must be very low in dissolved minerals, especially calcium and magnesium. Specific requirements of quality for process water in certain industries are so exacting that extensive treatment for many natural waters is usually necessary to make them suitable for use. Therefore, an important factor in the selection of sites for industries, in addition to an adequate supply of water, is the specific quality of the supply.

Information as to the chemical character of the water is essential not only in the location of many industrial plants but also to the distribution of the products manufactured. The manufacturer of water-softening equipment would not expect to find a ready market for his product in an area where the water supplies are soft. The need for materials and appliances for control of corrosion in water pipes, and the selection of boiler-plant and water-softening equipment will be influenced by the chemical character of the water.

Many of the water-supply papers of the U. S. Geological Survey and reports made in cooperation with State agencies contain considerable information relating to the chemical quality of water in the United States. See page 46 for the partial list. Among these are the annual "quality of surface water" reports beginning in October 1941, which give the results of comprehensive investigations in different areas of the country for the year named. Other reports give the results of comprehensive investigations within a State, among which are those dealing with the public water supplies; still others give information on the geology and the occurrence and availability of ground-water supplies with brief discussions of the chemical character of the water encountered in the area of investigation.

Reports showing the chemical character of the public water supplies of the larger cities of the United States were published in 1923 and 1934. The last published report, Geological Survey Water-Supply Paper 658, contains data for 670 of the larger cities, representing 46 percent of the total population of the United States. It has filled an important need in the field of water-supply engineering. The insistent demand for more current information and a more extended coverage has led to the present report. Descriptive and analytical data for about 75 percent of all the places that are included in the two volumes of this report have been published in a recent series of nine Geological Survey circulars, each circular covering a prescribed section of the country. The present report gives data for 1,315 places, representing 58.3 percent of the total population of the United States. It includes data for all places of 15,000 or more population, 80 percent or more of the total urban population of each State, and at least 10 places for each State except Delaware. Many places of less than 15,000 population are included in order that either 80 percent of the total urban population of the State or 10 places for each State might be represented. It was felt that the use of the above criteria for the

selection of the places to be included in the report would give adequate representation for each State.

Part 1 of the report includes data for 819 places in the 26 States and the District of Columbia east of the Mississippi River; part 2, for 496 places in the 22 States west of the Mississippi. The text material and illustrations and the form of the tables are identical in both parts of the report and apply to the country as a whole. The statements made in regard to the supplies as a whole and to other subjects are generally applicable in each part of the report.

An important part of this report is the descriptive and analytical data pertaining to the water supplies of the individual places. Although not as complete and representative as desired in some instances, these data are intended to show conditions as they existed at the time of collection. From the data as presented inferences and conclusions can be drawn as to the general character of the water and its general usability for many industrial purposes. In the use of the data, it must be borne in mind that many supplies from surface sources are quite variable in composition; that ground-water supplies are more uniform in composition than surface supplies; and that most of the analytical data relate to the treated or finished water as served to the consumers, although much information is given as to the character of the raw-water supplies.

The general discussion of hardness and the illustrations and tables with reference to the distribution and use of water of different hardness are of considerable value or importance in the report, since hardness is a characteristic of water that affects both the domestic and industrial use of water. Caution is necessary in the use of generalized data relative to the hardness of public water supplies, when location of industrial plants or industrial activities require more specific data as to the chemical character of the water supplies.

Fluoride occurring naturally in water supplies and the fluoridation of public water supplies, because of the effects of fluoride on the incidence of dental caries in the teeth of growing children and not because of the effects on the industrial use of the water, are discussed at some length.

Discussions of the various aspects of water supply and treatment are necessarily brief in this report. Fuller and detailed discussions are to be found in papers and books on the subjects.

ACKNOWLEDGMENTS

State departments of health, city and waterworks officials, private water companies, and commercial laboratories furnished many analyses, water-supply and water-plant data on forms prepared by the Quality of Water Branch for the purpose, and collected samples of water for analysis. (See table 1.) For these data and assistance grateful acknowledgment is made.

Many of the personnel of the Surface Water Branch and the Ground Water Branch, Water Resources Division, assisted in obtaining data in certain areas pertaining to the supplies and collecting samples for analysis. Grateful acknowledgment is made for this cooperation and assistance.

DIVISION OF WORK

This report is the result of the efforts of many of the personnel of the Quality of Water Branch of the Geological Survey under the general supervision of S. K. Love, chief, Quality of Water Branch. The efforts of the various members of the branch who participated in the work were coordinated by E. W. Lohr, chemist, who also reviewed and compiled all data submitted by the district offices of the branch, wrote the body of the text, and was mainly responsible for the tables and illustrations.

The analyses made by the Geological Survey for inclusion in the report were made in the district laboratories by the Quality of Water Branch in different sections of the country under the immediate supervision of the district chemists at

the time. The district offices also collected other data pertaining to the supplies in the States comprising their districts. The States comprising the different districts, the location of the district offices, and the personnel in charge at the time the work was in progress, are named below.

State	District or Regional Office
Alabama Arkansas Mississippi Missouri (part) Tennessee	I. S. T. Building, University of Arkansas, Fayetteville, Ark. G. A. Billingsley J. W. Geurin
California	2520 Marconi Avenue, Sacramento 21, Calif. I. W. Walling
Connecticut District of Columbia Florida Maine Maryland Massachusetts New Hampshire New Jersey New York Rhode Island Vermont	General Services Administration Bldg., Washington 25, D. C. S. K. Love W. F. White E. W. Lohr
Colorado (part) Iowa Kansas Minnesota Missouri (part) Montana (part) Nebraska North Dakota South Dakota Wyoming (part)	510 Rudge Guenzel Bldg. Lincoln 8, Nebr. P. C. Benedict H. A. Swenson
Arizona Colorado (part) New Mexico	P. O. Box 293, University Station, Albuquerque, N. Mex. J. D. Hem
Georgia North Carolina South Carolina	P. O. Box 5668, Raleigh, N. C. F. H. Pauszek
Illinois Indiana Kentucky Michigan Ohio West Virginia Wisconsin	2822 East Main Street, Columbus, Ohio W. L. Lamar P. N. Brown
Kansas (part) Oklahoma	P. O. Box 4355, Oklahoma City, Okla. T. B. Dover

State	District or Regional Office
Delaware Pennsylvania	1302 Custom House, Philadelphia, Pa. N. H. Beamer E. F. McCarren
Louisiana Texas	302 West 15th St., Austin, Tex. B. Irelan J. R. Avrett
Colorado (part) Idaho Montana (part) Nevada Oregon Utah Washington Wyoming (part)	P. O. Box 2657, Fort Douglas, Salt Lake City, Utah C. S. Howard R. T. Kiser
Virginia	P. O. Box 1488, University Station, Charlottesville, Va. J. G. Connor

ANALYSES OF WATER FROM PUBLIC SUPPLIES

SOURCES OF ANALYSES

Most of the analyses in this report were made during its preparation in the laboratories associated with the District offices of the Quality of Water Branch of the Geological Survey. Analyses from other sources were freely used as indicated in table 1. The lack of space prohibits giving the names of the individual analysts, although the names of the laboratories making or furnishing the analyses are given in the tables of analyses for the individual places.

Table 1. --Distribution of sources of analyses used

Source	Number of analyses	Number of places
U. S. Geological Survey laboratories:		
This report	1,781	1,008
Other reports	185	56
State laboratories	268	107
Waterworks laboratories	155	109
Commercial laboratories	117	35
Totals	2,506	1,315

Many analyses and other data not printed in this report were available. These analyses and data were valuable aids in the selection of the analyses and data which are printed.

COLLECTION OF SAMPLES

Many samples for analysis were collected by the personnel of the Quality of Water Branch and other members of the Water Resources Division of the Geological Survey. Other samples were collected in containers furnished by the Geolog-

ical Survey by waterworks, city, and health-department officials. At many places samples were collected of both raw- and finished-water supplies especially at those places where the treatment of the raw water was extensive or where the water was softened. Many samples of finished water were collected at the treatment plants of the individual cities; other samples were collected from city taps of the distribution systems. The samples collected are considered to be representative of the supplies at the time of collection.

APPLICABILITY OF ANALYSES

The analyses made by the Geological Survey used in this report were made by methods developed by the Quality of Water Branch or adapted from methods in general use for the mineral analysis of water. (Am. Pub. Health Assoc., 1946; Am. Soc. for Testing Materials, 1947). The analyses made by other laboratories were carefully examined for possible errors in order that the information given might be reliable. The reporting of these analyses has been made to conform to the Geological Survey method of reporting the results of water analysis and any difference in the analyses as published and originally submitted is because of this. Many waterworks laboratories make daily determinations of alkalinity, pH, and hardness which give some indications as to the extremes in chemical composition of the supplies. These data are given in the tables of analyses whenever they were available. Every effort has been made to give reliable information as to the chemical character of the water supplies at the time the analyses were made and throughout the year.

Single analyses of supplies from lakes and large reservoirs represent fairly well the chemical character of the water throughout the year, but for many supplies taken directly from streams or from small impounding reservoirs a single analysis will not represent the character of the water for the year. It may so happen that the single analysis will represent about the average character of the water for the year. Many streams are very variable in character not only with the seasons but with rapid changes in stage. Obviously a single analysis of such streams will not show the extremes in chemical composition of the water, and many analyses of daily samples or frequent samples are necessary to show the composition of the water throughout the year.

Some waterworks laboratories make complete analyses of composites of daily samples. Where available, averages of these analyses are given in the table of analyses. Averages of analyses of 10-day composites of daily samples for a period of a year are shown for a number of supplies. Analyses of composites of daily samples with the maximum and minimum content of dissolved solids are shown in a few instances. The single analyses and other analyses taken together with the analytical data furnished by the waterworks laboratories give reliable information as to the chemical character of many surface-water and treated-water supplies.

For many places that have several sources of supply, analyses are usually given representative of the several sources or of the combined sources. It is obvious that if different sections of a city are served by different sources, an analysis of a sample collected in one section of the city may not represent the character of the water served in the other section or the entire city. Statements in the descriptive data for the supplies of these places are made to show the percent of supply from each source. In many instances it was not possible to give analyses of each of the sources of supply.

Ground water, in general, is much more uniform in composition than surface water. A single analysis may suffice to show the general character of the water throughout the year not only for a single source but also for multiple sources furnishing water of similar composition. However, many places obtain public supplies from several wells or groups of wells in several well fields that differ considerably in chemical composition. Sometimes water from these various sources is pumped directly into the distribution system in different sections of the city. Sometimes groups of wells or individual wells are pumped at different times. For most such supplies analyses are selected to show the character of the water of the entire supply, or the several sources of supply, or the range or differences in

composition of the water from the individual wells or several groups of wells. It is obviously necessary to consider the descriptions of the sources of supply, the percent of supply obtained from each source, and the analyses of the supplies in order to evaluate or plan in connection with the use of the data of such groundwater supplies.

EXPRESSION OF RESULTS

The dissolved mineral constituents are reported in parts per million. A part per million is a unit of weight of a constituent in a million unit weights of water. Equivalents per million, though not given in this report, are sometimes preferred to the expression of results in parts per million. An equivalent per million is a unit chemical combining weight of a constituent in a million unit weights of water. Equivalents per million for any constituent are obtained by dividing the concentration of the constituent in parts per million by the chemical combining weight of the constituent. For convenience in making this conversion the reciprocals of chemical combining weights of the most commonly reported constituents are given in the following table:

Constituent	Factor	Constituent	Factor
Iron (Fe^{+++})	0.0537	Carbonate (CO_3^{--})	0.3333
Manganese (Mn^{++})	.0364	Bicarbonate (HCO_3^-)	.0164
Calcium (Ca^{++})	.0499	Sulfate (SO_4^{--})	.0208
Magnesium (Mg^{++})	.0822	Chloride (Cl^-)	.0282
Sodium (Na^+)	.0435	Fluoride (F^-)	.0526
Potassium (K^+)	.0256	Nitrate (NO_3^-)	.0161

Results in parts per million can be converted to grains per United States gallon by dividing by 17.12

A calculated quantity of sodium and potassium as sodium, given in some analyses, is the quantity of sodium needed in addition to the calcium and magnesium to balance the anions.

Total hardness as used in this report means, in most instances, the hardness expressed as calcium carbonate caused by calcium and magnesium in the water; it is obtained by calculation from the results of determination of these two constituents by either gravimetric or volumetric methods. In a few instances, other substances such as aluminum, iron, manganese, strontium, and free acid, which also cause hardness, have been included in the calculations. Many determinations of hardness made at waterworks treatment plants are made with soap solutions, and such results for total hardness tend to be lower generally and less accurate than those obtained by calculation. The volumetric test for hardness using ethylenediamine tetraacetic acid is much more reliable and is rapidly replacing the soap test (Connors, 1950). Hardness is further discussed on pages 12, 13-28.

Color is expressed in units of the platinum cobalt scale proposed by Hazen (1892, p. 427-428).

Hydrogen-ion concentration is expressed on the pH scale.

Specific-conductance values are expressed as micromhos per centimeter at 25°C. In many reports conductance is designated by the letter "K", and values expressed as above may be written $K \times 10^6$ at 25°C. A micromho is a millionth of a reciprocal ohm.

Turbidity is expressed as units of turbidity on the silica scale (U. S. Geological Survey, 1902).

Alkalinity as reported in the tables of determinations made at treatment plants is expressed as calcium carbonate. Acidity, in some instances, is shown in these tables as a minus alkalinity.

COMPOSITION OF NATURAL WATERS

All natural waters contain dissolved mineral matter. Water in contact with soils and rocks even for only a few hours will dissolve some mineral matter. The quantity of mineral matter dissolved by a natural water depends primarily on the type of rocks and soils with which the water comes in contact and the length of the contact. Some streams are fed by both surface runoff and ground water from springs and seeps. Such streams reflect the chemical character of the more concentrated ground water during dry periods and are more dilute during periods of heavy surface runoff. Ground water usually contains more dissolved mineral matter than surface runoff for it remains in contact with soils and rocks for longer periods of time. The concentration of dissolved solids in a river water may be increased by drainage from mines and oil fields, by discharge of industrial and municipal wastes into the streams, and in irrigated areas by return drain waters.

The mineral constituents and physical properties of the raw and treated supplies in the tables of analyses are those that affect the value of the water for most purposes. The analyses generally include results for silica, iron, manganese, calcium, magnesium, sodium, potassium (or sodium and potassium together as sodium), carbonate, bicarbonate, sulfate, chloride, fluoride, nitrate, dissolved solids, and hardness. Results for color, pH, specific conductance, turbidity, and temperature are reported in many others. The source and significance of the constituents and properties of water supplies are discussed in the following paragraphs.

MINERAL CONSTITUENTS IN SOLUTION

Silica (SiO_2). --The element silicon is not found free in nature but it occurs as silica in sand, in quartz, and as silicates in feldspar, kaolinite, and other minerals. Silica is dissolved from practically all rocks. Its state in solution in natural water is not definitely known, but it is assumed to be colloidal, and it does not enter into the ionic balance between the acids and bases of a water analysis.

Many natural surface waters, especially lakes, contain less than 5 parts per million and few contain more than 30 parts per million. Well waters generally contain more silica than surface waters, but comparatively few contain more than 50 parts per million.

Silica affects the industrial use of water because it contributes to the formation of boiler scale, or it may help to cement other scale-forming substances into a hard scale; it is usually removed from feed water for high-pressure boilers. Silica also forms troublesome deposits on the blades of steam turbines.

The silica in the treated water of a public supply is usually less than in the raw water if in the treatment process coagulation and filtration are employed. The use of activated silica as a coagulant, either alone or in conjunction with alum, will not increase the silica content of the treated water.

Aluminum (Al). --Although aluminum is relatively abundant in many rocks and ores some of which are readily soluble, aluminum is present only in negligible quantities in most natural waters for it precipitates from the waters. Acid waters and water that has been in contact with certain types of rocks or ores may contain considerable quantities of aluminum. Aluminum contributes to hardness in water and may be deposited as scale in boilers. It is not reported in the tables of analyses. In a few samples the aluminum content is indicated by footnotes.

Iron (Fe). --Iron is dissolved from practically all rocks, and practically all natural water supplies contain iron in solution. Surface waters, unless acid, rarely contain more than several tenths of a part per million. Acid waters may carry relatively large quantities. Iron in water upon being exposed to air is readily oxidized to ferric hydroxide which will readily settle out of a surface supply unless acid; therefore surface waters generally carry relatively small quantities of iron.

Many ground waters may carry several parts per million of iron. Such waters on exposure to air become turbid with ferric hydroxide as a result of the oxidation

of the iron. The ferric iron will settle out and the water will eventually clear up if it is quiescent. Iron in solution will cause reddish-brown stains on white enamelware, porcelain fixtures, and fabrics washed in these ground waters, which are objectionable also for other domestic and industrial uses.

Many natural waters may be corrosive to the supply system, dissolving sufficient quantities of iron from the pipes to be objectionable in the use of the water for many purposes. Much of the iron in natural waters is removed by the treatment as practiced at the modern water-purification plants, but sometimes such treatment will leave the waters corrosive so that they will dissolve objectionable quantities of iron from pipes in the supply system or household installations.

Manganese (Mn). --Manganese is found in many natural waters, sometimes in appreciable quantities. Water impounded in large reservoirs may contain manganese that has been dissolved from the mud on the bottom of the reservoir. Some ground waters may contain very objectionable quantities of manganese. Waters that contain appreciable quantities of manganese usually contain also objectionable quantities of iron. Manganese is especially objectionable in water used in laundering and textile manufacturing, for it causes dark-brown stains on the fabrics. It will also stain porcelain fixtures. Water supplies containing objectionable quantities of manganese require special treatment for its removal.

Calcium (Ca) and magnesium (Mg). --Calcium and magnesium are dissolved from many rocks but more particularly from limestone, dolomite, and gypsum. Limestone, which is primarily calcium carbonate, and dolomite and dolomitic limestone made up of both calcium and magnesium carbonates are readily soluble in water containing carbon dioxide. Caves and solutions channels in these rocks are the result of this action of water. Comparatively large quantities of calcium are also dissolved from gypsum (calcium sulfate). Calcium is frequently the principal basic constituent in waters that contain relatively small quantities of dissolved solids and are soft waters. Calcium and magnesium are the most universally characteristic constituents of natural waters.

Calcium and magnesium cause hardness in water and contribute to the formation of boiler scale and deposits in hot-water heaters and pipes and in water systems. The calcium and magnesium content and hardness of waters used for public supplies greatly affect the industrial value of the waters.

Sodium (Na) and potassium (K). --The very active metals sodium and potassium are not found free in nature, but their compounds are relatively abundant in the earth's crust and are highly soluble in water. Sodium and potassium are found in all natural waters. Natural waters that contain only 3 or 4 parts of the two together are likely to contain about equal quantities of each. As the total quantity of these constituents increases the proportion of sodium becomes much greater. Waters carrying from 40 to 50 parts per million of the two may carry one-fourth or one-tenth of the quantity as potassium; waters containing more sodium may even have a smaller proportion of potassium.

Some well waters that carry moderate quantities of dissolved material in passage through the earth may undergo base exchange and change from hard waters to soft waters. These waters may contain several hundred parts per million of sodium bicarbonate. Waters in arid and semiarid regions are likely to carry considerable quantities of sodium salts, usually sulfate and chloride. Streams that receive drainage from irrigated lands may carry several thousands parts per million of sodium sulfate. The quantity of sodium and potassium found in the water of most public supplies has comparatively little effect on the industrial use of the water.

Carbonate (CO_3) and bicarbonate (HCO_3). --Carbonate as such is present in relatively few natural waters. Some waters that have been treated with lime contain carbonate or even hydroxide. Free carbon dioxide in rain water increased by a larger amount from decaying organic matter in percolating water, in lakes, and in streams in contact with carbonate rocks or calcareous material is converted into bicarbonate. Bicarbonate is the chief anion in a great many natural waters and in most of the waters used for public supplies. Waters that have been in contact with granitic rocks and rocks of similar characteristics usually contain less than 50 parts per million of bicarbonate and frequently less than 25 parts, whereas those that have been in contact with carbonate rocks may contain as much as 500 parts.

Carbonate and bicarbonate are often reported as alkalinity which is expressed as calcium carbonate. One part of alkalinity as calcium carbonate corresponds to 1.22 parts of bicarbonate.

Sulfate (SO_4). --Sulfate is present in most natural waters, although in many it may be a relatively small quantity. Sulfate may be dissolved in relatively large quantities from beds of gypsum and shale. Some surface waters receiving acid mine drainage may contain considerable quantities of sulfate some of which may be the result of oxidation of the sulfides of iron. Water in arid or semiarid regions may contain relatively large quantities of sodium sulfate.

Sulfate in waters that contain much calcium and magnesium contributes to the formation of hard scale in steam boilers and affects the use of waters in other industrial processes. Aluminum sulfate as a coagulant in the treatment of public supplies increases the sulfate content and decreases the bicarbonate content of the water.

Chloride (Cl). --Chloride is found in practically all natural waters, although many surface waters contain only a few parts per million. Streams in arid or semiarid regions may contain several hundred parts per million of chloride especially if they drain areas where chlorides occur in natural deposits or have been concentrated in soils through evaporation processes. Sewage increases the chloride content of river waters. Drainage from oil wells or other deep wells, salt springs, and industrial wastes may add large quantities of chloride to stream waters. Most public supplies from surface sources contain less than 25 parts per million of chloride. Ground waters usually contain larger quantities than surface waters and some public-supply wells may contain as much as 100 parts per million. The larger quantities of chloride may affect the industrial use of the water.

Fluoride (F). --Fluoride occurs in nature in fluorspar, cryolite, and in both sedimentary and igneous rocks. In most natural surface waters it is present only in very small concentrations; in ground waters it is present in larger concentrations, in some waters as much as several parts per million. Fluoride in water supplies in relation to the dental defect known as mottled enamel and fluoridation and natural fluorides in relation to the prevention of dental caries is discussed on page 39 . The fluoride content of public water supplies may be of little importance as far as the industrial use of the water is concerned.

Nitrate (NO_3). --Nitrate is considered the final oxidation product of nitrogenous matter and its presence in water supplies of more than several parts per million may indicate previous contamination by sewage or other organic matter. The effect of nitrate present in most public water supplies on the industrial use of the water is practically negligible. Studies indicate that nitrate in excess of about 44 parts per million in drinking water may be a contributing factor or the cause of a condition in infants known as methemoglobinemia ("blue babies"). (Waring, 1949).

Dissolved solids. --The results reported as dissolved solids represent approximately the total quantity of dissolved mineral matter in each water analyzed. (Howard, 1933, p. 4-6). The quantity of dissolved solids in most instances was determined by evaporating a given volume of water, drying the residue at some definite temperature (180°C, by U. S. Geol. Survey), and weighing the dried residue. In some instances the quantity reported was obtained by a summation of the individual constituents shown in the analysis, bicarbonate being included as carbonate. This summation of constituents for dissolved solids is indicated by a footnote in the tables of analyses. Relatively few supplies of places in this report contain more than 500 parts per million of dissolved solids and many of them have less than 100 parts. Ground-water supplies usually contain more dissolved material than surface water supplies. Part of the material reported as dissolved solids in colored waters is organic matter, which is not shown in the analyses.

PROPERTIES AND CHARACTERISTICS OF WATER

Color. --Color, in water analysis, refers to the appearance of water that is free of suspended material. Many turbid waters that appear yellow, red, or brown have little color after the suspended material is removed. Color in natural waters is almost entirely the result of extraction of coloring matter from decaying roots,

stems, leaves, and other organic materials in the water and in the ground. Swamp waters may have as much as 200 or 300 units of color. Industrial wastes may add color to water. Color in most public supplies is rather negligible. A color of less than 10 units usually passes unnoticed. Some impounded supplies if not filtered may have appreciable color. Color is objectionable in the use of the water for some industrial purposes.

Hydrogen-ion concentration. --Hydrogen-ion concentration in an aqueous solution or in water on the pH scale is represented by a number which is the negative logarithm of the hydrogen-ion concentration in moles per liter of solution. The pH range is from 0 to 14. A solution with a pH of 7 is said to be neutral. Progressive values of pH below 7 denote increasing acidity, and progressive values above 7 denote increasing alkalinity. The pH values are logarithmic, for example, a water with a pH of 6 has 10 times the concentration of hydrogen ions as one with a pH of 7.

There is a definite relationship between pH and acidity although acidity should not be confused with pH, for a water with a pH value of 6.0 may have a low total acidity whereas another highly buffered water having a pH of 7 may have a high total acidity. Acidity is the results of the effects of a combination of substances and conditions in water, and may be defined as the power of the water to neutralize hydroxyl ions. Acidity is usually caused by the presence of free carbon dioxide, mineral acids, and salts of strong acids and weak bases.

A definite relationship also exists in waters between pH and alkalinity (carbonate, bicarbonate, and hydroxide). (Langelier, 1946.) Alkalinity in a water may be defined as its power to neutralize hydrogen ions. Alkalinity is caused by the presence of carbonates, bicarbonates, hydroxides and, to a lesser degree, by silicates, phosphates, borates, and organic substances. Although pH values and alkalinity are interrelated, high alkalinity may not be necessarily associated with high pH values; for example, a relative dilute water with a pH of 7 may have a low total alkalinity, whereas, a buffered water with a pH of 6.0 may have a high total alkalinity. The combined effects of the several substances and conditions in the water affect the relationship between alkalinity and pH values.

The pH value of most natural water ranges between 6 and 8. Waters containing free mineral acids have pH values below 4.5. Some ground waters have pH values above 8, some below 6. On account of the relation between the pH of water and its corrosive properties, many water-treatment plants make final adjustment of the pH of the supplies to prevent or minimize corrosion in the distribution system and household installations. The pH values of public supplies have a very considerable and definite bearing on the utility of the supplies for many industrial purposes.

Specific conductance ($K \times 10^6$ at 25°C). --The specific conductance of a water is a measure of its capacity to conduct an electric current. The conductance varies with the concentration and degree of ionization of the different minerals in solution and with the temperature of the water. It furnishes a rough measure of the mineral content of the water but does not give any indication of the relative quantities of the constituents in solution. It is useful in following the changes in the total quantity of dissolved minerals in a water through a series of samples.

Turbidity. --Turbidity of water is due to suspended matter such as clay, silt, finely divided organic matter, microscopic organisms, and any such similar material. The terms "turbidity" and "suspended matter" are not synonymous or equivalent expressions. Turbidity is an expression of an optical approximation of the suspended matter, based on the similarity of the interference of the suspended matter to the passage of light rays through a water sample when compared with standard samples of recorded turbidity. The standard unit of turbidity is considered as that produced by one part per million of diatomaceous earth or fuller's earth (silica) in distilled water.

Practically all public supplies that are filtered are free from noticeable turbidity or suspended matter. A few unfiltered supplies and those that contain enough iron to give an appreciable precipitate on exposure to air may show noticeable turbidities. Suspended matter in surface-water supplies is usually a much more variable quantity than dissolved solids and must be taken into consideration in any utilization of the unfiltered supplies.

Temperature.--The results for temperature in the tables of analyses are shown in degrees Fahrenheit and represent the temperature of samples at the time of collection. In a few instances results for temperature are shown that were obtained at the treatment plants.

Corrosiveness, causes and prevention.--Corrosiveness of a water is that property which makes the water aggressive to metal surfaces and frequently results in "red water" caused by solution of iron, although all red-water troubles may not be the result of corrosion. As discussed previously, many well waters contain considerable quantities of iron in solution and when these supplies are exposed to the air the iron separates out as a precipitate. Some of this precipitate may be carried along in the mains and pipes in suspension in the water giving red-water effects. Corrosive waters causes the deterioration of water pipes, steam boilers, and water-heating equipment. Many waters that do not appreciably attack cold-water lines may aggressively attack hot-water lines.

The phenomena of corrosion are not thoroughly understood (Speller, 1951). The active agents in water aside from the solvent action of water itself are acids, substances which upon hydrolysis or decomposition produce acid reactions, carbon dioxide, oxygen, and hydrogen sulfide. The problem of prevention of corrosion, therefore, is the problem of controlling these active agents or minimizing their effects. Books and papers have been written on various aspects of the problem. (Proc. A. S. T. M., 1940; Betz and Betz, 1953).

The principal methods used in the treatment of municipal water supplies to prevent corrosion and red-water trouble involve treatment to maintain proper alkalinity, pH values and stability in the treated waters. (Amer. Water Work Assoc., 1950; Baker, 1948). Effluent from filter plants where alum is used in the treatment, many unfiltered supplies, and some naturally soft supplies, contain free carbon dioxide and have low pH values, may aggressively corrode metal surfaces in distribution mains and plumbing installations, producing red-water troubles, pitting, and tuberculation. To increase the alkalinity and to raise the pH values, agents such as lime or soda ash are added to the supplies before they enter the distribution system. Where the supplies are softened, the alkalinity and residual hardness can be controlled so that the effluent may be left in a slightly unstable condition with respect to calcium carbonate, and a light protective coating of calcium carbonate may be deposited in the mains of the distribution system (Langelier, 1936). A stability test may indicate whether a water is corrosive or will form a protective film (Enslow, 1939).

Deaerators and degasifiers for the removal of dissolved gases are used to some extent in the treatment of boiler feed waters and in private installations (Powell and Burns, 1936; Powell, Bacon, and Lill, 1946). Aeration removes to some extent carbon dioxide and hydrogen sulfide, although in the treatment of public water supplies this process is used more for the purpose of removal of iron and of tastes and odors than for corrosion control.

Phosphates, metaphosphates, and silicates, classed as anodic inhibitors, are used to some extent in the treatment of public supplies and in industrial and private installations for prevention of corrosion. The compounds are effective because not only do they neutralize the agents of corrosion but also, it is thought, they form protective films on the metal surfaces. Sodium hexametaphosphate has been found not only to be effective in stopping corrosion but also to promote removal of corrosion products from pipelines (Rice, 1947).

Corrosion inside of steel tanks and standpipes may be prevented by a process known as cathodic protection. Special electrical equipment is required which in operation reverses the electrochemical processes set up in the corrosion of metal, thereby rendering the metal surface passive (Pallo, 1948).

Hardness.--Hardness of water is that characteristic or quality shown by water containing certain substances in solution. Calcium and magnesium are the principal constituents causing hardness. Other substances, such as aluminum, iron, manganese, strontium, zinc, and free acid also cause hardness, but most of these are not present in water supplies in sufficient quantities to affect appreciably the hardness.

The terms "carbonate" and "noncarbonate" hardness are roughly equivalent to or are used in the same sense as the older terms "temporary" and "permanent"

hardness. Carbonate hardness refers to the hardness in equivalence with carbonate and bicarbonate; noncarbonate hardness to the remainder of the hardness. A water has no noncarbonate hardness if the total hardness does not exceed in chemical equivalence the carbonate and bicarbonate (the alkalinity) present in the water. Waters of high noncarbonate hardness usually contain large quantities of calcium and magnesium sulfates, chlorides, or nitrates in solution. The character of scale formed in steam boilers is affected by the relation of carbonate to noncarbonate hardness. The selection of the proper methods for softening is based largely on the type and degree of hardness present in the waters.

Hardness in water in respect to both domestic and industrial use receives great attention. In domestic use hardness is recognized by the difficulty in obtaining a lather without an excessive consumption of soap; the insoluble, sticky curd that results with the use of soap, and the scale formed in vessels in which the water is boiled. Industry gives great attention to hardness in water supplies because of its effects in the various processes of manufacturing and on the manufactured product, and because of the scale deposited in the use of hard water in hot-water pipes, hot-water heaters, and steam boilers, resulting in economic loss through loss of heat transfer, increased fuel consumption, and breakdown of equipment. Large sums of money are expended in softening supplies to make them suitable for both domestic and industrial uses.

HARDNESS OF PUBLIC WATER SUPPLIES

Data relating to the hardness of the water of the larger public supplies of the United States as shown in the descriptive and analytical data for each place are summarized in a number of tables and illustrations. Most of these data relate to the supplies as served to consumers representing water of natural hardness and water of which the hardness has been changed by treatment including softening. The data shown relate to only 58.8 percent of the total population of the United States. The percent of population represented by each of more than half of the States is much less than the total for the whole country. Furthermore, in several of the summaries the average hardness of the State is used which does not show any extremes in the hardness of the supplies within the State. The extremes in the hardness of the supplies in some States are much greater than in others, although the average hardness for those States may not be any higher than for a State where the ranges in the hardness are not so great. Furthermore, it must be borne in mind that the smaller municipalities, which are not represented in the report and consequently are not in the summaries, obtain their supplies for the most part from ground-water sources whose supplies generally are harder than surface waters. Therefore, it is important that the base data of these summaries be kept in mind when making any conclusions or inferences relative to the distribution of water of certain hardness as shown by the hardness of the larger public water supplies of the country.

These summaries of data on hardness are based on the average hardness of a supply for a year. In some instances only meager analytical data were available to show the hardness of the supply for a year. In these instances an average for hardness was selected, based on known factors, such as the sources of the supply whether from a large or a small stream, or from lakes, reservoirs, wells, or springs, the time of year the sample or samples for analysis were collected, and the general knowledge of the hardness of water supplies in the locale of the supply in question. The average hardness used for many places with varying hardness was that furnished by the waterworks laboratories. The average hardness of those places furnished from more than one source where not mixed prior to distribution was based on the hardness of the supplies and the percent furnished from each source. In some instances the total population of a place was divided according to the percent of supply from each source so that the proper tabulation could be made as to population and hardness. For those places furnished with ground water from several sources of supply with different hardness, proper evaluation for an average hardness was based on the percent of supply from each source and the hardness of each supply. For a few places furnished with both ground and surface

water, the population using each had to be estimated in the tabulations where division was necessary.

RANGES IN HARDNESS

Table 2 shows the number of persons, in thousands using water of different ranges of hardness from larger public supplies in the United States. It gives no information as to the distribution of hard water by area or locality. The table is reasonably accurate as to the use of water in different ranges of hardness by the consumers indicated, which represent about 90 percent of the total urban population of the United States.

Table 2. --Number of persons using water in different ranges of hardness from public supplies for 1,315 of the larger cities in the United States, 1952.

	Population (thousands)				
	Surface water	Ground water	Mixed supplies	Total	Accumulative total
1-10	1,344	434	109	1,887	1,887
11-20	5,673	397	219	6,289	8,176
21-30	11,632	471	252	12,355	20,531
31-40	3,680	706	297	4,683	25,214
41-50	2,482	550	353	3,385	28,599
51-60	3,709	910	222	4,841	33,440
61-80	4,794	647	1,097	6,538	39,978
81-100	9,561	1,482	1,067	12,110	52,088
101-120	5,524	1,075	602	7,201	59,289
121-140	12,266	550	2,863	15,679	74,968
141-160	831	1,253	247	2,331	77,299
161-180	355	312	385	1,052	78,351
181-200	358	304	681	1,343	79,694
201-250	977	1,707	125	2,809	82,503
251-300	935	1,142	388	2,465	84,968
301-350	185	706	176	1,067	86,035
351-400	12	848	--	860	86,895
401-450	--	516	--	516	87,411
451-500	10	200	--	210	87,621
501-550	--	26	--	26	87,647
551-600	--	85	4	89	87,736
601-650	--	40	--	40	87,776
651-700	16	34	--	50	87,826

The table is not necessarily accurate as to the use of water in different ranges of hardness by the total population of the United States, because only 58.3 percent of the total population is represented and the supplies are treated supplies, many of which are softened. The significant things to note about the table are the relative proportion of numbers of people using water in the lower ranges from surface-water sources and from ground-water sources and how this proportion changes with respect to the supplies in the upper ranges of hardness. The proportions of users of surface water and ground water for the total population of the country probably are very different from the proportions here shown for the users of the larger public supplies.

The data for hardness summarized in table 2 are further summarized in tables 3 and 4. Table 4 is similar to table 3 with the exception that the mixed supplies shown in table 3 have been separated into surface-water and ground-water supplies according to the percentage of supply from each source and the average hardness of each supply. The number of ranges for hardness in these two tables has been decreased from 23 shown in table 2 to four. It is significant that a large population is served with water in the range of hardness from 1 to 60 parts per million,

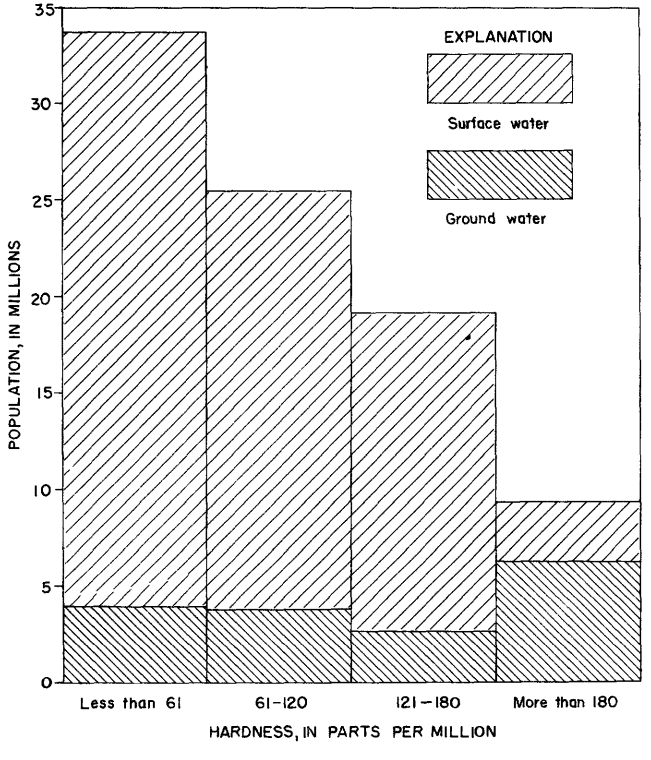
and in the ranges of hardness above 120 parts per million, ranges where softening is profitable and necessary for many domestic and industrial uses. These data are shown graphically on figure 1.

Table 3. --Number of persons using water in four ranges of hardness from public supplies, including mixed supplies, for 1,315 of the larger cities in the United States, 1952

Range in hardness (ppm)	Population (thousands)			
	Surface water	Ground water	mixed supplies	Total
1-60	28,520	3,468	1,452	33,440
61-120	19,879	3,204	2,766	25,849
121-180	13,452	2,115	3,495	19,062
180+	2,493	5,608	1,374	9,475
	64,344	14,395	9,087	87,826

Table 4. --Number of persons using water in four ranges of hardness from public supplies for 1,315 of the larger cities in the United States, 1952

Range in hardness (ppm)	Population (thousands)		
	Surface water	Ground water	Total
1-60	29,776	3,987	33,763
61-120	21,727	3,761	25,488
121-180	16,529	2,667	19,196
180+	2,921	6,458	9,379
	70,953	16,873	87,826



WEIGHTED AVERAGE HARDNESS

The data for hardness of the larger public water supplies of the United States are summarized in a different way in table 5. This table shows the weighted average hardness of both surface-water supplies and ground-water supplies, and both supplies combined for each State. To calculate the weighted-average hardness for the surface-water supplies of a State, the average hardness of each surface-water supply was multiplied by the population served by that supply; the sum of the products thus obtained was then divided by the total number of people served by the surface-water supplies. The weighted-average hardness for the ground-water supplies was obtained in the same way. Then the weighted average hardness for all supplies for the State was obtained by dividing the total of all the products by the total population served in the State. Thus the weighted average hardness of all supplies of a State represents the average hardness of each supply weighted according to the population served by that supply.

The data thus summarized in table 5 gives valuable information as to the distribution of hard water not so much within each State but for all the States. In some States the range in hardness of the supplies is not large, whereas in others the range is considerable. No supply in the State of Connecticut included in the report had a hardness of more than 60 parts per million. Only one place from each of the States of Maine, New Hampshire, Oregon, and Rhode Island, had a hardness of more than 60 parts per million. For a few States the range in hardness for the supplies extended from not less than 80 parts to well over 500 parts. The range in hardness of the supplies for the places in Texas is from 4 to 700 parts.

The weighted average hardness of the supplies for the States, Illinois, Indiana, Michigan, Minnesota, New York, Ohio, and Wisconsin, bordering on the Great Lakes is influenced by the hardness of the supplies taken from these lakes. The weighted-average hardness for each of these States except New York is decreased by the weighted average hardness of the supplies taken from the Great Lakes. The weighted average hardness of the supplies in Illinois, Michigan, and Wisconsin are influenced more than in the other States, because about 50 percent of the population of Illinois and Michigan and about 30 percent of the population of Wisconsin are represented by the population of the places included in this report. The weighted average of the supplies not taken from the lakes in these three States is much higher than the weighted average for the whole State and is probably much nearer the average of the supplies not included in the report.

The weighted average hardness for New York State is increased by the hardness of the supplies from lakes Erie and Huron, although the weighted average for the whole State is influenced more by the supply of New York City than all other supplies in the State combined that are included in the report. No other supplies in the whole country influence the weighted-average hardness of the State as much as the supplies for New York City and Chicago influence the weighted average for New York and Illinois. Data on the weighted-average hardness for the States named above are summarized in tables 6 and 7 for both finished and raw water.

Table 5.--Weighted average hardness of finished water from large public supplies in each State, 1952

State	Surface supplies			Ground supplies			All supplies		
	Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served	
		Thousands	Percent of population of State		Thousands	Percent of population of State		Thousands	Percent of population of State
Alabama	52	878	28.7	68	271	8.8	55	1,149	37.5
Arizona	200	167	22.2	225	271	36.2	216	438	58.4
Arkansas	36	355	18.6	54	187	9.8	42	542	28.4
California	107	7,962	75.2	164	1,945	18.4	118	9,907	93.6
Colorado	107	754	56.9	--	--	--	107	754	56.9
Connecticut	29	1,481	73.7	42	23	1.2	29	1,504	74.9
Delaware	53	128	40.3	81	44	13.7	60	172	54.0
District of Columbia	96	803	100	--	--	--	96	803	100
Florida	104	262	9.4	127	1,218	44.0	123	1,480	53.4
Georgia	24	1,237	35.9	114	294	8.6	41	1,531	44.5
Idaho	92	84	14.3	135	142	24.2	119	226	38.5
Illinois	135	4,901	56.3	348	549	6.3	156	5,450	62.6
Indiana	194	1,310	33.3	334	571	14.5	237	1,881	47.8
Iowa	138	429	16.3	265	592	22.6	212	1,021	38.9
Kansas	163	423	22.2	190	380	20.0	176	803	42.2
Kentucky	101	916	31.1	108	47	1.6	102	963	32.7
Louisiana	72	871	32.4	57	332	12.4	68	1,203	44.8
Maine	20	388	42.4	22	23	2.5	20	411	44.9
Maryland	48	1,677	71.6	27	34	1.4	48	1,711	73.0
Massachusetts	20	3,314	70.7	54	330	7.0	23	3,644	77.7
Michigan	100	3,359	52.7	218	510	8.0	115	3,869	60.7
Minnesota	74	1,012	33.9	261	282	9.5	114	1,294	43.4
Mississippi	73	161	7.4	24	361	16.6	39	522	24.0
Missouri	100	2,099	53.0	184	157	4.0	106	2,256	57.0
Montana	100	205	34.8	226	39	6.6	120	244	41.4
Nebraska	261	264	19.9	232	247	18.7	247	511	38.6
Nevada	79	54	33.5	204	42	26.5	135	96	60.0
New Hampshire	16	194	36.3	56	83	15.6	28	277	51.9
New Jersey	54	2,886	59.7	135	988	20.4	75	3,874	80.1
New Mexico	73	50	7.4	274	222	32.6	237	272	40.0
New York	46	10,660	71.8	112	1,122	7.6	52	11,782	79.4
North Carolina	33	1,194	29.4	66	57	1.4	34	1,251	30.8
North Dakota	111	104	16.8	296	49	7.9	170	153	24.7
Ohio	120	3,952	49.7	284	899	11.3	150	4,851	61.0
Oklahoma	119	774	34.6	163	122	5.5	125	896	40.1
Oregon	14	644	42.3	37	114	7.5	17	758	49.8
Pennsylvania	84	6,387	60.9	128	320	3.0	86	6,707	63.9
Rhode Island	33	672	84.9	26	42	5.2	32	714	90.1
South Carolina	17	615	29.1	25	125	5.9	18	740	35.0
South Dakota	136	67	10.2	394	114	17.5	299	181	27.7
Tennessee	84	790	24.0	50	543	16.5	70	1,333	40.5
Texas	120	1,971	25.6	143	1,890	24.5	132	3,861	50.1
Utah	171	194	28.2	212	179	25.9	191	373	54.1
Vermont	52	103	27.2	59	21	5.6	53	124	32.8
Virginia	60	1,466	44.2	151	93	2.8	65	1,559	47.0
Washington	22	1,029	43.2	118	308	13.0	44	1,337	56.2
West Virginia	71	541	27.0	170	108	5.4	88	649	32.4
Wisconsin	128	1,095	31.9	250	519	15.1	167	1,614	47.0
Wyoming	123	71	24.3	223	64	22.3	171	135	46.6
United States	82	70,953	47.1	162	16,873	11.2	97	87,826	58.3

Table 6. --Weighted average hardness of finished water from large public supplies of States bordering the Great Lakes, 1952

	Surface supplies			Ground supplies			All supplies		
	Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served	
		Thousands	Percent of population of State		Thousands	Percent of population of State		Thousands	Percent of population of State
Illinois:									
Supplied from Lake Michigan	133	4,256	48.9	--	--	--	133	4,256	48.9
Remainder of State	143	645	7.4	348	549	6.3	237	1,194	13.7
Whole State	135	4,901	56.3	348	549	6.3	156	5,450	62.6
Indiana:									
Supplied from Lake Michigan	136	326	8.3	--	--	--	136	326	8.3
Remainder of State	213	984	25.0	334	571	14.5	258	1,555	29.5
Whole State	194	1,310	33.3	334	571	14.5	237	1,881	47.8
Michigan:									
Supplied from Great Lakes	100	3,158	49.5	--	--	--	100	3,158	49.5
Remainder of State	89	201	3.2	218	510	8.0	182	711	11.2
Whole State	100	3,359	52.7	218	510	8.0	115	3,869	60.7
Minnesota:									
Supplied from Lake Superior	46	107	3.6	--	--	--	46	107	3.6
Remainder of State	77	905	30.3	261	282	9.5	121	1,197	39.8
Whole State	74	1,012	33.9	261	282	9.5	114	1,294	43.4
New York:									
Supplied from Great Lakes	125	964	6.5	--	--	--	125	964	6.5
New York City	30	7,800	52.6	143	500	3.4	37	8,300	56.0
Remainder of State	70	1,896	12.7	87	622	4.2	75	2,518	16.9
Whole State	46	10,660	71.8	112	1,122	7.6	52	11,782	79.4
Ohio:									
Supplied from Lake Erie	130	1,901	23.9	--	--	--	130	1,901	23.9
Remainder of State	111	2,051	25.8	284	900	11.3	164	2,950	37.1
Whole State	120	3,952	49.7	284	900	11.3	150	4,851	61.0
Wisconsin:									
Supplied from Lake Michigan	128	1,006	29.3	--	--	--	128	1,006	29.3
Remainder of State	120	89	2.6	250	519	15.1	231	608	17.7
Whole State	128	1,095	31.9	250	519	15.1	167	1,614	47.0

Table 7. --Weighted average hardness of raw water from large public supplies of States bordering the Great Lakes, 1952

	Surface supplies			Ground supplies			All supplies		
	Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served	
		Thousands	Percent of population of State		Thousands	Percent of population of State		Thousands	Percent of population of State
Illinois:									
Supplied from Lake Michigan	131	4,256	48.9	--	--	--	131	4,256	48.9
Remainder of State	177	646	7.4	384	549	6.3	272	1,194	13.7
Whole State	137	4,902	56.3	384	549	6.3	162	5,450	62.6
Indiana:									
Supplied from Lake Michigan	135	326	8.3	--	--	--	135	326	8.3
Remainder of State	230	984	25.0	354	571	14.5	275	1,555	39.5
Whole State	206	1,310	33.3	354	571	14.5	251	1,881	47.8
Michigan:									
Supplied from Great Lakes	103	3,158	49.5	--	--	--	103	3,158	49.5
Remainder of State	278	201	3.2	314	510	8.0	304	711	11.2
Whole State	113	3,359	52.7	314	510	8.0	140	3,869	60.7

Table 7. --Weighted average hardness of raw water from large public supplies of States bordering the the Great Lakes, 1952--Continued

	Surface supplies			Ground supplies			All supplies		
	Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served	
		Thousands	Percent of population of State		Thousands	Percent of population of State		Thousands	Percent of population of State
Minnesota:									
Supplied from Lake Superior	44	107	3.6	--	--	--	44	107	3.6
Remainder of State	162	905	30.3	275	282	9.5	188	1,187	39.8
Whole State	150	1,012	33.9	275	282	9.5	177	1,294	43.4
New York:									
Supplied from Great Lakes	124	964	6.5	--	--	--	124	964	6.5
New York City	30	7,800	52.6	143	500	3.4	37	8,300	56.0
Remainder of State	71	1,895	12.7	87	622	4.2	75	2,518	16.9
Whole State	46	10,659	71.8	112	1,122	7.6	52	11,782	79.4
Ohio:									
Supplied from Lake Erie	128	1,901	23.9	--	--	--	128	1,901	23.9
Remainder of State	149	2,051	25.8	358	899	11.3	213	2,950	37.1
Whole State	139	3,952	49.7	358	899	11.3	179	4,851	61.0
Wisconsin:									
Supplied from Lake Michigan	129	1,006	29.3	--	--	--	129	1,006	29.3
Remainder of State	172	89	2.6	253	519	15.1	241	608	17.7
Whole State	132	1,095	31.9	253	519	15.1	171	1,614	47.0

The weighted average hardness for the supplies of 670 places in the United States in Water-Supply Paper 658 in 1932 was 102 parts per million; for the supplies in 1,315 places in this report, it is 97 parts. This difference of 5 parts in the hardness may seem difficult to explain when it is realized that the supplies of the more than 600 places included in this report and not included in the report in 1932, are comparatively small places and many obtain their supplies from ground water which has a much higher average hardness generally than surface waters. This decrease in the hardness is readily explained by changes in the sources of supply to water of lower hardness affecting a rather large part of the population, and by an increase, in practice, of softening of supplies. Some of the places where changes in the hardness of the supplies have been effected are Little Rock, Flint, Minneapolis, St. Paul, Kansas City (Mo.), Oklahoma City, Toledo, Wichita, and the metropolitan area of Southern California. In 1932 the number of places with softened supplies was 40; in this report of the same 670 places mentioned in Water-Supply Paper 658 the number of places with softened supplies is 85.

The weighted average hardness for the surface-water supplies in the report in 1932 was 85 parts per million; in this report it is 82 parts. The weighted average hardnesses for the ground-water supplies are 191 and 162 parts per million respectively. The decreases in the weighted average hardness of both surface and ground-water supplies are explained as above for the decrease in the weighted average for all the supplies for the country. Although the decrease in hardness of the ground-water supplies is much greater than in the surface-water supplies, this decrease has less weight in decreasing the weighted average for all supplies than the decrease in the surface supplies because the ground-water supplies represent only 11.2 percent of the total population, the surface supplies, 47.1 percent.

Data on weighted average hardness for the raw-water supplies are shown in table 8 in the same manner as they are shown in table 5 for the water supplies as served to the consumers. Average-hardness values for the raw supplies were obtained in the same manner as for the supplies as served to the consumers, although more estimates were made for the raw water averages of the individual supplies

than for the finished water supplies.

An examination of the tables shows the weighted average hardness of the raw-water supplies for the United States to be 116 parts per million as compared to 97 parts for the finished-water supplies; 96 parts for raw surface-water supplies as compared to 82 parts for the finished surface-water supplies; and 200 parts for the raw ground-water supplies as compared to 162 parts for the finished ground-water supplies.

Table 8.--Weighted average hardness of raw water from large public supplies in each State, 1952

State	Surface supplies			Ground supplies			All supplies		
	Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served		Hardness as $CaCO_3$ (ppm)	Population served	
		Thousands	Percent of population of State		Thousands	Percent of population of State		Thousands	Percent of population of State
Alabama	40	878	28.7	67	271	8.8	47	1,149	37.5
Arizona	200	167	22.2	225	271	36.2	215	438	58.4
Arkansas	23	355	18.6	60	187	9.8	36	542	28.4
California	184	7,962	75.2	206	1,945	18.4	188	9,907	93.6
Colorado	110	754	56.9	--	--	--	110	754	56.9
Connecticut	27	1,481	73.7	42	23	1.2	27	1,504	74.9
Delaware	55	128	40.3	56	44	13.7	55	172	54.0
District of Columbia	84	803	100	--	--	--	84	803	100
Florida	95	262	9.4	242	1,218	44.0	216	1,480	53.4
Georgia	15	1,237	35.9	167	294	8.6	44	1,531	44.5
Idaho	90	84	14.3	135	142	24.2	119	226	38.5
Illinois	137	4,901	56.3	384	549	6.3	162	5,450	62.6
Indiana	206	1,310	33.3	354	571	14.5	251	1,881	47.8
Iowa	210	429	16.3	342	592	22.6	286	1,021	38.9
Kansas	221	423	22.2	271	380	20.0	245	803	42.2
Kentucky	107	916	31.1	291	47	1.6	116	963	32.7
Louisiana	108	871	32.4	84	332	12.4	101	1,203	44.8
Maine	18	388	42.4	22	23	2.5	18	411	44.9
Maryland	38	1,677	71.6	27	34	1.4	38	1,711	73.0
Massachusetts	19	3,314	70.7	53	330	7.0	22	3,644	77.7
Michigan	113	3,359	52.7	314	510	8.0	140	3,869	60.7
Minnesota	150	1,012	33.9	275	282	9.5	177	1,294	43.4
Mississippi	56	161	7.4	20	361	16.6	31	522	24.0
Missouri	126	2,099	53.0	228	157	4.0	133	2,256	57.0
Montana	101	205	34.8	224	39	6.6	121	244	41.4
Nebraska	261	264	19.9	239	247	18.7	250	511	38.6
Nevada	101	54	33.5	204	42	26.5	147	96	60.0
New Hampshire	16	194	36.3	58	83	15.6	29	277	51.9
New Jersey	51	2,886	59.7	137	988	20.4	73	3,874	80.1
New Mexico	76	50	7.4	282	222	32.6	244	272	40.0
New York	46	10,660	71.8	112	1,122	7.6	52	11,782	79.4
North Carolina	23	1,194	29.4	123	57	1.4	28	1,251	30.8
North Dakota	255	104	16.8	345	49	7.9	283	153	24.7
Ohio	139	3,952	49.7	358	899	11.3	179	4,851	61.0
Oklahoma	150	774	34.6	224	122	5.5	160	896	40.1
Oregon	13	644	42.3	37	114	7.5	15	758	49.8
Pennsylvania	86	6,387	60.9	200	320	3.0	91	6,707	63.9
Rhode Island	21	672	84.9	25	42	5.3	21	714	90.1
South Carolina	17	615	29.1	23	125	5.9	18	740	35.0
South Dakota	253	67	10.2	426	114	17.5	362	181	27.7
Tennessee	77	790	24.0	49	543	16.5	66	1,333	40.5
Texas	162	1,971	25.6	144	1,890	24.5	153	3,861	50.1
Utah	171	194	28.2	212	179	25.9	191	373	54.1
Vermont	52	103	27.2	59	21	5.6	53	124	32.8
Virginia	48	1,466	44.2	157	93	2.8	54	1,559	47.0
Washington	24	1,029	43.2	118	308	13.0	45	1,337	56.2
West Virginia	66	541	27.0	185	108	5.4	86	649	32.4
Wisconsin	132	1,095	31.9	253	519	15.1	171	1,614	47.0
Wyoming	114	71	24.3	233	64	22.3	171	135	46.6
United States	96	70,953	47.1	200	16,873	11.2	116	87,826	58.3

Further examination of the tables shows that for six States the hardness reported for the raw-water supplies is the same as for the finished-water supplies. For 17 States where soft water supplies are generally found the weighted average hardness of the raw-water supplies is less than the finished-water supplies, indicating the addition of lime in the treatment of the raw-water supplies for pH adjustment and corrosion control; and for 19 States where hard-water supplies are more general, the hardness of the raw-water supplies is considerably higher than the finished-water supplies, indicating that softening was part of the treatment of the raw-water supplies in those areas.

The data on weighted average hardness in table 5 are further summarized on plate 1 and table 8 on plate 2. The States are separated into four groups according to the weighted average hardness of the supplies of each State and are shown on the maps by shaded patterns representing the four groups or ranges of hardness. These maps of weighted-average hardness of supplies by States have definite limitations, but they show, in a general way, the areas where water in definite ranges of hardness is found. It is obvious that hardness of water supplies does not follow State lines; moreover, each State, with one exception, has supplies with hardness that exceed the limits of the ranges of hardness for the particular group into which it falls. The map for the weighted average hardness of the raw-water supplies more nearly represents the average hardness of the natural waters than the map for the weighted average hardness of the finished-water supplies.

The classification of water supplies as soft, moderately hard, hard, and very hard is rather unsatisfactory even where the domestic use of the water is concerned, and much more so with respect to the industrial use of the water. Water with a hardness of 100 parts per million may be called a soft water by one accustomed to using a water with 300 or 400 parts of hardness, whereas, one accustomed to using a water with less than 50 parts hardness may call water with a hardness of 100 parts rather hard. A water with a hardness of 100 parts is not soft in terms of soap consumption in cleansing, washing, and laundering operations. About 60 percent of the population of the places in this report are furnished with water having a hardness of 100 parts per million or less. (See table 9 and plate 3.)

Table 9.--Population served, and the percent of population served with water from public supplies having hardness of 100 parts per million or less for 1,315 of the larger cities in the United States, 1952

State	Population served (thousands)	Percent	State	Population served (thousands)	Percent
Alabama	1,065	92.7	Nebraska	0	0
Arizona	32	7.3	Nevada	44	45.8
Arkansas	509	93.9	New Hampshire	252	91.0
California	2,643	26.7	New Jersey	2,686	69.3
Colorado	183	24.3	New Mexico	35	12.9
Connecticut	1,504	100	New York	10,187	86.5
Delaware	155	90.1	North Carolina	1,236	98.8
District of Columbia	803	100	North Dakota	46	30.1
Florida	857	57.9	Ohio	957	19.7
Georgia	1,382	90.3	Oklahoma	638	71.2
Idaho	140	61.9	Oregon	758	100
Illinois	215	3.9	Pennsylvania	3,580	53.4
Indiana	135	7.2	Rhode Island	714	100
Iowa	396	38.8	South Carolina	731	98.8
Kansas	155	19.3	South Dakota	33	18.2
Kentucky	627	65.1	Tennessee	1,064	79.8
Louisiana	1,133	94.2	Texas	2,012	52.1
Maine	411	100	Utah	0	0
Maryland	1,711	100	Vermont	112	90.3
Massachusetts	3,644	100	Virginia	1,524	97.8
Michigan	3,078	79.6	Washington	1,135	84.9
Minnesota	1,012	78.2	West Virginia	473	72.9
Mississippi	472	90.4	Wisconsin	133	8.2
Missouri	1,594	70.7	Wyoming	61	45.2
Montana	111	45.5	Total	52,378	59.6

The limitations of quality with respect to the hardness of water supplies for industrial use are so varied that any general classification would not be feasible or satisfactory. A supply with a hardness of 60 parts per million may be satisfactory for one or several industries and not satisfactory for others. The grouping of the supplies in this report into four groups or ranges of hardness follows the pattern used in Water-Supply Paper 658 and is convenient for comparison; the grouping does not fit any industrial classification. Some other grouping may be more practical or satisfactory than the above.

For the finished-water supplies 17 States fall into the first group, 1 to 60 parts per million of hardness; 14 States and the District of Columbia fall into the second group, 61 to 120 parts of hardness; 10 States fall into the third group, 121 to 180 parts of hardness; and 7 States fall into the group, above 180 parts of hardness. In the second group 3 States (California, Idaho, and Montana) have weighted-average hardnesses near the maximum for the group, and a total of 9 States and the District of Columbia have weighted average hardnesses above 90 parts. In the third group 4 States (Kansas, North Dakota, Wisconsin, and Wyoming) have weighted average hardnesses around 170 parts or near the upper range of hardness for the group.

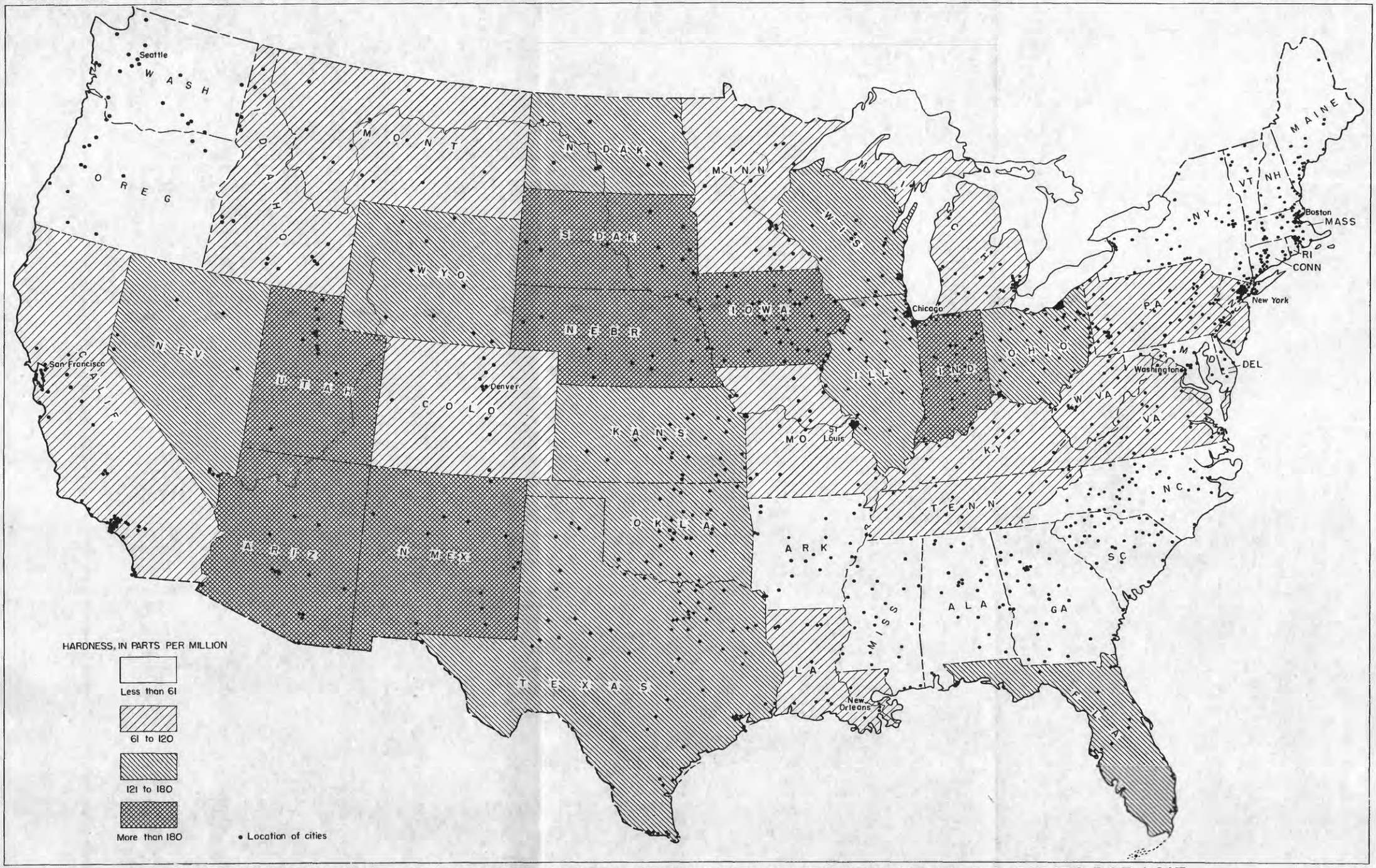
For the raw-water supplies, the States fall into the four groups as follows: 18 States in the first group; 8 States and the District of Columbia in the second group; 11 States in the third group; and 11 States in the last group. The significant fact in this grouping of the States according to the weighted average hardness of the finished-water supplies and the raw-water supplies is the difference in the number of States falling into the second and last groups. Supplies that have been softened generally fall in with the group with 61 to 120 parts of hardness, and raw-water supplies most likely to be softened fall in the third and last groups. This difference in the number of States in the second group has been the result of softening of supplies with hardness not only above 180 parts but also those with hardness in the upper ranges of the third group.

AVERAGE HARDNESS

Further summaries of data on the hardness of the finished-water supplies for the places in this report are shown in table 10 and plate 4. Table 10 shows the average hardness of both finished surface-water and ground-water supplies and also of both supplies combined for each State, based on the number of supplies shown in the table for each State. It is realized that for some of the States the averages are based on too few or insufficient data--for example, no ground-water supplies are included in the average for Colorado, and only one surface supply is included in the average for Nebraska.

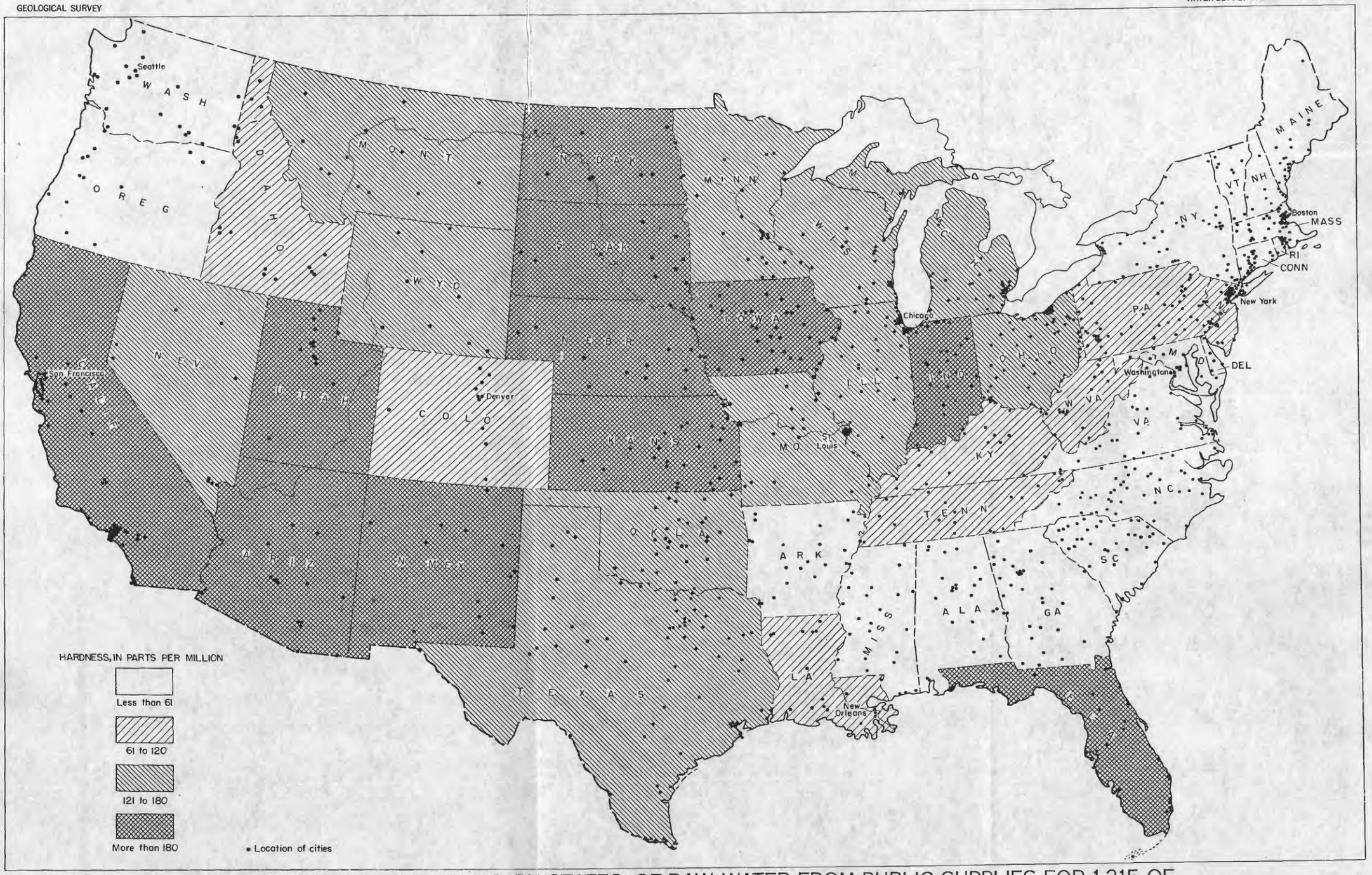
These arithmetical averages for the States as a whole are slightly higher than the weighted average hardness, for a small place has the same weight as a large place in the arithmetical averages and the larger places in many States are the ones that have the softer supplies or receive softened supplies, and consequently have more weight in a weighted average. The average hardness for the United States is 121 parts compared to 97 parts for the weighted average.

The grouping of the States for plate 4 according to the four ranges of hardness differs considerably from the grouping for plate 1 of weighted averages. The number of States in the group of 1 to 60 parts per million of hardness and the group of above 180 parts for plate 4 is 12 and 13, respectively, as compared to 17 and 7 for plate 1. The number of States in the other two groups is about the same, but the States making up the groups are different.



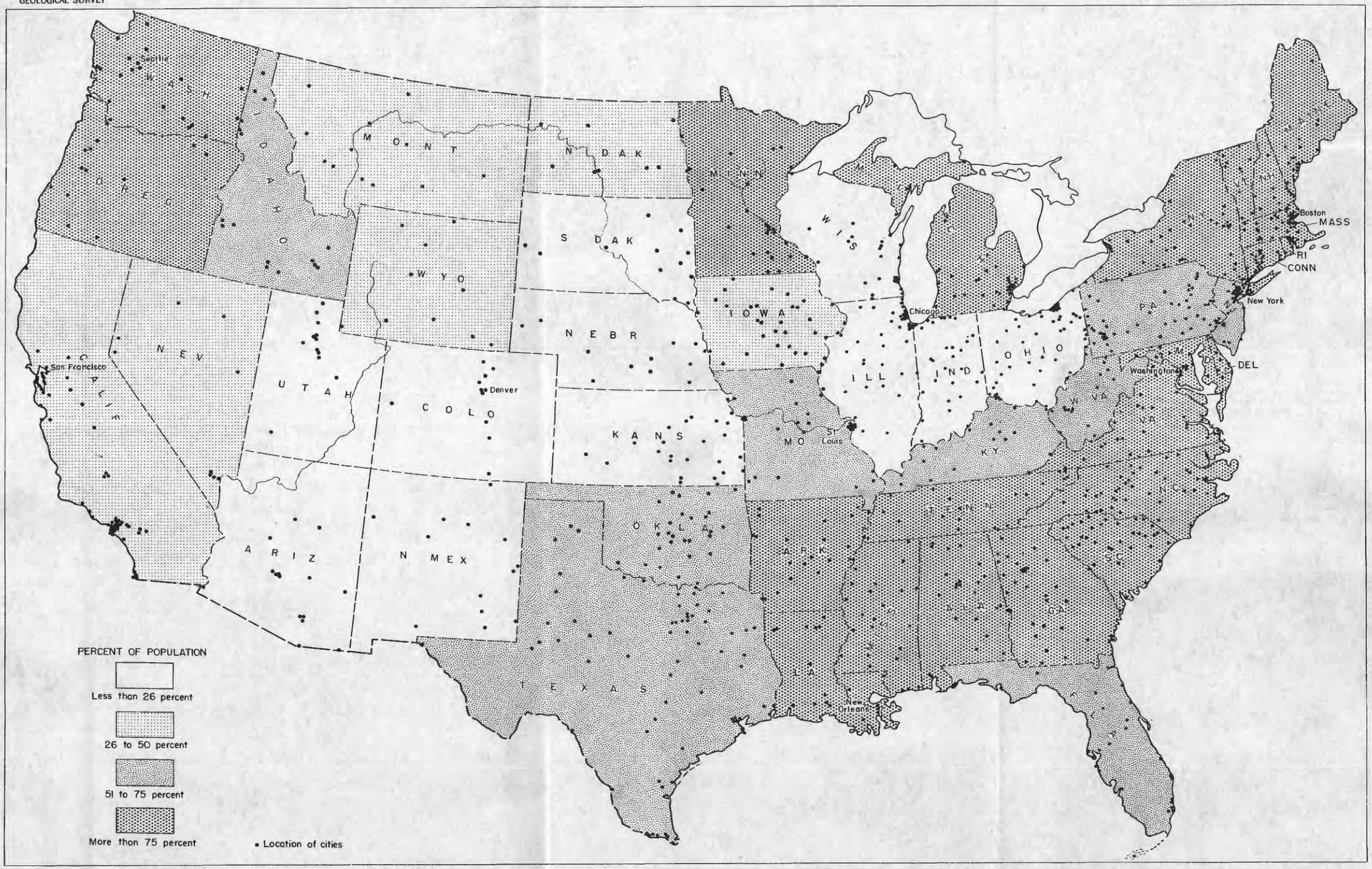
WEIGHTED AVERAGE HARDNESS, BY STATES, OF FINISHED WATER FROM PUBLIC SUPPLIES FOR 1,315 OF THE LARGER CITIES IN THE UNITED STATES, 1952

303739 O - 54 (Face p. 22) No. 1



WEIGHTED AVERAGE HARDNESS, BY STATES, OF RAW WATER FROM PUBLIC SUPPLIES FOR 1,315 OF THE LARGER CITIES IN THE UNITED STATES, 1952

303739 O - 54 (Face p. 22) No. 2



PERCENT OF POPULATION, BY STATES, SERVED FROM PUBLIC SUPPLIES WITH WATER HAVING HARDNESS OF 100 PARTS PER MILLION OR LESS FOR 1,315 OF THE LARGER CITIES IN THE UNITED STATES, 1952

303739 O - 54 (Face p. 22) No. 3

Table 10.--Number of supplies, and average hardness, by States, of finished water for 1,315 of the larger cities of the United States, 1952

State	Surface supplies		Ground supplies		All supplies	
	Number	Hardness as $CaCO_3$ (ppm)	Number	Hardness as $CaCO_3$ (ppm)	Number	Hardness as $CaCO_3$ (ppm)
Alabama	15	46	8	70	23	54
Arizona	5	186	20	215	25	210
Arkansas	13	51	15	70	28	61
California	29	132	57	176	86	161
Colorado	12	106	--	--	12	106
Connecticut	20	29	3	42	23	30
Delaware	2	61	7	76	9	74
District of Columbia	1	96	--	--	1	96
Florida	5	90	24	112	29	108
Georgia	16	31	17	114	33	75
Idaho	7	68	11	172	18	132
Illinois	20	133	14	324	34	212
Indiana	15	182	20	338	35	271
Iowa	13	140	24	274	37	227
Kansas	13	134	15	229	28	185
Kentucky	18	97	3	128	21	101
Louisiana	6	70	11	60	17	64
Maine	13	23	2	42	15	23
Maryland	9	44	2	26	11	40
Massachusetts	33	28	14	56	47	36
Michigan	19	107	14	216	33	153
Minnesota	5	78	18	265	23	224
Mississippi	3	81	20	28	23	35
Missouri	16	125	7	173	23	140
Montana	10	90	6	202	16	132
Nebraska	1	261	12	253	13	254
Nevada	4	132	6	168	10	154
New Hampshire	7	17	4	50	11	30
New Jersey	18	58	22	104	40	83
New Mexico	3	87	11	321	14	271
New York	44	77	19	104	63	85
North Carolina	38	35	4	76	42	39
North Dakota	6	128	5	275	11	195
Ohio	26	123	16	202	42	153
Oklahoma	20	174	8	156	28	169
Oregon	11	28	4	50	15	34
Pennsylvania	54	71	11	127	65	80
Rhode Island	8	38	4	28	12	34
South Carolina	21	23	14	22	35	22
South Dakota	5	154	8	379	13	292
Tennessee	13	89	9	86	22	88
Texas	34	162	46	125	80	140
Utah	3	196	12	222	15	217
Vermont	8	57	4	79	12	64
Virginia	25	49	7	140	32	69
Washington	14	32	9	82	23	53
West Virginia	16	71	5	168	21	94
Wisconsin	9	120	15	240	24	195
Wyoming	6	195	7	225	13	211
United States	712	85	594	164	1,306	121

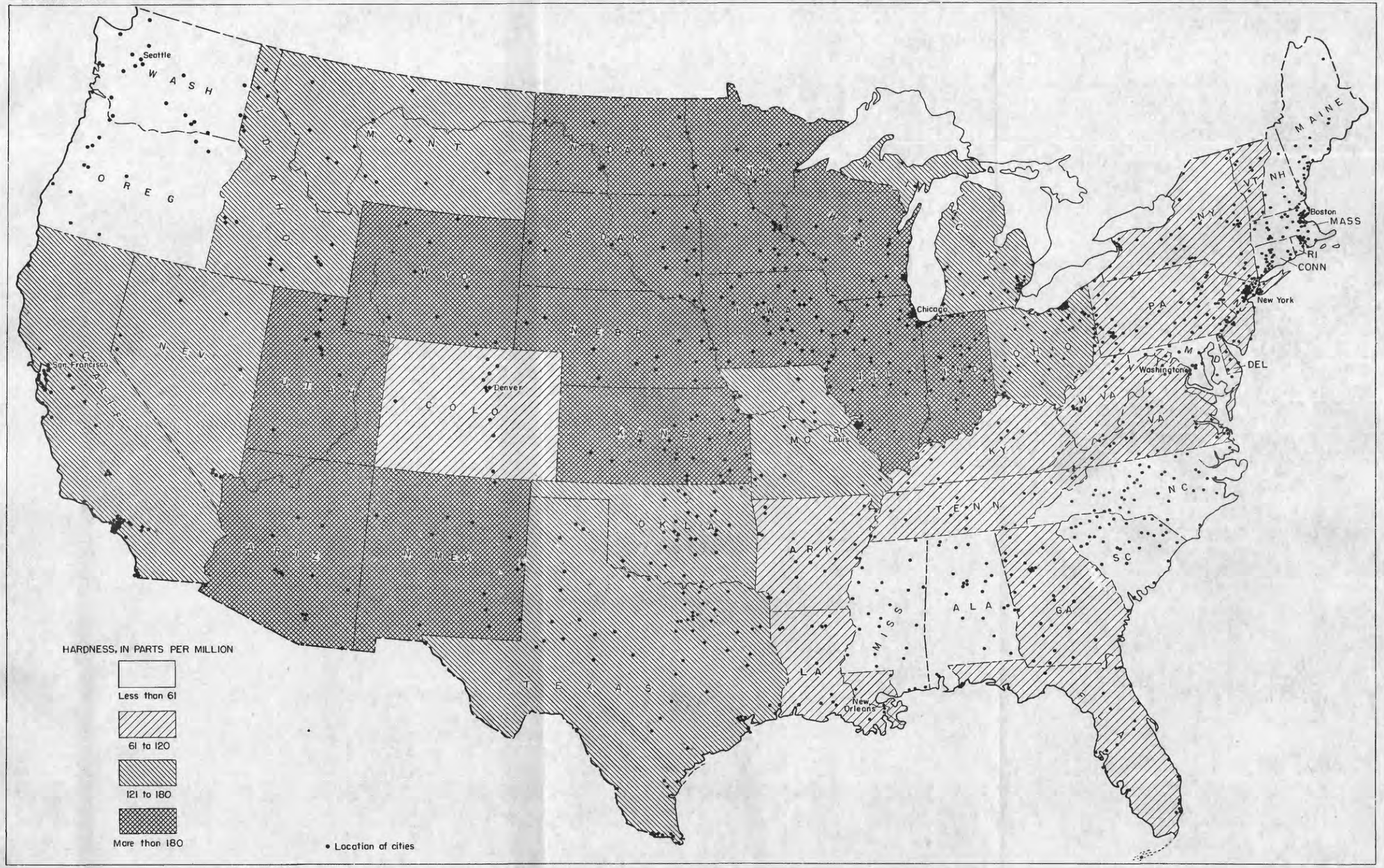
Further data on average hardness of the raw-water supplies of places in this report are shown in table 11 and plate 5. The results for average hardness of the raw-water supplies in table 11 were obtained in the same manner as for table 10 of the finished-water supplies. The averages for some of the States in table 10 differ only to a small degree, being either higher or lower, from the weighted averages of the raw-water supplies as shown in table 8, whereas for other States the two averages differ considerably. The average hardness for the United States is 139 parts as compared to 116 parts for the weighted average.

The arrangement of the States into the four groups, according to the ranges of average hardness as shown in plate 5, differs considerably as to the number falling into each group and as to the States making up each group, from the groupings made according to the weighted average hardness as shown on plate 2. The greatest difference as to number of States is in the two groups of the higher ranges of hardness, 121 to 180 parts and above 180 parts, respectively. In these two groups there are 4 States and 19 States respectively, as compared to 11 and 11 in the same groups for plate 2.

The data on hardness as summarized in table 11 and plate 5 when compared with those summarized in table 10 plate 4 also reveal important difference in the values for average hardness of the raw and finished supplies of the individual States and the grouping of the States into the four groups or ranges of hardness. The data as summarized in table 11 and plate 5 give more nearly accurate information as to the average hardness of the natural waters of the States than the data on average hardness weighted according to population or changed by reason of the treatment of the supplies, summarized in the preceding tables and illustrations. Plate 5 is a reasonably accurate representation of the areas of soft and hard waters in the United States.

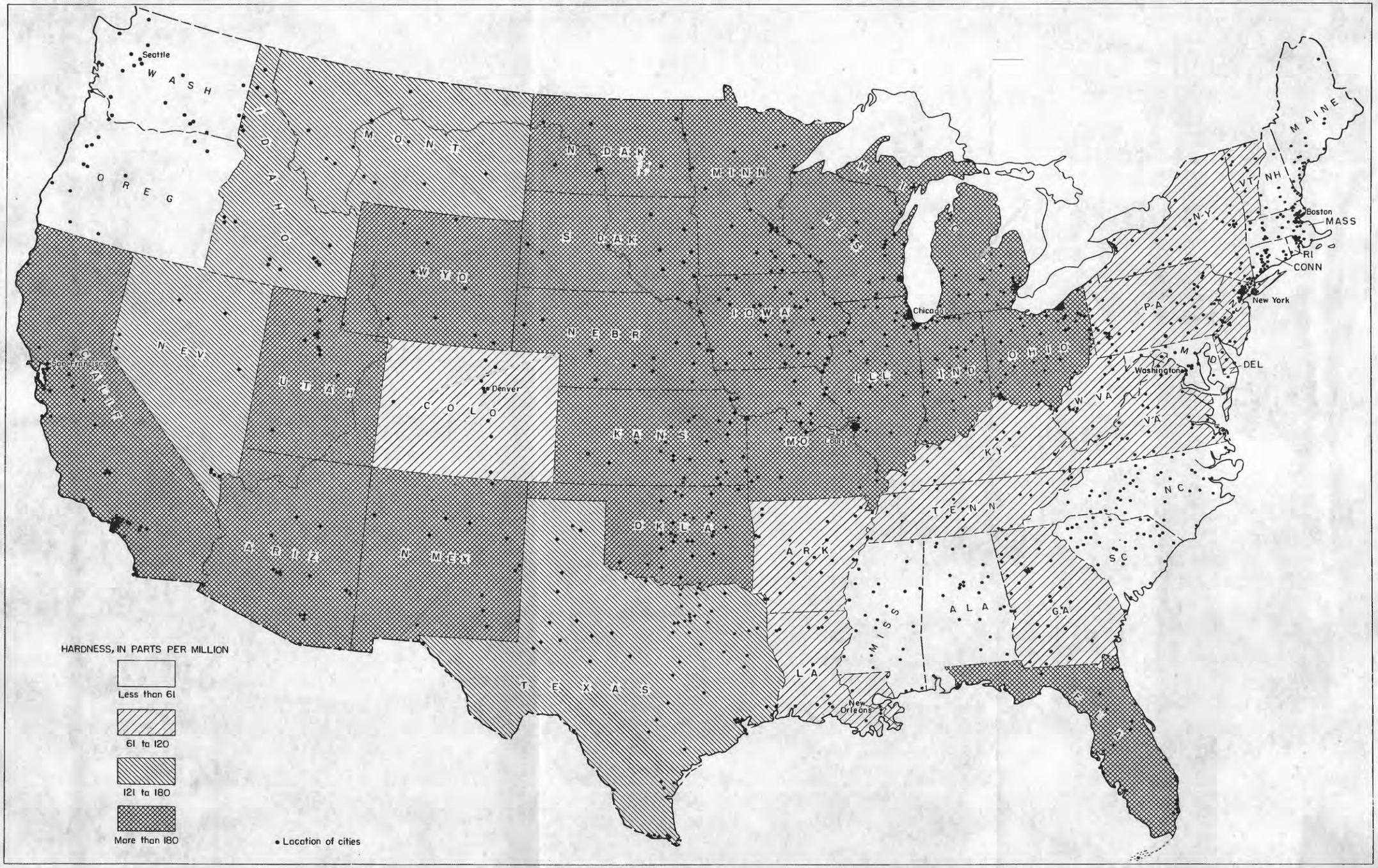
Table 11. --Number of supplies, and average hardness, by States, of raw water for 1,315 of the larger cities in the United States, 1952

State	Surface supplies		Ground supplies		All supplies	
	Number	Hardness as $CaCO_3$ (ppm)	Number	Hardness as $CaCO_3$ (ppm)	Number	Hardness as $CaCO_3$ (ppm)
Alabama	15	30	9	72	24	46
Arizona	5	183	20	215	25	209
Arkansas	13	38	15	80	28	61
California	32	150	56	189	88	175
Colorado	12	107	--	--	12	107
Connecticut	19	26	3	42	22	28
Delaware	2	45	7	72	9	66
District of Columbia	1	84	--	--	1	84
Florida	5	75	24	252	29	222
Georgia	16	24	18	126	34	78
Idaho	7	65	11	172	18	131
Illinois	19	174	14	358	33	252
Indiana	17	199	21	352	38	284
Iowa	13	195	24	355	37	299
Kansas	13	210	15	307	28	262
Kentucky	18	92	3	206	21	109
Louisiana	6	87	11	112	17	103
Maine	13	20	2	22	15	21
Maryland	8	36	3	30	11	34
Massachusetts	33	24	14	58	47	34
Michigan	19	135	14	298	33	204
Minnesota	5	148	18	280	23	251
Mississippi	3	61	20	34	23	37



AVERAGE HARDNESS, BY STATES, OF FINISHED WATER FROM PUBLIC SUPPLIES FOR 1,315 OF THE LARGER CITIES IN THE UNITED STATES, 1952

303739 O - 54 (Face p. 24) No. 1



AVERAGE HARDNESS, BY STATES, OF RAW WATER FROM PUBLIC SUPPLIES FOR 1,315 OF THE LARGER CITIES IN THE UNITED STATES, 1952

303739 O - 54 (Face p. 24) No. 2

Table 11.--Number of supplies, and average hardness, by States, of raw water for 1,315 of the larger cities in the United States, 1952--Continued

State	Surface supplies		Ground supplies		All supplies	
	Number	Hardness as $CaCO_3$ (ppm)	Number	Hardness as $CaCO_3$ (ppm)	Number	Hardness as $CaCO_3$ (ppm)
Missouri	16	163	7	247	23	189
Montana	10	106	6	193	16	139
Nebraska	1	261	12	267	13	267
Nevada	4	182	6	168	10	174
New Hampshire	7	17	4	55	11	31
New Jersey	18	54	22	110	40	85
New Mexico	3	89	11	337	14	284
New York	44	78	19	106	63	87
North Carolina	38	22	4	126	42	32
North Dakota	6	231	5	300	11	262
Ohio	26	160	17	361	43	240
Oklahoma	20	176	8	246	28	196
Oregon	11	26	4	50	15	33
Pennsylvania	54	70	12	172	66	89
Rhode Island	8	31	5	26	13	29
South Carolina	21	18	14	19	35	19
South Dakota	5	256	8	452	13	392
Tennessee	13	85	9	84	22	85
Texas	34	177	46	126	80	148
Utah	3	196	12	222	15	217
Vermont	8	57	4	79	12	64
Virginia	25	43	9	141	34	69
Washington	14	33	9	83	23	52
West Virginia	16	62	5	202	21	95
Wisconsin	9	142	15	239	24	203
Wyoming	6	173	7	247	13	213
United States	714	94	602	192	1,316	139

MEDIAN HARDNESS

Data on the average hardness of public water supplies, by States, for 1,315 of the larger cities of the United States are summarized in a different way in table 12 for finished-water supplies and in table 13 for raw-water supplies than in the preceding tables. These two tables in addition to showing the median of the average hardnesses of the supplies of each State, show the range in average hardness of the supplies of each State based on the number of supplies indicated in each table. The number of supplies shown for each State may not necessarily coincide with the number of cities for each State included in the report, because a number of cities in several States are supplied from a single source of supply, and conversely, one city may have several sources of supply.

Table 12. --Number of supplies, range in average hardness, and median hardness of finished water, by States, for 1,315 of the larger cities in the United States, 1952

State	Number of supplies	Range in hardness	Median hardness	State	Number of supplies	Range in hardness	Median hardness
Alabama	23	14-115	49	Nebraska	13	112-370	274
Arizona	25	12-500	185	Nevada	10	33-320	162
Arkansas	28	11-250	45	New Hampshire	11	10-121	21
California	86	18-561	152	New Jersey	40	10-251	67
Colorado	12	11-317	68	New Mexico	14	30-626	168
Connecticut	23	11-46	32	New York	63	7-292	82
Delaware	9	24-144	61	North Carolina	42	6-113	36
District of Columbia	1	--	96	North Dakota	11	81-406	152
Florida	29	20-274	91	Ohio	42	46-427	120
Georgia	33	18-360	50	Oklahoma	28	8-675	130
Idaho	18	8-354	125	Oregon	15	9-95	36
Illinois	34	80-565	144	Pennsylvania	65	5-256	72
Indiana	35	76-640	286	Rhode Island	12	17-83	30
Iowa	37	83-632	192	South Carolina	35	3-107	17
Kansas	28	75-548	130	South Dakota	13	70-672	255
Kentucky	21	12-198	107	Tennessee	22	19-177	79
Louisiana	17	2-151	76	Texas	80	4-700	96
Maine	15	8-82	18	Utah	15	152-349	198
Maryland	11	3-85	35	Vermont	12	16-121	58
Massachusetts	47	8-80	39	Virginia	32	8-295	45
Michigan	33	43-405	132	Washington	23	12-155	46
Minnesota	23	46-464	241	West Virginia	21	28-264	70
Mississippi	23	2-150	23	Wisconsin	24	50-500	131
Missouri	23	55-294	120	Wyoming	13	12-575	170
Montana	16	16-404	121				

Table 13. --Number of supplies, range in average hardness, and median hardness of raw water, by States, for 1,315 of the larger cities in the United States, 1952

State	Number of supplies	Range in hardness	Median hardness	State	Number of supplies	Range in hardness	Median hardness
Alabama	24	7-115	41	Nebraska	13	155-370	284
Arizona	25	12-500	190	Nevada	10	33-320	202
Arkansas	28	10-250	35	New Hampshire	11	10-121	21
California	88	18-561	167	New Jersey	40	5-251	66
Colorado	12	11-308	64	New Mexico	14	35-626	212
Connecticut	22	11-46	28	New York	63	7-292	81
Delaware	9	22-144	35	North Carolina	42	6-195	23
District of Columbia	1	--	84	North Dakota	11	51-445	257
Florida	29	12-1,060	200	Ohio	43	95-677	217
Georgia	34	10-360	48	Oklahoma	28	8-700	134
Idaho	18	8-354	105	Oregon	15	8-95	35
Illinois	33	126-565	225	Pennsylvania	66	5-314	68
Indiana	38	112-640	285	Rhode Island	13	10-68	26
Iowa	37	96-632	268	South Carolina	35	3-107	16
Kansas	28	115-548	250	South Dakota	13	193-673	281
Kentucky	21	12-350	100	Tennessee	22	25-161	86
Louisiana	17	2-395	90	Texas	80	4-700	126
Maine	15	8-63	18	Utah	15	152-349	198
Maryland	11	3-80	32	Vermont	12	16-121	57
Massachusetts	47	8-95	28	Virginia	34	7-330	44
Michigan	33	43-405	185	Washington	23	12-155	46
Minnesota	23	44-464	250	West Virginia	21	16-264	87
Mississippi	23	3-226	20	Wisconsin	24	50-500	168
Missouri	23	55-317	183	Wyoming	13	12-700	150
Montana	16	3-404	144				

The range in hardness as shown in these two tables is the range in the average hardnesses for the number of supplies as indicated for each State. No intent is made to show the range in hardness of the individual supplies of each city. The tables show that for some States the range in average hardness of the supplies is comparatively small, whereas for other States it is large. The lower limits of the range in average hardness for all the States for finished-water supplies range from 2 to 152 parts, the upper limits from 46 to 700 parts. For the raw-water supplies, the lower limits of the range in average hardness for all the States is 2 to 193 parts; the upper limits, 46 to 1,060 parts. The ranges in average hardnesses, as here shown for the public water supplies included in this report for each State, tend to emphasize the fact that erroneous conclusions may be drawn from averages of hardness for each State.

The median of the average hardnesses is that value below which there are as many supplies with hardness less than the median as there are supplies with hardness greater than the median. The difference between the average hardness and the median indicates the difference in balance of the hardnesses of supplies with less and greater hardness than the median.

All data on hardness of public water supplies, by States, for the places included in this report are shown in summary table 14, in which are summarized the data on weighted average hardness, average hardness, and median hardness.

Table 14.--Summary of data on hardness of public water supplies, by States, for 1,315 of the larger cities in the United States, 1952

State	Finished water			Raw water		
	Weighted average hardness	Average hardness	Median hardness	Weighted average hardness	Average hardness	Median hardness
Alabama	55	56	49	47	46	41
Arizona	216	208	185	215	209	190
Arkansas	42	61	45	36	61	35
California	118	160	152	188	187	167
Colorado	107	106	68	110	89	64
Connecticut	21	29	32	27	28	28
Delaware	60	75	61	55	66	35
District of Columbia	96	96	96	84	84	84
Florida	123	91	91	216	222	200
Georgia	41	76	50	44	78	48
Idaho	119	136	125	119	131	105
Illinois	156	215	144	162	252	225
Indiana	237	272	286	251	284	285
Iowa	212	235	192	286	299	268
Kansas	176	185	130	245	262	250
Kentucky	102	101	107	116	109	100
Louisiana	68	64	76	101	103	90
Maine	20	23	18	18	21	18
Maryland	48	40	35	38	34	32
Massachusetts	23	36	39	22	34	28
Michigan	115	160	132	140	207	185
Minnesota	114	224	241	177	251	250
Mississippi	39	35	23	31	37	20
Missouri	106	141	120	133	188	183
Montana	120	137	121	121	139	144
Nebraska	247	254	274	250	267	284
Nevada	135	154	162	147	174	202
New Hampshire	28	30	21	29	31	21
New Jersey	75	86	67	73	85	66
New Mexico	237	271	168	244	284	212
New York	52	74	82	52	87	81

Table 14.--Summary of data on hardness of public water supplies, by States, for 1,315 of the larger cities in the United States, 1952--Continued

State	Finished water			Raw water		
	Weighted average hardness	Average hardness	Median hardness	Weighted average hardness	Average hardness	Median hardness
North Carolina ..	34	38	36	28	32	23
North Dakota	170	192	152	283	262	257
Ohio	150	155	120	179	240	217
Oklahoma.....	125	169	130	160	196	134
Oregon	17	37	36	15	33	35
Pennsylvania ...	86	81	72	91	89	68
Rhode Island ...	32	34	30	21	29	26
South Carolina ..	18	22	17	18	19	16
South Dakota	299	292	255	362	392	281
Tennessee	70	86	79	66	85	86
Texas	132	144	96	153	148	126
Utah	191	217	198	191	217	198
Vermont.....	53	64	58	53	64	57
Virginia	65	70	45	54	69	44
Washington	44	52	46	45	52	46
West Virginia ...	88	94	70	86	100	87
Wisconsin	167	195	131	171	203	168
Wyoming	171	211	170	171	221	150
United States..	97	121	91	116	139	90

SOURCES AND TREATMENT OF PUBLIC WATER SUPPLIES

Table 15 is a tabulation of data as to sources and general methods of treatment relative to the public water supplies of the larger cities of the United States in 1952. The data for the table were taken from those shown for the supply for each place in the report.

Table 15. --Source and treatment of the public water supplies for 1,315 of the larger cities in the United States, 1952

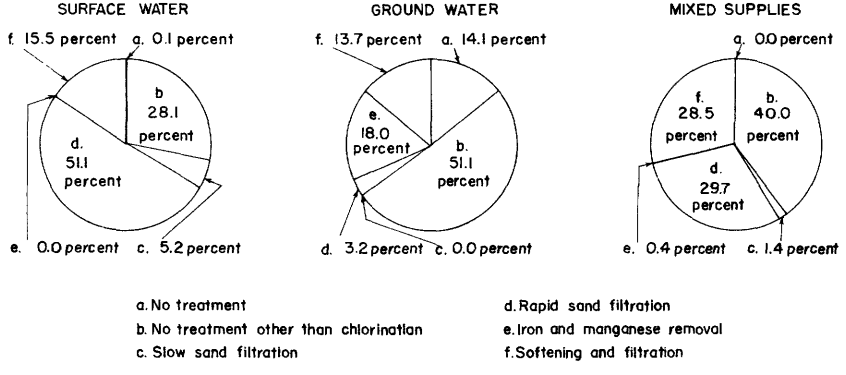
Source and treatment	Number of places	Population served		
		Thousands	Percent	Percent of population of United States
Surface water:				
No treatment	3	95	0.1	0.1
No treatment other than chlorination	143	18,095	28.1	12.0
Slow sand filtration	28	3,348	5.2	2.2
Rapid sand filtration	459	32,867	51.1	21.8
Softening				
With lime	44	3,917	6.1	2.6
With lime-soda ash	31	3,163	4.9	2.1
By cation exchange	3	2,859	4.5	1.9
Total softened supplies	78	9,939	15.5	6.6
Total surface-water supplies	711	64,344	100.0	42.7
Ground water (wells, infiltration galleries, and springs):				
No treatment	114	2,025	14.1	1.4
No treatment other than chlorination	213	7,335	51.0	4.9
Iron and manganese removal	64	2,594	18.0	1.7
Slow sand filtration	0	0	0	0
Rapid sand filtration	16	463	3.2	.3
Softening				
With lime	31	1,114	7.7	.7
With lime-soda ash	20	524	3.6	.4
By cation exchange	14	340	2.4	.2
Total softened supplies	65	1,978	13.7	1.3
Total ground-water supplies	472	14,395	100.0	9.6
Mixed supplies (surface and ground water):				
No treatment	0	0	0	0
No treatment other than chlorination	37	3,631	40.0	2.4
Iron and manganese removal	2	41	.4	.0
Slow sand filtration	7	132	1.4	.1
Rapid sand filtration	58	2,694	29.7	1.8
Softening				
With lime	10	1,164	12.8	.8
With lime-soda ash	12	1,096	12.1	.7
By cation exchange	6	329	3.6	.2
Total softened supplies	28	2,589	28.5	1.7
Total mixed supplies	132	9,087	100.0	6.0
Total all softened supplies	171	14,506	16.5	9.6
Total all supplies	1,315	87,826	100.0	58.3

NATURAL SURFACE WATER

Of the 711 places included in this report that are supplied with surface water only, 3 receive no treatment and 143 receive no treatment other than chlorination. See table 15 and fig. 2. The population thus served represents 28.2 percent of the population served with surface supplies only, and 12 percent of the total population of the United States. Falling into this category are some of the largest public supplies of the country. These supplies are usually taken from large lakes or from impounding reservoirs on streams that drain protected uninhabited watersheds. The storage capacity of these lakes and reservoirs is usually so large in relation to demand that sufficient time is given for the settling of any suspended matter and for natural purification. The growth of algae in these open bodies of water can be very troublesome.

Many of these waters are soft and contain small quantities of mineral matter in solution. Some may have little color, others may be highly colored. The lack of hardness and dissolved minerals are desirable characteristics as far as domestic use and many industrial uses are concerned, but on the other hand these waters are likely to be corrosive and may cause trouble in service mains and plumbing installations. Some of the waters that are not corrosive may be equally troublesome because of their hardness and mineral content.

The current trend is to treat public supplies so as to make them not only safe for drinking from a sanitary point of view but more satisfactory for general use and to protect expensive water-supply systems from corrosion and resultant troubles.



TREATED SURFACE WATER

A total of 487 places of all the places supplies with surface water included in this report were furnished with water filtered through sand filters, exclusive of those supplies filtered in conjunction with softening. Of the population supplied with filtered water, 5.2 percent received water from slow sand filters, and 51.1 percent, from rapid sand filters. Seventy-eight of the surface water supplies were softened. These softened supplies represented 15.5 percent of population furnished with surface water only.

A total of 71.4 percent of the population served with surface water received water that was given more treatment than just chlorination. The above total does not include the surface water mixed with ground water and classed as mixed supplies.

GROUND WATER

Ground water, although used exclusively by only 472 of the places included in this report is used by the greater part of the rural population of the country and by the smaller cities and towns. Ground water is less subject to changes in chemical composition than surface water, is generally clearer, and is cooler in summer. On the other hand, ground water usually contains more dissolved mineral matter and frequently objectionable quantities of iron. Supplies from shallow sources and springs are sometimes subject to pollution.

The population served exclusively by ground-water supplies of the places in this report represents 16.4 percent of the total population of the 1,315 places, and only 9.6 percent of the total population of the country. Of the 472 places served with ground water, 114 places received water with no treatment; 213 places received water with no treatment other than chlorination. The population of these 327 places represents about 65 percent of the total population served exclusively with ground water. Sixty-five places were served with softened water, the population of which places represents about 14 percent of the total population served with ground water.

MIXED SUPPLIES

The population of 132 of the 1,315 places in this report was furnished with supplies, classed as mixed, from both surface and ground sources. In some instances the water from one source was not mixed with that from the other before entering the city mains; in other instances the water from the two sources was mixed prior to entering the mains. In some instances one or more sections of a city was furnished with water from one source, while at the same time other sections were furnished water from the other source. Ground water made up about 27 percent of the total supply of these places furnished with mixed supplies. The population served with mixed supplies is about 10 percent of the total population of the 1,315 places included in this report and 6.0 percent of the population of the country.

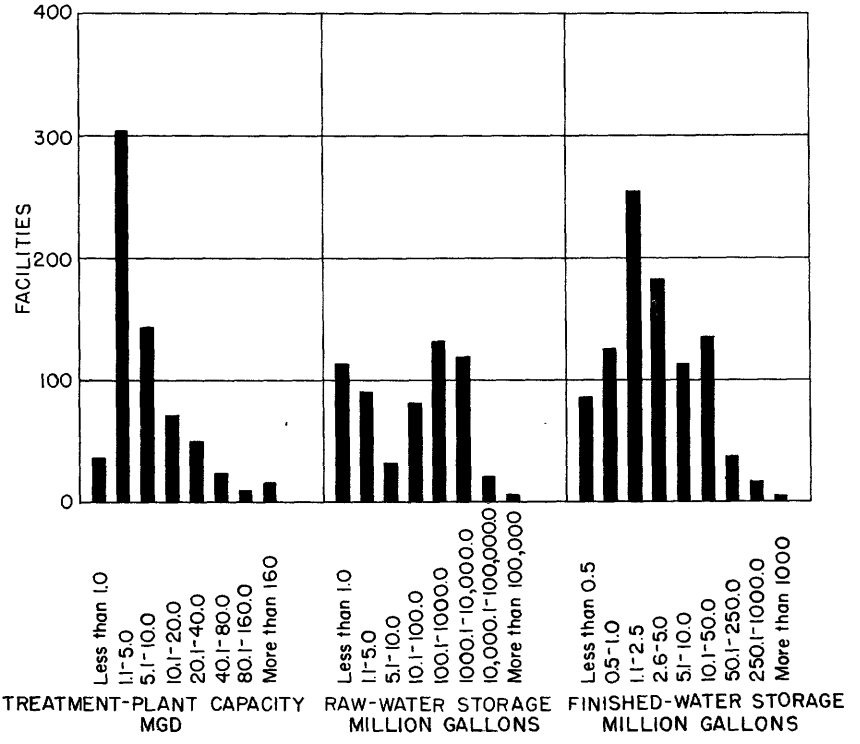
Most of these places received water which was given more treatment than chlorination. Most of the supplies were filtered or softened. In some instances one part of the supply received no treatment other than chlorination, whereas the other part received more treatment.

PHYSICAL PLANT FACILITIES

Data relative to the physical plant facilities for treatment, raw-water storage, and finished-water storage for most of the places included in this report, are shown in table 16 and graphically in figure 3. Facilities for chlorination only are not included in the statistics relative to the number and capacities of the treatment plants. For a few places the capacities of the treatment plants are not shown. Facilities for the storage of raw and finished water are included for all places included in the report for which storage data are shown. For some places storage data were not available or were not reported. In the tabulation of the data, chlorinated water is considered finished water. Many large cities, the supplies of which are taken from natural lakes or from large streams, have few facilities for raw-water storage and have no particular need for them. Many places taking their supplies from wells have few facilities for raw-water storage since many such supplies are pumped directly into the distribution systems.

Table 16.--Physical plant facilities for public water supplies for the larger cities in the United States, 1952

State	Treatment plants		Raw-water storage		Finished-water storage	
	Number of plants	Total capacity (mgd)	Number of places	Capacity (mg)	Number of places	Capacity (mg)
Alabama	15	139	11	5,736	24	61
Arizona	5	43	9	8,598	9	172
Arkansas	20	74	7	17,498	26	74
California	17	652	55	621,233	39	1,956
Colorado	7	242	15	187,354	7	221
Connecticut	10	115	21	113,154	11	1,260
Delaware	5	6	5	100	6	4
District of Columbia	2	225	1	560	1	118
Florida	17	217	10	766	24	59
Georgia	19	217	16	1,238	29	78
Idaho	4	19	11	3,015	7	22
Illinois	21	494	10	15,631	41	789
Indiana	23	317	13	7,993	30	141
Iowa	19	136	15	2,404	30	125
Kansas	17	150	9	1,039	19	10
Kentucky	16	222	11	3,058	21	164
Louisiana	11	185	6	40	13	45
Maine	4	20	8	8,774	17	162
Maryland	8	315	10	59,036	11	847
Massachusetts	13	116	52	562,570	50	2,570
Michigan	18	889	10	1,641	38	288
Minnesota	8	349	5	6,755	20	223
Mississippi	9	35	7	1,209	18	28
Missouri	18	503	14	4,176	28	379
Montana	4	53	11	18,279	6	33
Nebraska	4	123	7	96	5	95
Nevada	1	2	7	119	3	7
New Hampshire	3	6	7	9,536	7	85
New Jersey	15	300	36	54	50	1
New Mexico	2	4	9	2,851	9	47
New York	36	498	30	377,798	51	5,225
North Carolina	39	187	27	48,856	40	169
North Dakota	7	26	4	7	10	191
Ohio	31	888	28	32,164	46	686
Oklahoma	21	161	18	107,974	24	128
Oregon	6	45	6	15	15	385
Pennsylvania	35	936	36	49,028	45	2,502
Rhode Island	5	111	15	6,440	15	93
South Carolina	22	94	20	5,483	29	75
South Dakota	8	27	2	3,876	11	38
Tennessee	16	212	2	2	19	156
Texas	36	605	33	119,719	65	497
Utah	0	0	9	1,685	4	66
Vermont	1	6	8	1,606	5	56
Virginia	24	257	19	30,564	30	3,222
Washington	4	24	8	8,371	19	755
West Virginia	18	133	8	1,501	21	60
Wisconsin	12	293	7	20	26	140
Wyoming	4	23	5	724	7	49
Total	660	10,694	693	2,460,346	1,081	24,557



TREATMENT OF WATER

The treatment of water for public supplies is comprehensively discussed in technical books expressly written for that purpose (Amer. Water Works Assoc., 1950; Hopkins, 1948; Nordell, 1951). Improvements in the design of waterworks equipment and installations and the processes involved in the treatment and purification of water supplies are generally reported in the Journal of the American Water Works Association and other waterworks publications of a technical or professional nature. Statistics and descriptions have been collected for practically all public water-supply systems and purifications plants of the country. (U. S. Public Health Service, 1948).

The general discussions in this report relative to the treatment of public water supplies are of necessity brief and are intended to be mainly explanatory in character as to the data contained herein. The descriptions given of the treatment of some of the individual supplies are incomplete, and others are lacking in detail, but it is hoped that the descriptions that are given will be of some aid to those using the report, and of value in the interpretation and avaluation of the analytical data for each supply.

NATURAL PURIFICATION

It is generally recognized that waters impounded in artificial lakes and reservoirs improve in quality from storage. Suspended matter settles out, and the amount of color and the number of pathogenic and other bacteria decrease. On the other hand, conditions are favorable for the growth of algae and other microorganisms. Sanitary conditions within the catchment area of such supplies are

usually carefully controlled to prevent pollution of the supply.

On account of the great increase in urban population and industrial development, and the resultant pollution of many streams, relatively few places depend on natural purification of their supplies. Chlorine is regularly applied as a safety measure to those supplies that have no other treatment than natural purification.

FILTRATION

Filtration, simply defined, is a process of clearing a liquid of suspended material. Filtration in water treatment and purification is of extreme importance. Sand is usually the filtering medium, and the two principal types of filters are rapid sand filters and slow sand filters. The essential difference between filtration by means of rapid sand filters and slow sand filters is in the treatment of the raw water preceding filtration, the rate of filtration, and the method of cleaning the filters. The preliminary treatment of the raw water is important in the efficient operation of filters of both types. The rate of filtration is as much as 50 times more rapid in the rapid sand filter than in the slow sand filter. The rapid sand filter is cleansed or is washed by reversing the flow of water through the filtering medium, and the slow sand filter by removing and cleaning the top layer of sand.

Other filtering media and other types of filters are used in the treatment of water. Crushed and graded anthracite coal is sometimes used instead of sand and gravel. The rate of filtration through anthracite coal is more rapid than through sand, and the velocity needed for the wash water is lower, but coal is more expensive than sand and gravel. Pressure types of filters with upward or downward flow are used as opposed to the sand filters with gravity flow. Pressure filters may be horizontal as well as vertical in design. Pretreatment of the water is as necessary for the pressure filters as it is for the more conventional type sand filter.

RAPID SAND FILTRATION

The essential processes in the treatment of water where rapid sand filters are concerned are coagulation and sedimentation preceding filtration.

Plain sedimentation.--Plain or primary sedimentation, differentiated from that which follows after the addition of the coagulants to the raw water, is accomplished at many plants by allowing the raw water to stand in large basins or reservoirs for a length of time sufficient for the greater quantity of the suspended material to settle out. Finely divided and colloidal materials do not readily settle out, making it necessary to add coagulants before the filtration process. Plain sedimentation is an important preliminary step in the treatment of turbid waters even where rapid sand filters are used and is absolutely essential where slow sand filters are used, if coagulation is not used prior to filtration. Earlier this was the only treatment given surface waters, but the current practice is not to rely on plain sedimentation as a means of water purification. Impounded reservoir supplies are usually chlorinated as an added precaution when no other treatment is given.

Provisions are usually necessary for the removal of the settled material from reservoirs and basins by operation of sluice gates or other means. Capacity of reservoirs can be greatly lessened by this settled material and the useful life of the reservoir limited.

Coagulation.--To settle out the finely divided solid material, colloidal material, and bacteria and other micro-organisms, it is necessary to apply coagulants to the raw water after plain sedimentation. The most commonly used coagulant is aluminum sulfate, referred to as alum. Ferrous sulfate and ferric sulfate are less commonly used. Other coagulants are ferric chloride, sodium aluminate, sodium silicate, and bentonite. Lime and soda ash as conditioning agents are frequently used in conjunction with coagulants. Activated silica, originally sug-

gested by Baylis (1937) as an aid in coagulation, is finding increasing use as a coagulant in softening plants (Black, 1948) and in other treatment plants (Hay, 1944). Different coagulants have specific merits which must be recognized in selecting the ones to be used. Coagulants, either in dry or liquid form, are fed to the raw water by various regulating feeding devices. The ease in handling and application of the coagulant is sometimes an important consideration in the selection of the coagulant to be used.

The addition of alum in the coagulation process increases the sulfate content, reduces the alkalinity of the water, and tends to leave the water somewhat corrosive. The increase in the sulfate content of the water is of minor significance in the industrial use of the water. The adjustment of the pH of the water is usually necessary before delivery to the mains.

The action of the coagulant is to clump together the suspended material, so that it and most of the coagulant may settle out prior to filtration. Proper coagulation and subsequent settling are very important in the efficient operation of the modern rapid sand filtration plant. The quantity or dosage of coagulant to be added to the raw water was based formerly on the turbidity, later on the alkalinity of the water. Current practice is to determine the proper dosage by trial. Turbidity, pH, temperature of the water, and length of time of mixing are factors to be considered in determining the proper dosage. Finely divided suspended material is more difficult to coagulate than larger particles. Good coagulation is obtained only at definite pH ranges, and in some waters adjustment of pH is necessary. Length of time of mixing and temperature of the water affect coagulation and flocculation, and consequently the dosage required. The variable character of a water and the different types of waters must be considered; strict laboratory control is necessary throughout the whole treatment process.

Mixing and settling basins, filters. --There are various types of mixing basins, the function of which are to mix the chemicals with the water quickly and uniformly so as to bring about the proper flocculation of the coagulant and to keep the water in motion a certain length of time before it enters the settling basins or sedimentation basins. The coagulated water is detained in the settling basins to allow the floc to settle out. The design and arrangement of the settling basins are such that this settled floc or sludge can be removed continuously or periodically. The water finally enters the filters from the settling basins practically free of suspended matter and floc and a great many bacteria and micro-organisms.

The rapid sand filter is usually rectangular in shape, filled to the desired depth with graded gravel and sand, equipped with a system of underdrains to carry off the filtered water, and a means of washing by an upward flow of water.

The rate of flow of water through the filter is usually 2 to 3 gallons per minute per square foot of filter surface. The filtering rate and loss of head at most modern plants are recorded automatically. Washing is necessary when there is loss of head and flow of water through the filter. The washing process consists basically in an upward flow of water through the filter bed at such velocity that the filtering sand layer is agitated sufficiently to clean it of the material to be removed yet without appreciable loss of filter sand. Mechanical means of agitating the sand are sometimes employed during the washing process. The efficient operation of rapid sand filters requires constant attention to give an effluent of high quality.

SLOW SAND FILTRATION

Slow sand filters are the older type of sand filters and are often referred to as the European type, as compared with the rapid sand filters or the American type.

The filtering units are usually of large size requiring much more space, and therefore construction costs are much greater than for rapid sand filters of the same capacity. The rates of filtration range from 2 to 10 million gallons per acre of sand surface per day as compared to the 125 million gallons or more of the rapid sand filter.

Filtration by slow sand filters is definitely limited to waters of low turbidity, usually less than 20 parts (silica standard), of low color, and of low bacterial load. Water from lakes and large reservoirs may be filtered by slow sand filters without

pretreatment.

Slow sand filters are efficient in the removal of taste and odor because biological activity in the filters changes the forms of nitrogen and destroys some forms of organic matter. They can be operated with a minimum of attention. Because of construction costs and the lack of adaptability to waters of changing characteristics and to modifications of treatment of the water, few slow sand filters are being installed today.

DISINFECTION

Chlorine is the chief reagent used in the disinfection of water supplies and is added before delivery of the water to the mains. The quantity of chlorine to be added for effective disinfection depends upon the chlorine demand of the water. This quantity must satisfy the chlorine demand and leave a residual of free available chlorine of about 0.1 to 0.3 part per million. The chlorine residual can be conveniently determined by the well-known ortho-tolidine or ortho-tolidine arsenite test. Once the chlorine residual required for a water, determined by bacteriological check, is known, the chlorine dosage can be controlled to meet this requirement by an automatic feeding device. Excessive chlorination can thus be avoided.

Other agents used in the disinfection of water are chloride of lime, hypochlorites, chloramines, chlorine dioxide, ammonia in conjunction with chlorine, ozone, and ultra-violet light. Some of these agents find special application where control of tastes and odors are concerned, or where the volume of water to be treated is not large.

Prechlorination is practiced in many modern water-treatment plants. Numerous benefits result from the practice and in some instances it is a necessity, especially where control of tastes and odors are involved in the treatment scheme. In practice the chlorine may be added to the water before or with the coagulant. Prechlorination may find special application in waters softened with lime.

Superchlorination is practiced at some plants where the water is heavily polluted or contains taste-producing compounds. If the chlorine is added greatly in excess of the chlorine demand of the water, dechlorination, usually with sulfur dioxide or some of its derivatives, should follow to remove the surplus chlorine before the water enters the mains.

Chlorination does not normally affect the industrial value of the water except as it may affect the taste or odor.

ADJUSTMENT OF pH

Some adjustment of the pH of the water is usually necessary either during the main treatment process or before the filter effluent enters the mains. Finished water of too low pH will aggressively attack iron mains, resulting in the water carrying in solution troublesome quantities of iron, and damage to the mains by pitting and tuberculation. Lime or soda ash is usually used to adjust the pH of the water so that it will not be corrosive. Carbon dioxide is also used to adjust the pH of lime softened waters.

TASTES AND ODORS

One of the requirements of a good drinking water is that it be free of tastes and odors. Tastes and odors do not seriously affect the industrial use of water except in the food and beverage industries.

Tastes and odors in public water supplies may be divided into two general classes --those caused by plant growths of the algal type and those that are due to sewage and to polluting wastes from industrial plants such as coke, gas works, oil refinery, and cannery. The tastes and odors resulting from the growth and destruction of algae are usually accompanied by those resulting from decaying vegetation, such as

leaves, grass, and roots, and from bacterial slimes. The tastes and odors resulting from sewage and industrial pollution may be due to the tastes and odors of the polluting substances themselves or may be produced as a direct result of the presence of these substances in the water in the treatment process. These tastes and odors may be described as organic, medicated, or phenolic.

Various methods are used in the prevention and elimination of tastes and odors. Aeration is sufficient in some instances. Effective algicides are copper sulfate and chlorine, the latter either in elemental form or as calcium hypochlorite. But it must be emphasized that the growth of algae should be prevented or controlled, for the tastes and colors resulting from too great a destruction of algae is often worse than those produced by the algae in their life cycle. Activated carbon, usually added along with coagulants, is used at many plants. It may also be applied to reservoirs. Heavy application of chlorine in prechlorination or superchlorination is used in preventing so-called phenolic tastes as well as those resulting from heavy pollution. Ammonia, in conjunction with chlorine, also is used for the same purpose. In recent years chlorine dioxide is finding increasing application in the prevention and control of tastes and odors. (Aston, 1950.) The whole problem of prevention and elimination of tastes and odors is complicated.

IRON AND MANGANESE REMOVAL

Surface-water supplies, generally, have very little iron in solution. Some streams, however, receiving industrial wastes or acid mine drainage may carry objectionable quantities of iron and manganese as well. Some surface waters containing complex organic acids or substances may carry in solution considerable quantities of iron.

Many ground waters contain considerable quantities of iron dissolved from soil and rock material by carbon dioxide in solution in the water, in the absence of oxygen, as ferrous carbonate. Iron in solution as a result of oxidation of iron pyrites is present as ferrous sulfate. Organic acids in ground water may contribute to the solution of the iron. Many ground waters containing considerable quantities of iron frequently contain objectionable quantities of manganese.

The occurrence of iron in ground waters cannot be predicted with any degree of certainty. Samples of water from wells of about the same depth and in close proximity may differ decidedly in their iron content.

The principle of iron removal is simple but no single method may be entirely satisfactory because of the presence of other constituents, such as organic matter, manganese, and carbon dioxide. Iron in solution in the water in the ferrous condition is oxidized by aeration to ferric hydrate, which settles out. Surface-water supplies, because of natural aeration, require very little attention to iron removal. The regular treatment that is given most surface supplies and the aeration incident thereto is generally sufficient to remove most of the iron. If the water is softened, both iron and manganese are removed in the process. Some treated waters may dissolve iron from the distribution mains and service pipes.

Aeration followed by settling, and filtration through sand or fine gravel, will generally remove iron from most ground waters. Aeration not only brings the iron in water in contact with dissolved oxygen but releases carbon dioxide also, thus the precipitation of the iron is hastened. Aeration and oxidation may be accomplished by means of sprays, cascades, perforated trays, contact beds of coke, broken pebbles, coal, or some such material.

Manganese is not oxidized as readily as iron and a method of treatment that may be effective for iron removal may not be satisfactory for manganese removal. Manganese may be oxidized by chlorine, and catalytic manganese dioxide (Zapffe, 1933) deposited on contact beds of coke, coal, crushed stone, and the like. Such treatment followed by filtration effectively removes manganese. Carefully planned treatment is necessary for satisfactory removal of both iron and manganese (Nordell, 1951.)

Cation-exchange units will remove iron and manganese from waters provided the iron and manganese are in the soluble reduced state. Any prior oxidation of the iron before the water enters the exchange unit will result in the deposition of

oxidized iron on the exchanger, thus interfering with its effective action. These units are adaptable to the treatment of some well waters.

MUNICIPAL SOFTENING

Numerous data are available showing the value of the use of soft water and softened water supplies relative to soap consumption (Olson, 1939). The savings resulting from decreased soap consumption in many instances are sufficient to pay for the cost of softening the whole supply. Savings from decreased soap consumption is only one of the values resulting from the use of a softened public water supply. Many industries require soft process water and would be attracted to places where adequate supplies of such water are available.

The practice of softening of public water supplies is not new. (Baker, 1948.) It might be said as far as this country is concerned that it centered at Columbus, Ohio, because of the research carried on and the practices developed at the plant at that city. (Hoover, 1927, 1928, 1943.) The practice of softening public supplies has increased considerably since 1932. (Olson, 1945.)

A number of factors are involved in the proper selection of the method of softening water supplies, chief of which are the physical and chemical characteristics of the water and the extent of the reduction of the hardness. The softening process involves the removal by chemical precipitation or cation exchange of those substances in the water, principally calcium and magnesium, that cause hardness.

The larger municipalities use lime or the lime-soda ash process in softening their supplies. Lime is effective in removing carbonate hardness but soda ash in addition to lime is usually used to remove noncarbonate hardness. Excess lime serves the same purpose as soda ash in the excess lime treatment process. These methods of softening are used where the water generally requires filtration, volume demand is large, and competent technical supervision is provided.

Lime-softened waters are unstable (Hoover, 1942) being supersaturated with the normal carbonates of calcium and magnesium, and require recarbonation to prevent these carbonates from crystallizing out on the sand grains of a filter eventually destroying its effectiveness as a filter, or in the mains of the distribution system, lessening its capacity. When excess lime is used in the softening process, the softened water contains caustic alkalinity, and carbon dioxide is usually used to neutralize the excess lime. Phosphates are also used in stabilizing lime-softened waters.

The cation-exchange method of softening (Streicher and Bowers, 1950) involves the exchange of calcium and magnesium in the water for sodium in the exchange material. The exchange material when exhausted is regenerated with a solution of sodium chloride (common salt). Sea water or natural brines are used at a few plants. The operation of a cation-exchange softening plant requires less attention and less expert control than a lime or lime-soda ash softening plant. It is adaptable to those supplies where the water is relatively free of suspended matter and excessive quantities of iron and manganese and where the volume demand is not generally large.

It is not practical or desirable to soften a supply completely, although this is possible with a cation-exchange softener. At a few places this type of softener is used in conjunction with lime softening, employing what is known as split treatment. (Streicher, 1945.) Split treatment is used also in softening some groundwater supplies. In this method of treatment a portion of a supply may be completely softened by cation exchange, and then raw water, unsoftened water, or partially softened water may be mixed with it in such volume as to produce an effluent of a definite hardness.

Lime reduces the quantity of dissolved solids in water in the softening process; soda ash and cation exchangers do not.

The equipment required in water-softening plants using lime approximates that used in the filtrations plants of the rapid sand type. Greater facilities for handling chemicals are needed; some means for the production of carbon dioxide are required; and facilities for handling sludge are necessary. (American Water Works Assn., 1949). Some plants are recalcining the sludge and reusing the

lime or selling it for agriculture use.

Data in Water Supply Paper 658 in 1932 showed that of the 670 places in that report, 40 were furnished with softened water, representing a total population of 4,065,000, 7.2 percent of the total population of the 670 places, and 3.4 percent of the total population of the country. Data in table 11 of this report show that 171 places are furnished with softened water, representing a total population of 14,506,000, or 16.5 percent of the total population of the 1,315 places in this report and 9.6 percent of the total population of the country. Of the 670 places in Water Supply Paper 658 and also in this report, 85 places now have softened supplies. Thus 86 of the total of 171 places that have softened supplies are among the 645 places in this report but not in Water Supply Paper 658. These 645 places are small in population in comparison with the 670 places.

In this report the hardness of the public supplies that are softened ranges from less than 50 parts per million to about 150 parts. For many large supplies the hardness ranges between 70 and 85 parts. About one-third of the total population of the places in this report that receive softened water, receive water having a hardness greater than 100 parts per million. Many laundries and industrial plants require softer water than that furnished as public supplies and find it profitable and necessary to further soften. Municipalities can well afford to give more attention to softening of supplies to effect greater economies and satisfaction in the use of the water.

FLUORIDES AND FLUORIDATION

It was discovered about two decades ago that fluoride in drinking water caused the dental defect known as mottled enamel. (Churchill, 1931; Smith, Lantz, and Smith, 1931.) Through much study and observation as a result of this discovery the limit of fluoride concentration, below which mottling does not usually occur, was fairly well established. (Dean, 1936.) It was observed also that the prevalence of dental caries in areas where mottled enamel was endemic was no greater, in many instances less, than in areas where fluoride was not naturally present in the water supplies. (Dean, 1938.) Further study and observations along this line by Dean and his associates showed that there was a very definite relationship between fluoride in the water supplies and the prevalence of dental caries in the permanent teeth of children. (Dean, Jay, Arnold, and Elvove, 1941.) These and other studies showed that fluoride concentrations of about 1.0 to 1.5 parts per million in the water supplies, concentrations below which mottling of the enamel does not usually occur, greatly lessened the incidence of dental caries in the permanent teeth of children using the water. Other investigations showed also that fluoride compounds topically applied to the tooth surfaces of children's teeth lessened the incidence of caries (Knutson and Armstrong, 1943).

The results of these numerous studies and investigations naturally led to the question of fluoridation of water supplies in order to prevent or lessen the incidence of caries in the permanent teeth of children. Fluoridation has much support from dental and health associations. (Amer. Water Works Assn., 1952). In a news release of June 1, 1950, Assistant Surgeon General Bruce D. Forsyth of the U. S. Public Health Service, said:

"Artificial fluoridation of communal water supplies has been found to be effective in reducing the incidence and prevalence of dental caries among children as does water naturally containing fluorides. As a result of new evidence from its Grand Rapids project where community water has been fluoridated since January 25, 1945, the Public Health Service has now altered its basic policy to read: 'Using scientific methods and procedures, communities desiring to fluoridate their communal water supplies should be strongly urged to do so' ".

The compounds now most generally used for fluoridating public water supplies are sodium fluoride and sodium silicofluoride. Sodium fluoride is much more soluble than sodium silicofluoride, but it is much more costly per unit weight. Hydrofluosilicic acid is less frequently used, and hydrofluoric acid is rarely used. Because hydrofluoric acid is highly corrosive, its application requires considerable care.

The quantity of fluoride added to the water supply is such that the concentration as the fluoride ion generally ranges between 0.7 and 1.3 parts per million. The quantity of fluoride ingested by an individual will depend upon the quantity of water used by the individual and the fluoride content of the water. This quantity is further related to climatic conditions and the characteristics of the individual as to need for water. Some supplies may require only 0.7 part per million, whereas others may require nearly up to the permissible maximum of 1.5 parts. (U. S. Public Health, 1946.) The quantity of fluoride naturally present in the supply must be taken into account in fluoridating the supply. Some fluoride is removed by alum in the coagulation process in the regular treatment of public supplies and a larger quantity if the supply is softened, therefore, the application of the fluoride should be at such place in the treatment scheme so as not to be removed.

The practice of fluoridation has gained considerable impetus in the past 2 years (1951-52). At the time of the collection of most of the data on the supplies for the places in this report about 70 supplies were being fluoridated or facilities were under construction for fluoridating. However, since the collection of the data, and as of the end of the year 1952, reliable statistics (Amer. Water Works Assn., 1953) indicate that of the places in this report 155 were receiving fluoridated water, representing a population of about 12 million people or about 14 percent of the total population of all the places included in this report.

Table 17 shows the number of places and the population using water with different concentrations of fluoride from large public supplies at the time of the collection of these data. The table shows among other things that about 85 percent of the total population of the places in this report used water with a concentration of fluoride in the range of 0.0 to 0.5 part per million. A population of about 7 million people used water with a concentration of fluoride in the range of 0.6 to 1.5 parts per millions. Such a range of concentration of fluoride will include practically all those supplies that were being fluoridated at the time and in addition those supplies with natural fluoride of that range of concentration.

Table 17.--Number of places and population, in thousands, using water with different quantities of fluoride from large public supplies in the United States, 1952

Fluoride (ppm)	Surface supplies		Ground supplies		Mixed supplies		All supplies		Percent of total
	Places	Population	Places	Population	Places	Population	Places	Population	
<0.6	628	55,604	368	10,661	117	8,538	1,113	74,803	85.2
.6 - 1.0	39	3,991	56	2,120	6	132	101	6,243	7.1
1.1 - 1.5	10	412	16	302	3	52	29	766	.9
1.6 - 2.0	2	34	9	164	--	--	11	198	.2
2.1 - 3.0	1	65	5	149	--	--	6	214	.2
>3.0	--	--	6	136	--	--	6	136	.2
Not reported	31	4,238	12	863	6	365	49	5,466	6.2
Total	711	64,344	472	14,395	132	9,087	1,315	87,826	100

INDUSTRIAL TREATMENT OF WATER FROM PUBLIC SUPPLIES

The treatment that is given to a public water supply is planned primarily to give a water that is safe to drink and that is free from pathogenic bacteria, without too much regard for other uses of the water. The water may be generally satisfactory for most domestic uses, but many public supplies are far from satisfactory for many industrial uses. The additional treatment that may be required may range from almost nothing to that which includes sand filtration, softening, and corrosion control.

BOILER FEED WATER

One of the common uses of water from public supplies is in steam boilers for

the production of power and heat. Large boilers carrying high steam temperatures and pressures require water of rather exacting standards of quality. Table 18 suggests quality-tolerance limits for boiler-feed waters.

Table 18.--Suggested water-quality tolerance for boiler-feed water a/

	Allowable limits, in parts per million, for indicated pressure in lb/sq. in.			
	<150	150-250	250-400	>400
Oxygen consumed	15	10	4	3
Dissolved oxygen b/	1.4	.14	.0	.0
Hydrogen sulfide (H_2S)	c/5	c/3	0	0
Total hardness as $CaCO_3$	80	40	10	2
Aluminum oxide (Al_2O_3)	5	.5	.05	.01
Silica (SiO_2)	40	20	5	1
Bicarbonate (HCO_3) b/	50	30	5	0
Carbonate (CO_3)	200	100	40	20
Hydroxide (OH)	50	40	30	15
Total solids d/	3,000-500	2,500-500	1,500-100	50
Turbidity	20	10	5	1
Color	80	40	5	2
Sulfate-carbonate ratio (A. S. M. E.) (Na_2SO_4:Na_2CO_3)	1:1	2:1	3:1	3:1
pH value (minimum)	8.0	8.4	9.0	9.6

a/Moore, E. E., Progress report of the committee on quality tolerances of water for industrial uses: New England Water Works Assoc. Jour., v. 54, p. 263, 1940.

b/Limits applicable only to feed water entering boiler, not to original water supply.

c/Except when odor in live steam would be objectionable.

d/Depends on design of boiler.

The treatment of boiler water has received much attention generally. Details on the methods of treating water supplies for boiler feed, and on boiler-operating practices are found in books and papers on the subject. (Brown, 1946; Betz, 1953).

SCALE, CORROSION, EMBRITTLEMENT, FOAMING, AND PRIMING

Scaling in boilers and indirectly hardness in water supplies receive much attention in the treatment of boiler-feed waters. Scale consists of mineral deposits on boiler surfaces; it is composed principally of compounds of calcium and magnesium with usually smaller quantities of other substances such as silica and iron. Mineral matter in the boiler-feed water becomes greatly concentrated in the boiler; slightly soluble substances precipitate, and under the influence of heat, may be baked on the boiler surfaces as scale or carried as sludge in the boiler water.

Scale formed as a result of carbonate hardness in the water is usually more porous and less adherent than the scale formed as a result of noncarbonate-hardness minerals. Both may become hard and adherent because of the presence of some cementing material like silica or from conditions prevailing in the boiler. Silica scale, itself, is hard and adherent and of low thermal conductivity. Much use is made of phosphate compounds in the treatment of boiler waters in scale prevention and control. Silica may be removed by magnesium compounds in conjunction with hot lime or hot lime-soda softening.

Corrosion would result in a boiler from the use of a water containing noncarbonate hardness caused by the chlorides and nitrates of calcium and magnesium or by free acid. Such waters are rarely served to the public or used in boilers

without treatment. Dissolved gases--oxygen, carbon dioxide, ammonia--originally present in the boiler water, in the returned condensate, or formed as a result of the treatment, may corrode boilers. These gases may be removed by aeration or by daerating heaters. Controlled "causticity" or hydroxide concentration in boiler waters is important in the prevention of corrosion.

"Caustic embrittlement" or cracking of the boiler plate, a controversial subject for many years, may result from maintaining too high a causticity in the boiler water or from the use of waters containing considerable quantities of sodium bicarbonate or carbonate either originally present or as a result of treatment. It has been regarded by some as fundamentally due to poor boiler construction. The development of the embrittlement detector by the U. S. Bureau of Mines has facilitated the study of caustic embrittlement. (Schroeder and Berk, 1941.)

To prevent this type of failure, emphasis was formerly placed on the proper ratio of sulfate to carbonate in the boiler water; later investigations, however, have shown that the recommended ratios may not necessarily protect against embrittlement. (Berk and Schroeder, 1943.) Sodium nitrate and quebracho tannin (Bureau of Mines, 1951) are successfully used to prevent this type of failure. Simultaneous control of pH and of phosphate concentration in the boiler water may prevent embrittlement and is applicable where the water is primarily evaporated makeup or condensate.

Foaming and priming, associated activities in boiler waters, are attributed to a number of causes, some of which may be in the structural design and operation of the boiler itself. Foaming is generally attributed to too great a concentration in the water of soluble compounds of sodium and the presence of finely divided solids in suspension in the water. The standard method of controlling this condition, although sometimes not the most economical, is by blowdown to reduce the concentration of dissolved solids and to remove some of the sludge. Effective organic antifoam agents, such as polymerized esters, alcohols, and amides, have been developed in recent years. The insolubility of some of these agents in water makes it necessary to disperse them with other agents in feeding. Priming is usually the result of careless operation of the boiler.

SOFTENING

Municipal supplies when softened with lime and soda ash may contain anywhere from 25 to 100 parts per million or more of hardness. It is possible with the use of the cation-exchange type of softener to produce a completely softened water. However, for economical reasons this is rarely done in practice, except in the split treatment or in conjunction with lime softening. Many municipal supplies, even when softened, therefore, require softening for satisfactory use in boilers. The methods of softening employed may be hot lime, hot lime-soda ash, hot phosphate, and cation exchange. The method selected depends upon a number of factors, chief of which are character of the water, volume of water required, further treatment necessary after softening, and the conditions under which the boilers are operated.

INTERNAL TREATMENT

The practice of introducing chemicals in the water within the boiler to condition the water or make its use possible is known as internal treatment. (Blanning and Rich, 1934.) The practice began because of the inadequacy, in part, of the lime-soda softening or because of no treatment at all of waters used in boilers. Hardly any external treatment is adequate protection against scale formation of some kind; therefore the necessity for internal treatment.

These boiler compounds are both inorganic and organic in composition. They are used for the control of concentrations of carbonate and silica to prevent scale formation, corrosion, and such. The phosphate compounds, for example, are much used in the treatment of water that has already been softened with lime and

soda ash, or not softened at all, to further soften it and to prevent the formation of calcium scale in the boiler. Organic compounds such as tannin, lignin, agar, and starches are used in internal treatment. They are thought to have a dispersing action on inorganic precipitates or to exert to some extent a coating action on inorganic precipitates, decreasing their tendency to cohere and also adhere to the boiler surface.

Internal treatment may be used successfully where the water supply is only moderately hard and the boiler is operated at a moderate pressure and not at too high a rating. Internal treatment, rather than being a "cure all" for boiler operation difficulties, should supplement the rather thorough external treatment of the boiler water.

WATER FOR INDUSTRIAL PROCESSES

The use of huge volumes of water by industry demonstrates the extreme importance of water to industry, whether the water is used as an ingredient in the production of other materials, as a cleansing agent, or for cooling. Each industry requires a process water of characteristics peculiar to that industry, therefore, the requirements as to quality of process water are so varied that a water or a method of treatment that is entirely adequate for one process may not be suitable for another. (Nordell, 1951.) The following tables set forth some requirements as to both quantity and quality of water for a number of industrial uses.

Table 19.--Industrial requirements for water a/

Item	Unit	Water required (gal. per unit)	Item	Unit	Water required (gal. per unit)
Airplane engine	to test	50,000-125,000	Milk:		
Alcohol	gal.	100	Receiving station		180
Aluminum	lb.	160	Bottling works		250
Aviation gas	gal.	7-10	Cheese factory		200
Brewing:			Creamery	1,000 raw lb.	110
Beer	1 bbl.	470	Condensery		150
Whiskey	gal.	80	Dry milk factory		150
Buildings:			General dairy		340
Office	person	b/27-45	Oil, edible	gal.	22
Hospital	bed	b/135-350	Oil field	100 bbl. crude	18,000
Hotels	guest room	b/350-525	Oil refining	100 bbl.	77,000
Laundries:			Paper:		
Commercial	lb. "work"	4.3-5.7	Paper mill	1 ton	39,000
Institutional	lb. "work"	3	Pasteboard		14,000
Restaurants	meal	0.5-4.0	Strawboard		26,000
Butadiene	lb.	160	Deinking		83,000
Canning:			Paper pulp:		
Apricots	100 cases No. 2 cans	8,000	Ground wood	1 ton dry	5,000
Asparagus		7,000	Soda		85,000
Beans:			Sulfate		64,000
Green		3,500	Sulfite		60,000
Lima		25,000	Poultry	1 bird	b/1
Pork and		3,500	Rail freight	ton-mile	0.1
Beets		2,500	Records	1 disc	2.4
Corn		2,500	Smokeless powder	ton	50,000
Grapefruit:			Soap factories	ton	500
Juice		500	Steam power	ton of coal	c/60,000-120,000
Sections		5,600	Sugar refineries	lb.	0.5
Peaches, pears		6,500	Tanning:		
Peas		2,500	Vegetable	100 lb. raw hide	800
Pumpkin, squash		2,500	Chrome	100 lb. raw hide	800
Sauerkraut		300	Textile:		
Spinach		16,000	Cotton:		
Succotash		12,500	Sizing		820
Tomatoes:			Desizing		1,750
Products		7,000	Kiering		1,240
Whole		750	Bleaching		300
Cement	ton	750	Souring		3,400
Coke	100 tons	360,000	Mercerizing		30,000
Distilling, grain:			Dyeing:		
Combined wastes	1,000 bu. grain mashed	600,000	Basic	1,000 lb. processed	18,000
Thin slop			Direct		6,400
Tailings			Vat		19,000
Evaporator condensate			Sulfur		5,400
Distilling, molasses	1,000 gal. 100 proof	8,400	Developed		14,400
Distilling, cooling water	1,000 gal. 100 proof	120,000	Naphthol		4,800
Electric power	kw.	80	Aniline black		15,600
Explosives	lb.	100+	Print works		4,500
Gasoline	gal.	7-10	Finishing		6
Iron ore (brown ore)	ton	1,000	Knit goods	lb. bleached	8
Meat:			Rayon manufacture	1,000 lb. produced	135,000-160,000
Packing house	100 hogs killed	550	Rayon hosiery	1,000 produced	9,000
Slaughterhouse	100 hogs killed	550	Woolens	1,000 lb. finished	70,000
Stockyards	1 acre	160			

a/Jordan, H. E., Industrial requirements for water: American Water Works Assoc., v. 38, p. 66-67, 1946.
b/Per day.
c/60,000 for recirculating systems, 120,000 for nonrecirculating systems.

Table 20.--Suggested water-quality tolerances a/
(Allowable limits in parts per million)

Industry or use	Turbidity	Color	Hardness as $CaCO_3$	Iron (Fe)	Manganese (Mn)	Total solids	Alkalinity as $CaCO_3$	Odor, Taste	Hydrogen sulfide	Other requirements b/
Air conditioning	--	--	--	c/0.5	0.5	--	--	low	1	No corrosiveness, slime formation.
Baking	10	10	--	c/.2	.2	--	--	low	.2	P.
Brewing:										
Light beer	10	--	--	c/.1	.1	500	75	low	.2	P. NaCl less than 275 ppm (pH 6.5-7.0.)
Dark beer	10	--	--	c/.1	.1	1,000	150	low	.2	P. NaCl less than 275 ppm (pH 7.0 or more).
Canning:										
Legumes	10	--	25-75	c/.2	.2	--	--	low	1	P.
General	10	--	--	c/.2	.2	--	--	low	1	P.
Carbonated beverages	2	10	250	.2	.2	850	50-100	low	.2	P. Organic color plus oxygen consumed less than 10 ppm.
Confectionery	--	--	--	c/.2	.2	100	--	low	.2	P. pH above 7.0 for hard candy.
Cooling	50	--	50	c/.5	.5	--	--	--	5	No corrosiveness, slime formation.
Food: General	10	--	--	c/.2	.2	--	--	low	--	P.
Ice	5	5	--	c/.2	.2	--	--	low	--	P. SiO_2 less than 10 ppm.
Laundering	--	--	50	c/.2	.2	--	--	--	--	
Plastics, clear, uncolored	2	2	--	c/.02	.02	200	--	--	--	
Paper and pulp:										
Groundwood	50	20	180	c/1.0	.5	--	--	--	--	No grit, corrosiveness.
Kraft pulp	25	15	100	c/.2	.1	300	--	--	--	
Soda and sulfite	15	10	100	c/.1	.05	200	--	--	--	
High-grade light papers	5	5	50	c/.1	.05	200	--	--	--	
Rayon (viscose):										
Pulp production	5	5	8	c/.05	.03	100	total 50; hydroxide 8	--	--	Al_2O_3 less than 8 ppm, SiO_2 less than 25 ppm, Cu less than 5 ppm.
Manufacture	.3	--	55	.0	.0	--	--	--	--	pH 7.8 to 8.3.
Tanning	20	10-100	50-135	c/.2	.2	--	total 135; hydroxide 8	--	--	
Textiles: General	5	20	--	.25	.25	--	--	--	--	
Dyeing	5	5-20	--	c/.25	.25	200	--	--	--	Constant composition. Residual alumina less than 0.5 ppm.
Wool scouring	--	70	--	c/1.0	1.0	--	--	--	--	
Cotton bandage	5	5	--	c/.2	.2	--	--	low	--	

a/Moore, E. W., Progress report of the committee on quality tolerances of water for industrial uses: New England Water Works Assoc. Jour., v. 54, p. 271, 1940.
b/P indicates that potable water, conforming to U. S. Public Health Service standards, is necessary.
c/Limit given applies to both iron alone and the sum of iron and manganese.

Water that is used in the processing of foods and beverages must be safe for drinking, that is, free of pathogenic bacteria. Water that is used in washing and rinsing of food products prior to the actual processing should be free of pathogenic bacteria and other organisms that might subsequently cause food spoilage.

The most common improvement made in water from public supplies for use in industrial processes is softening. Softening may be accomplished by the methods used for boiler waters plus any other treatment necessary to meet specific requirements. Softening by cation exchange is practicable and profitable for laundries.

Water used for baking should be free of substances that might produce undesirable tastes, odors, and colors. Too much hardness in the water retards fermentation processes, although some calcium is necessary for some yeast action, and too little softens the gluten resulting in soggy bread. Water of zero hardness is used in making certain bakery products.

The quality of the water used in brewing (Pozen, 1940) affects considerably the final product. Waters low in alkalinity and comparatively high in calcium sulfate are desirable. Moderate quantities of chlorides also seem to be beneficial. Water used in the production of carbonated beverages should be free of suspended matter, color, tastes and odors, iron, manganese, and must be low in alkalinity because of the acid nature of the product. (Gullo, 1951.)

Process water for canning and freezing of foods should be free of tastes and odors, color, organic matter, iron, and manganese. Hardness causes toughening of some foods, such as peas and beans, and may cause deposits on others. (Lancefield, 1938.)

Water used in the manufacture of ice should be free of iron, manganese, tastes and odors, and should be low in dissolved solids. (West, 1944.) Calcium and magnesium can be rather easily removed, but the remaining salts are almost as troublesome as calcium. The use of demineralizing resins or distillation may be resorted to in order to remove certain elements not removed in ordinary treatment. The upper concentrations limits of minerals in water used in ice manufacture will depend to some extent on the practices followed in the actual freezing process itself.

Process water used in the manufacture of textiles and fine paper should be practically free of suspended matter, color, iron, and manganese. Iron and manganese cause staining, and color may be adsorbed resulting in an inferior product (Miller, 1944). Hardness interferes in washing operations, dyeing of fabrics, and in sizing of paper, although it is reported that some hardness is desirable in water used for scouring of wool.

Corrosion and scaling would result from the use of many public water supplies in cooling systems (Powell, 1948.) Corrosion may be lessened by the adjustment of the pH of the supply and the use of protective coatings for the pipes. Scale formation may be minimized by the use of organic inhibitors such as tannin or by treatment with phosphates and silicates.

DOMESTIC TREATMENT OF WATER FROM PUBLIC SUPPLIES

The treatment given to public water supplies undoubtedly is receiving more attention today than ever before. Domestic users and industry in general have more or less indirectly demanded this increased attention to treatment. The sanitary conditions of many streams and lakes are such that increased treatment of the supplies is required to make them satisfactory as public supplies. Many public supplies may be further improved by treatment for household use.

Hardness is objectionable in many public supplies and the installation of domestic softeners is often desirable as a matter of economy and satisfaction in the use of the water. The savings resulting from softening in decreased soap consumption, smaller plumbing repair bills, and longer life of hot-water heating equipment often more than pay for such equipment. Even where public supplies are softened in very hard water areas it is often desirable to further soften them in the home.

The cation-exchange type of softener is especially adapted for use in homes. Low cost of installation and simplicity of operation, in some types automatic, are attractive features, aside from the fact of being capable of delivering completely softened water which is so desirable in cleaning and laundering. The sodium cation exchanger in operation removes calcium and magnesium from the water in exchange for the sodium in the exchange material. This reaction is reversible. When the exchange material's capacity for softening is exhausted, it is regenerated by treating the exchange material with a solution of sodium chloride (common salt). Sodium from the salt solution is taken up by the exchange material and calcium and magnesium are released. Excess salt solution is washed out and the exchanger is ready again for softening.

Where public supplies are not softened, softening or conditioning agents, such as ammonia, borax, sodium carbonate, and such are much used in cleansing and laundering in the home. Trisodium sodium phosphate under various trade names is much used in this respect. Synthetic detergents, "soapless soaps", have recently been developed and are finding special application not only in the home but in industry as well. These agents, in common with soaps, possess properties of wetting, dispersing, and emulsifying, although they may not be equally effective for all three purposes. They are produced in greater variety than soaps, more specifically suited to an express purpose under a variety of conditions, are finding ready markets, and are replacing soaps for many purposes. (Larson, 1949.)

Home equipment is available from plumbing establishments and manufacters of water-conditioning equipment for control of corrosion in water pipes to prevent "red water" troubles. Most of these are designed to raise the pH of the water supply to make it less aggressive to metal surfaces.

Equipment or devices for elimination of tastes and odors may be used to some extent in homes, although it is not generally practicable to do much in a home to improve the taste or odor of a public supply.

PUBLICATIONS

The following reports contain information relating to the quality of the surface water of the United States and to the public water supplies of the United States and of several States. The reports were prepared by the U. S. Geological Survey or by the Survey with cooperating State agencies. Most of the reports listed are available for consultation in the larger public and institutional libraries. Copies of Geological Survey publications, except circulars, still in print may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., who will furnish lists and prices upon request. Publications out of print are preceded by an asterisk. Circulars may be obtained free of charge on application to the Director, U. S. Geological Survey, Washington 25, D. C., as long as stocks are available.

WATER-SUPPLY PAPERS

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912. Industrial utility of public water supplies in Georgia, 1940.
942. Quality of surface waters of the United States, 1941.
950. Quality of surface waters of the United States, 1942.
970. Quality of surface waters of the United States, 1943.
1022. Quality of surface waters of the United States, 1944.
1030. Quality of surface waters of the United States, 1945.
1047. Public water supplies in Eastern Texas.
1050. Quality of surface waters of the United States, 1946.
1069. Public water supplies in Central and North-Central Texas.
1070. Public water supplies in Southern Texas.
1102. Quality of surface waters of the United States, 1947.
1106. Public water supplies in Western Texas.
1132. (Parts 1-6) Quality of surface waters of the United States, 1948.
1133. (Parts 7-14) Quality of surface waters of the United States, 1948.
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*197. The industrial utility of public water supplies in the East South Central States, 1952.
*203. The industrial utility of public water supplies in the Mountain States, 1952.
*206. The industrial utility of public water supplies in the West North Central States, 1952.

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*232. The industrial utility of public water supplies in the Pacific States, 1952.
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*269. The industrial utility of public water supplies in the South Atlantic States, 1952.
*283. The industrial utility of public water supplies in the Middle Atlantic States, 1952.
*288. The industrial utility of public water supplies in the New England States, 1952.

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DESCRIPTIONS AND ANALYSES OF PUBLIC WATER SUPPLIES IN THE STATES EAST OF THE MISSISSIPPI RIVER

ALABAMA

ANDALUSIA
(Population, 9,162)

Ownership: Water Works Board of Andalusia; also supplies about 450 people outside the city limits. Total population supplied, about 9,600.
Source: 5 wells (1 to 5). Wells 1, 2, and 3 are 300 to 350 ft deep; wells 4 and 5 635 ft deep; yield reported to be 200, 75, 110, 500, and 500 gpm, respectively.
Treatment: None.
Storage: 200,000 gal.

Wells 1 and 4 are used most of the time. Well 4 furnishes about 75 percent of the supply.

ANALYSES

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

	Well 1	Well 4		Well 1	Well 4
Silica (SiO_2)	13	8.3	Hardness as $CaCO_3$:		
Iron (Fe)	.00	.00	Total	115	14
Manganese (Mn)	.00	.00	Noncarbonate	12	0
Calcium (Ca)	34	3.9			
Magnesium (Mg)	7.4	1.0	Color	5	7
Sodium (Na)	1.6	98	pH	7.7	8.2
Potassium (K)	1.1	2.5	Specific conductance (micromhos at 25 C.)	213	403
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	126	254			
Sulfate (SO_4)	7.2	1.5	Turbidity	1	2
Chloride (Cl)	3.2	13	Temperature (F.)	71	73
Fluoride (F)	.0	.1	Date of collection	Oct. 23, 1951	Oct. 23, 1951
Nitrate (NO_3)	.6	.2			
Dissolved solids	130	254			

Depth (feet)	300-350	635
Diameter (inches)	6	8
Date drilled	--	1948
Percent of supply	--	75

ANNISTON
(Population, 31,066)

Ownership: Municipal; supplies unincorporated communities of Oxford and Blue Mountain, and other suburban districts. Total population supplied, about 58,600.
Source: Cold Water Spring, about 7 miles southwest of the city.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 8,000,000 gal.

ANNISTON--Continued

ANALYSIS

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

	Tap sample		Tap sample
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.25	Total	104
Manganese (Mn)	.00	Noncarbonate	3
Calcium (Ca)	22		
Magnesium (Mg)	12	Color	5
Sodium (Na)	2.1	pH	7.5
Potassium (K)	1.6	Specific conductance (micromhos at 25 C.)	191
Carbonate (CO_3)	0	Turbidity	2
Bicarbonate (HCO_3)	124	Temperature (F.)	70
Sulfate (SO_4)	2.8	Date of collection	Oct. 18, 1951
Chloride (Cl)	2.2		
Fluoride (F)	.0		
Nitrate (NO_3)	.9		
Dissolved solids	118		

AUBURN
(Population, 12,939)

Ownership: Municipal.
Source: Moores Mill Creek, impounded, and 2 wells, one of which flows into the water plant and furnishes 6 percent of the supply. Chewacla Creek, impounded, auxiliary supply.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 1,440,000 gpd.
Raw-water storage: --
Finished-water storage: 825,000 gal.

The treatment plant is $2\frac{1}{2}$ miles southeast of the city.

ANALYSES

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

	Moores Mill a Creek	Finished water (comp.)		Moores Mill a Creek	Finished water (comp.)
Silica (SiO_2)	6.5	6.1	Hardness as $CaCO_3$:		
Iron (Fe)	.94	.02	Total	14	49
Manganese (Mn)	.02	.00	Noncarbonate	0	18
Calcium (Ca)	3.2	16			
Magnesium (Mg)	1.5	2.1	Color	25	5
Sodium (Na)	2.9	2.9	pH	6.8	8.7
Potassium (K)	2.7	2.7	Specific conductance (micromhos at 25 C.)	45.0	110
Carbonate (CO_3)	0	--	Turbidity	2	1
Bicarbonate (HCO_3)	20	b 37	Temperature (F.)	70	71
Sulfate (SO_4)	2.2	13	Date of collection	Oct. 22, 1951	Oct. 22, 1951
Chloride (Cl)	3.2	7.2			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.5	.7			
Dissolved solids	34	70			

[a] Raw water.
Includes the equivalent of less than 5 ppm of carbonate (CO_3).

BESSEMER
(Population, 28,445)

Ownership: (See Birmingham.) Supplies about 2,700 people outside the city limits. Total population supplied, about 31,150.

BIRMINGHAM
(Population, 326,037)

Ownership: Municipal; supplies also Bayview, Bessemer and its suburban area, Edgewater, Fairfield, Fultondale, Graysville, Homewood, Mountain Brook, Tarrant City, and number of other communities. Total population supplied, about 426,000.

Source: Domestic supply: Cahaba River, Little Cahaba River with impounded reservoir (Lake Purdy) and Inland Lake (owned by Birmingham Industrial Water System from which raw water is purchased).
Industrial supply: Blackburn Fork of the Black Warrior River impounded in Inland Lake (21 billion gal capacity).

Treatment: Domestic supply: Cahaba River and Lake Purdy (Shades Mountain plant) plain sedimentation, prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and lime for adjustment of pH to 8.2 to 8.4. Inland Lake purchased water, (Birmingham Station plant) prechlorination, coagulation with alum, lime for manganese removal, sedimentation, rapid sand filtration, and postchlorination. Industrial supply: Inland Lake-chlorination (approximately 1.0 ppm of chlorine), and application of soda ash (approximately 3.0 ppm).

Rated capacity of treatment plants: Shades Mountain plant, 55,000,000 gpd; Birmingham Station plant, 12,000,000 gpd.

Raw-water storage: 5,682,000,000 gal.

Finished-water storage: 4,500,000 gal.

The Shades Mountain plant is 5 miles south of the city on the Cahaba River, and the Birmingham Station plant, about 7 miles northeast of the center of the city.

The Birmingham Industrial Water System serves 52 industrial consumers, some consumers taking water at more than one location, in and around Birmingham. In 1951 the total volume of water delivered to the industrial consumers amounted to 17,541,335,000 gal.

BIRMINGHAM--Continued

ANALYSES

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

	Cahaba River		Inland Lake	
	Raw water	Finished water	Raw water	Finished water
Silica (SiO_2)	7.8	6.1	5.0	4.5
Iron (Fe)	.06	.06	.07	.03
Manganese (Mn)	.01	.00	.00	.00
Calcium (Ca)	26	27	1.8	9.2
Magnesium (Mg)	5.9	5.7	1.2	1.1
Sodium (Na)	5.1	4.8	2.4	2.9
Potassium (K)	2.0	1.8	1.3	1.1
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	95	89	9	29
Sulfate (SO_4)	16	21	2.9	7.5
Chloride (Cl)	2.8	4.2	2.2	2.2
Fluoride (F)	.2	.2	.3	.1
Nitrate (NO_3)	1.2	1.3	1.6	1.5
Dissolved solids	116	118	26	46
Hardness as $CaCO_3$:				
Total	89	91	9	27
Noncarbonate	11	18	2	4
Color	7	8	23	7
pH	7.3	7.2	6.2	8.4
Specific conductance (micromhos at 25 C.)	189	193	29.3	72.6
Turbidity	2	2	1	2
Temperature (F.)	69	69	55	57
Date of collection	Oct. 18, 1951	Oct. 18, 1951	Oct. 19, 1951	Oct. 19, 1951

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[a]	--	95	22	7.4	7.9	7.0	--	--	--	--	380	15
Finished water[a]	--	105	29	8.3	8.5	8.0	--	100	40	0	0	0
Raw water[b]	12	16	10	7.2	7.3	7.1	12	12	12	--	30	15
Finished water[b]	--	48	19	9.0	9.1	8.9	30	36	24	0	0	0

[a] Shades Mountain.
[b] Birmingham.

DECATUR
(Population, 19,974)

Ownership: Municipal; supplies also Austinville and other suburban districts. Total population supplied, about 26,100.
Source: Tennessee River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Clear well, 130,000 gal; elevated tanks 3,300,000 gal.

The treatment plant is 1½ miles east of the city.

DECATUR--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.6	6.1	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.10	Total	78	92
Manganese (Mn)	.00	.00	Noncarbonate	23	29
Calcium (Ca)	23	29			
Magnesium (Mg)	4.9	4.9	Color	30	6
Sodium (Na)	7.0	7.0	pH	6.9	7.5
Potassium (K)	1.5	1.4	Specific conductance (micromhos at 25 C.)	192	209
Carbonate (CO_3)	0	0	Turbidity	4	2
Bicarbonate (HCO_3)	67	77	Temperature (F.)	·69	70
Sulfate (SO_4)	14	20	Date of collection	Oct. 17, 1951	Oct. 17, 1951
Chloride (Cl)	15	17			
Fluoride (F)	.3	.0			
Nitrate (NO_3)	3.9	.8			
Dissolved solids	113	118			

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	--	--	--	7.3	7.6	7.0	--	--	--	50	228	20
Finished water	--	--	--	7.9	8.1	7.7	--	--	--	0	0	0

DOTHAN
(Population, 21,584)

Ownership: Municipal.
Source: 9 wells (1 to 4 and 6 to 10). The depths of the wells are reported to be 625-640 (1, 2, and 3), 315, 326, 335, 680, 760, and 760 ft. The yield of the wells is reported to be 200 (1, 2, and 3), 240, 500, 640, 560, 620, and 600 gpm, respectively.
Treatment: Chlorination of water from well 4; aeration of water from well 6; and addition of phosphate for corrosion correction to water from well 7.
Raw-water storage: None.
Finished-water storage: 1,950,000 gal.

The wells are not pumped as a unit. Well 5 has been abandoned.

DOTHAN--Continued

ANALYSES

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

	Well 7 (raw water)	Well 9	Well 10	Wells, Finished water (composite)
Silica (SiO_2)	8.3	15	13	7.4
Iron (Fe)	.01	.06	.05	.07
Manganese (Mn)	.00	.00	.00	.00
Calcium (Ca)	7.8	33	32	8.0
Magnesium (Mg)	1.3	7.7	7.7	1.5
Sodium (Na)	3.3	25	26	2.9
Potassium (K)	.7	3.1	2.8	.7
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	27	181	180	28
Sulfate (SO_4)	1.4	12	11	1.8
Chloride (Cl)	3.8	4.8	4.5	4.5
Fluoride (F)	.0	.0	.0	.0
Nitrate (NO_3)	2.8	.2	.2	3.4
Dissolved solids	44	190	186	48
Hardness as $CaCO_3$:				
Total	25	114	112	26
Noncarbonate	3	0	0	3
Color	7	5	6	4
pH	6.3	7.7	7.9	6.4
Specific conductance (micromhos at 25 C.)	65.7	294	291	68.7
Turbidity	1	1	1	0
Temperature (F.)	70	74	--	74
Date of collection	Oct. 23, 1951	Oct. 23, 1951	Oct. 23, 1951	Oct. 23, 1951
Depth (feet)	335	760	760	
Diameter (inches)	24-16	18	18	
Date drilled	1945	1947	1951	
Percent of supply	--	--	--	

FAIRFIELD
(Population, 13,177)

Ownership: (See Birmingham.)

FLORENCE
(Population, 23,879)

Ownership: Municipal. Total population supplied, 23,929.
Source: Cypress Creek.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Underground storage, 250,000 gal; elevated tanks, 1,030,000 gal.

The treatment plant is about 3 miles north of the city.

FLORENCE--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.2	6.8	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.17	Total	61	75
Manganese (Mn)	.00	.00	Noncarbonate	3	18
Calcium (Ca)	21	26			
Magnesium (Mg)	2.1	2.5	Color	6	14
Sodium (Na)	.5	1.8	pH	7.1	7.7
Potassium (K)	.6	.8	Specific conductance (micromhos at 25 C.)	114	151
Carbonate (CO_3)	0	0	Turbidity	2	2
Bicarbonate (HCO_3)	71	70	Temperature (F.)	59	--
Sulfate (SO_4)	1.9	15	Date of collection	Oct. 17, 1951	Oct. 17, 1951
Chloride (Cl)	1.8	3.5			
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.7	1.3			
Dissolved solids	72	94			

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	45	56	8	6.8	7.4	6.0	--	--	--	--	--	--
Finished water	30	50	18	8.6	8.8	8.2	--	--	--	--	--	--

GADSDEN

(Population, 55,725)

Ownership: Municipal; supplies also Attalla and Rainbow City. Total population supplied, about 64,900.
Source: Coosa River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 9,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 7,500,000 gal.

The treatment plant is about a mile northeast of the city. There is some variation in the chemical character of the water throughout the year.

GADSDEN--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	6.5	6.6	Hardness as $CaCO_3$:		
Iron (Fe)	.17	.04	Total	60	72
Manganese (Mn)	.00	.00	Noncarbonate	4	15
Calcium (Ca)	15	20			
Magnesium (Mg)	5.5	5.5	Color	15	5
Sodium (Na)	5.2	5.2	pH	7.5	8.2
Potassium (K)	1.3	1.2	Specific conductance (micromhos at 25 C.)	127	148
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	68	70			
Sulfate (SO_4)	9.0	15	Turbidity	3	2
Chloride (Cl)	3.5	4.5	Temperature (F.)	70	70
Fluoride (F)	.0	.0	Date of collection	Oct. 18, 1951	Oct. 18, 1951
Nitrate (NO_3)	1.6	1.6			
Dissolved solids	84	96			

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	30	54	16	7.0	8.3	6.3	42	54	30	--	700	25
Finished water	52	67	25	8.3	8.5	8.0	56	72	38	--	--	--

HOMEWOOD
(Population, 12,866)

Ownership: (See Birmingham.)

HUNTSVILLE
(Population, 16,437)

Ownership: Municipal; supplies West Huntsville and other suburban areas. Total population supplied, about 25,000.
Source: 2 springs (Big Spring and Braham Spring). Lincoln Mills supply may be used in case of emergency.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 600,000 gal.

Big Spring is in downtown Huntsville. Braham Spring is 2 miles south of Huntsville.

HUNTSVILLE--Continued

ANALYSES

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

	Big Spring[a]	Braham Spring[a]		Big Spring[a]	Braham Spring[a]
Silica (SiO_2)	8.3	7.7	Hardness as $CaCO_3$:		
Iron (Fe)	.15	.07	Total	126	103
Manganese (Mn)	.00	.00	Noncarbonate	12	11
Calcium (Ca)	42	34			
Magnesium (Mg)	5.2	4.4	Color	5	5
Sodium (Na)	1.2	1.8	pH	7.1	7.0
Potassium (K)	.5	.8	Specific conductance (micromhos at 25 C.)	239	196
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	139	112			
Sulfate (SO_4)	4.2	3.1	Turbidity	2	1
Chloride (Cl)	3.0	3.2	Temperature (F.)	62	62
Fluoride (F)	.0	.0	Date of collection	Oct. 17, 1951	Oct. 17, 1951
Nitrate (NO_3)	7.7	7.2			
Dissolved solids	141	118			

[a] Raw water.

JASPER
(Population, 8,589)

Ownership: Water Works Board of Jasper; also supplies Cordova, Parrish, and suburban districts. Total population supplied, about 15,900.
Source: Warrior River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 1,400,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,500,000 gal.

The treatment plant is ten miles southeast of Jasper.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.6	4.5	Hardness as $CaCO_3$:		
Iron (Fe)	.13	.22	Total	21	37
Manganese (Mn)	--	--	Noncarbonate	7	17
Calcium (Ca)	4.8	11			
Magnesium (Mg)	2.2	2.3	Color	65	7
Sodium (Na)	3.2	1.6	pH	6.5	8.8
Potassium (K)	2.6	2.0	Specific conductance (micromhos at 25 C.)	65.9	94.1
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	17	[a] 24			
Sulfate (SO_4)	12	17	Turbidity	17	2
Chloride (Cl)	3.5	5.0	Temperature (F.)	69	69
Fluoride (F)	.3	.1	Date of collection	Oct. 19, 1951	Oct. 19, 1951
Nitrate (NO_3)	.9	.7			
Dissolved solids	56	58			

[a] Includes the equivalent of less than 5 ppm of carbonate (CO_3).

JASPER--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	20	25	5	7.1	7.3	7.0	--	--	--	--	--	--
Finished water	20	22	19	8.5	9.1	8.0	--	--	--	--	--	--

MOBILE
(Population, 129,009)

Ownership: Municipal; supplies also suburban districts. Total population supplied, about 149,000.
Source: Clear Creek furnishes 80 percent of supply; Threemile Creek furnishes 20 percent; Eightmile Creek furnishes 4,000,000 gpd as auxiliary supply.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 20,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 20,000,000 gal.

The treatment plant is 8 miles northwest of the city.
A new source of supply (Big Creek) is being developed. Clear Creek and Three Mile Creek will be abandoned as sources of supply after 1952.

ANALYSES

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

	Clear Cr. and Threemile Cr. (raw water)	Clear Cr. and Threemile Cr. (finished water)	Big Creek (raw water)
Silica (SiO_2)	6.8	6.1	5.0
Iron (Fe)	.69	.12	.03
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	1.6	6.4	.8
Magnesium (Mg)	.9	1.0	.8
Sodium (Na)	2.2	2.3	1.8
Potassium (K)	1.0	.5	.5
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	8	12	5
Sulfate (SO_4)	.9	6.7	.7
Chloride (Cl)	3.5	5.2	2.8
Fluoride (F)	.0	.0	.1
Nitrate (NO_3)	1.0	1.7	.6
Dissolved solids	31	38	20
Hardness as $CaCO_3$:			
Total	8	20	5
Noncarbonate	1	10	1
Color	50	5	27
pH	6.4	7.0	6.2
Specific conductance (micromhos at 25 C.)	26.2	53.7	17.7
Turbidity	6	1	1
Temperature (F.)	75	76	70
Date of collection	Oct. 24, 1951	Oct. 24, 1951	Oct. 24, 1951

MOBILE--Continued

Regular determinations at treatment plant, 1951 [a]

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Temperature		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water.....	5	6	3	6.3	6.5	6.0	8	10	6	67	78	50
Finished water...	11	12	7	8.9	9.3	8.5	36	40	20	67	78	50

[a] Oct. 1, 1950 to Sept. 30, 1951.

MONTGOMERY
(Population, 106,525)

Ownership: Municipal; supplies also a population of about 14,000 outside the city limits. Total population supplied, about 120,500.

Source: 32 wells, regular supply; 13 (airlift) wells, auxiliary supply. The depth of the wells ranges from 64 to 740 ft. The depth of the greater number of the wells is around 600 ft. The yield of the wells (data on 27 wells) ranges from 120 (well 17) to 650 gpm (well 27), and averages 419 gpm.

Treatment: Chlorination.

Raw-water storage: 11,000,000 gal.

Finished-water storage: 2,250,000 gal.

An additional 4,000,000 gal storage tank will be completed in 1951.

There are two pumping stations, one on Court Street, and the other on Day Street. Each station pumps 16 wells. The Day Street Station pumps wells 21 to 36 inclusive.

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

	Wells [a]	Wells [b]	Well 2	Well 8	Well 14
Silica (SiO_2)	15	29	15	13	15
Iron (Fe)	.15	.35	.25	.02	.18
Manganese (Mn)	.01	.05	.03	.00	.00
Calcium (Ca)	4.6	23	1.8	3.2	1.4
Magnesium (Mg)	1.5	2.4	.9	1.2	.8
Sodium (Na)	57	30	2.9	84	2.1
Potassium (K)	1.7	1.7	1.6	1.0	1.4
Carbonate (CO_3)	0	0	0	16	0
Bicarbonate (HCO_3)	143	128	7	165	8
Sulfate (SO_4)	12	13	.8	14	1.5
Chloride (Cl)	11	10	4.2	8.5	2.8
Fluoride (F)	.4	.2	.0	.5	.0
Nitrate (NO_3)	3.3	4.6	6.1	1.7	.4
Dissolved solids	185	180	41	228	34
Hardness as $CaCO_3$:					
Total	18	67	8	13	7
Noncarbonate	0	0	2	0	0
Color	4	3	4	5	5
pH	7.5	7.0	5.7	8.9	5.5
Specific conductance (micromhos at 25 C.)	283	257	38.6	341	32.1
Turbidity	2	1	1	2	1
Temperature (F.)	71	77	69	71	68
Date of collection	Oct. 21, 1951	Oct. 20, 1951	Oct. 20, 1951	Oct. 21, 1951	Oct. 20, 1951

[a] Finished water, composite sample, collected at Court Street pumping plant.
[b] Finished water, composite sample, collected at Day Street pumping plant.

MONTGOMERY--Continued

	Well 2	Well 8	Well 14
Depth (feet)	78	497	650
Diameter (inches)	24	18	14
Date drilled	1918	1921	1937
Percent of supply	--	--	--

ANALYSES

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

	Well 15	Well 23	Well 24S	Well 27	Well 31
Silica (SiO_2)	13	31	37	33	11
Iron (Fe)	.25	.16	.08	.73	.19
Manganese (Mn)	.00	.00	.08	.06	.00
Calcium (Ca)	1.2	25	28	19	3.0
Magnesium (Mg)	.5	2.1	2.0	1.7	.8
Sodium (Na)	105	15	9.0	39	104
Potassium (K)	1.1	2.6	1.7	1.5	1.4
Carbonate (CO_3)	32	0	0	0	9
Bicarbonate (HCO_3)	183	24	106	150	211
Sulfate (SO_4)	16	28	6.2	8.6	9.3
Chloride (Cl)	10	30	3.0	6.5	28
Fluoride (F)	.6	.0	.1	.5	.9
Nitrate (NO_3)	.2	18	.2	.3	1.1
Dissolved solids	272	192	142	186	274
Hardness as $CaCO_3$:					
Total	5	71	78	54	11
Noncarbonate	0	51	0	.0	0
Color	6	5	5	25	3
pH	9.1	5.8	6.9	7.4	8.6
Specific conductance (micromhos at 25 C.)	424	241	183	261	443
Turbidity	1	0	1	2	2
Temperature (F.)	72	69	69	68	68
Date of collection	Oct. 20, 1951	Oct. 20, 1951	Oct. 20, 1951	Oct. 20, 1951	Oct. 20, 1951
Depth (feet)	81	140	166	598	636
Diameter (inches)	14	18	18	18	18
Date drilled	1937	1942	1948	1943	1949
Percent of supply	--	--	--	--	--

MOUNTAIN BROOK
(Population, 8,359)

Ownership: (See Birmingham.)

OPELIKA
(Population, 12,295)

Ownership: Municipal.
Source: Sougahatchee Creek impounded in Sougahatchee Lake.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: Impounding reservoir.
Finished-water storage: 1,243,000 gal.

OPELIKA--Continued

The treatment plant is about 5½ miles northeast of Opelika.
Raw water is furnished to Pepperell Mill which has its own filter plant having a rated capacity of 2,000,000 gpd.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.8	4.6	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.13	Total	15	35
Manganese (Mn)	.00	.00	Noncarbonate	0	12
Calcium (Ca)	3.3	11			
Magnesium (Mg)	1.6	1.8	Color	20	5
Sodium (Na)	3.5	3.5	pH	6.9	8.4
Potassium (K)	2.2	1.7	Specific conductance (micromhos at 25 C.)	50.5	89.0
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	22	28			
Sulfate (SO_4)	1.3	9.3	Turbidity	2	2
Chloride (Cl)	2.8	7.0	Temperature (F.)	71	71
Fluoride (F)	.1	.0	Date of collection	Oct. 22, 1951	Oct. 22, 1951
Nitrate (NO_3)	.2	.1			
Dissolved solids	31	57			

PHENIX CITY

(Population, 23,305)

Ownership: Municipal; supplies also about 300 people outside the city limits. Total population supplied, about 23,600.
Source: Chattahoochee River. Emergency connections can be made with the municipal supply of Columbus, Ga.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and lime for corrosion control.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 1,250,000 gal.
Finished-water storage: 1,250,000 gal.
The treatment plant is located 1 mile north of the city.
There is some variation in the chemical character of the water throughout the year, but the dissolved solids are usually low.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	8.3	8.5	Hardness as $CaCO_3$:		
Iron (Fe)	.67	.01	Total	19	30
Manganese (Mn)	.00	.00	Noncarbonate	1	11
Calcium (Ca)	4.2	9.0			
Magnesium (Mg)	2.0	1.8	Color	70	4
Sodium (Na)	6.0	6.0	pH	7.1	7.2
Potassium (K)	2.2	2.2	Specific conductance (micromhos at 25 C.)	63.8	90.2
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	22	23			
Sulfate (SO_4)	4.6	12	Turbidity	6	1
Chloride (Cl)	5.0	7.8	Temperature (F.)	71	71
Fluoride (F)	.0	.0	Date of collection	Oct. 22, 1951	Oct. 22, 1951
Nitrate (NO_3)	2.5	1.7			
Dissolved solids	53	60			

PHENIX CITY--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.....	14	17	12	7.2	8.8	6.9	18	22	14	50	400	10
Finished water...	17	21	16	8.4	8.9	8.4	30	36	28	.2	.3	.1

PRICHARD
(Population, 19,014)

Ownership: Municipal; supplies also Chickasaw and Whistler. Total population supplied, about 33,000.
Source: Eight Mile Creek.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 500,000 gal.

The treatment plant is about $1\frac{1}{2}$ miles northwest of Prichard.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.5	4.5	**Hardness as $CaCO_3$:**		
Iron (Fe)	.15	.02	Total	7	33
Manganese (Mn).....	.00	.00	Noncarbonate.....	1	16
Calcium (Ca).....	1.1	12			
Magnesium (Mg).....	1.1	.8	Color.....	60	4
Sodium (Na)	2.1	1.9	pH.....	6.1	9.2
Potassium (K)	1.2	.5	Specific conductance (micromhos at 25 C.).....	22.9	78.3
Carbonate (CO_3).....	0	4			
Bicarbonate (HCO_3)	8	13	Turbidity.....	6	1
Sulfate (SO_4).....	1.2	12	Temperature (F.)...	71	71
Chloride (Cl).....	3.5	6.8	Date of collection...	Oct. 24, 1951	Oct. 24, 1951
Fluoride (F).....	.1	.0			
Nitrate (NO_3).....	.7	.7			
Dissolved solids.....	32	50			

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.....	3	4	2	5.8	6.0	5.6	--	--	--	--	--	--
Finished water...	15	17	14	8.3	8.4	8.2	--	--	--	--	--	--

SELMA
(Population, 22,840)

Ownership: Municipal; supplies also suburban districts. Total population supplied, about 23,340.
Source: 3 wells (1 to 3) 460, 460, and 465 ft deep, and reported to yield 1,500, 1,500, and 1,800 gpm, respectively. Equal quantities of water are pumped from each well.
Treatment: Aeration, coagulation (lime), sedimentation, chlorination, and rapid sand filtration.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,300,000 gal.

ANALYSES

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

	Well 2	Finished water		Well 2	Finished water
Silica (SiO_2)	14	12	Hardness as $CaCO_3$:		
Iron (Fe)	1.4	.11	Total	67	71
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	20	21			
Magnesium (Mg)	4.1	4.5	Color	33	5
Sodium (Na)	3.2	2.7	pH	7.1	8.0
Potassium (K)	6.9	6.9	Specific conductance (micromhos at 25 C.)	159	162
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	89	93	Turbidity	4	1
Sulfate (SO_4)	4.8	5.8	Temperature (F.)	70	69
Chloride (Cl)	3.0	4.5	Date of collection	Oct. 20, 1951	Oct. 21, 1951
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.3	.0			
Dissolved solids	102	104			

Depth (feet)	460
Diameter (inches)	12
Date drilled	1946
Percent of supply	--

SHEFFIELD
(Population, 10,767)

Ownership: Municipal; supplies also the town of Muscle Shoals. Total population supplied, about 12,700.
Source: Tennessee River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and pH adjustment.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 537,000 gal.

The treatment plant is 0.5 mile northwest of Sheffield.

SHEFFIELD--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.6	5.6	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.05	Total	76	90
Manganese (Mn)	.00	.01	Noncarbonate	18	33
Calcium (Ca)	23	28			
Magnesium (Mg)	4.6	4.9	Color	15	10
Sodium (Na)	7.2	6.0	pH	6.8	7.4
Potassium (K)	1.7	1.5	Specific conductance (micromhos at 25 C.)	190	208
Carbonate (CO_3)	0	0	Turbidity	2	2
Bicarbonate (HCO_3)	71	69	Temperature (F.)	71	70
Sulfate (SO_4)	13	23	Date of collection	Oct. 17, 1951	Oct. 17, 1951
Chloride (Cl)	12	16			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	4.8	2.3			
Dissolved solids	108	128			

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	44	68	28	7.0	--	--	--	--	--	--	--	--
Finished water	65	65	56	8.4	--	--	--	--	--	--	--	--

SYLACAUGA

(Population, 9,606)

Ownership: Municipal; supplies also a few people in suburban areas. Total population supplied, about 9,700.

Source: Tallaseehatchee Creek and Bills Creek (impounded).

Treatment: Aeration, prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and polyphosphate (Calgon) for corrosion control.

Rated capacity of treatment plant: 2,000,000 gpd.

Raw-water storage: --

Finished-water storage: 1,350,000 gal.

The treatment plant is 4 miles northeast of Sylacauga.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	9.4	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.10	Total	14	35
Manganese (Mn)	.00	.00	Noncarbonate	0	18
Calcium (Ca)	3.5	12			
Magnesium (Mg)	1.2	1.2	Color	21	9
Sodium (Na)	3.3	4.0	pH	6.6	6.8
Potassium (K)	1.2	1.2	Specific conductance (micromhos at 25 C.)	41.2	99.4
Carbonate (CO_3)	0	0	Turbidity	2	2
Bicarbonate (HCO_3)	19	21	Temperature (F.)	66	67
Sulfate (SO_4)	2.5	18	Date of collection	Oct. 18, 1951	Oct. 18, 1951
Chloride (Cl)	2.5	6.5			
Fluoride (F)	.2	.3			
Nitrate (NO_3)	.7	.5			
Dissolved solids	39	69			

SYLACAUGA--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.....	20	24	12	6.5	6.9	6.1	30	35	25	--	--	--
Finished water...	20	24	14	7.0	7.1	7.0	50	100	35	--	--	--

TALLADEGA
(Population, 13,134)

Ownership: Municipal; supplies also suburban districts. Total population supplied, about 14,500.
Source: Talladega Creek.
Treatment: Coagulation with alum and lime, chlorination, sedimentation, rapid sand filtration, polyphosphate (Calgon) for corrosion control, and ammoniation.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 1,000,000 gal.
Finished-water storage: 1,250,000 gal.

The treatment plant is about 3 miles south of Talledega.
The rated capacity of the treatment plant will be increased to 4,000,000 gpd in 1952.
The storage facilities for the raw and finished waters are being increased to 3,000,000 and 2,250,000 gal, respectively.
There is some variation in the chemical character of the water throughout the year, but the amount of the dissolved solids is usually low.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	7.6	Hardness as $CaCO_3$:		
Iron (Fe)	.26	.26	Total	17	48
Manganese (Mn)	.00	.00	Noncarbonate.....	3	29
Calcium (Ca)	3.9	15			
Magnesium (Mg).....	1.8	2.5	Color.....	15	6
Sodium (Na)	2.4	1.5	pH.....	6.6	8.1
Potassium (K)	1.1	.6	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.).....	46.3	113
Bicarbonate (HCO_3)	17	23	Turbidity.....	2	2
Sulfate (SO_4)	6.2	27	Temperature (F.)...	70	68
Chloride (Cl)	1.8	4.8	Date of collection...	Oct. 18, 1951	Oct. 18, 1951
Fluoride (F)	.1	.2			
Nitrate (NO_3)	1.2	.4			
Dissolved solids.....	39	75			

Regular determinations at treatment plant, 1949

	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	15	10	6.6	6.9	6.6	13	18	8	--	--	--
Finished water...	14	16	12	9.2	9.3	9.0	45	52	38	--	--	--

TROY
(Population, 8,555)

Ownership: Municipal; supplies also suburban communities. Total population supplied, about 10,600.
Source: 2 wells 237 and 560 ft deep, and each reported to yield 740 gpm. The wells are pumped alternately.
Treatment: None.
Storage: 250,000 gal.

ANALYSIS

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

	2 wells (composite)		2 wells (composite)
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.00	Total	60
Manganese (Mn)	.00	Noncarbonate	0
Calcium (Ca)	18		
Magnesium (Mg)	3.7	Color	5
Sodium (Na)	51	pH	7.8
Potassium (K)	5.0	Specific conductance (micromhos at 25 C.)	305
Carbonate (CO_3)	0	Turbidity	1
Bicarbonate (HCO_3)	197	Temperature (F.)	72
Sulfate (SO_4)	6.2	Date of collection	Oct. 23, 1951
Chloride (Cl)	3.8		
Fluoride (F)	.0		
Nitrate (NO_3)	.1		
Dissolved solids	197		

Depth (feet)	237, 560
Diameter (inches)	10
Date drilled	1939, 1945
Percent of supply	100

TUSCALOOSA
(Population, 46,396)

Ownership: Municipal; supplies Northport and other suburban districts. Total population supplied, about 55,300.
Source: Yellow Creek impounded.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, fluoridation, and pH adjustment.
Rated capacity of treatment plant: 9,000,000 gpd.
Raw-water storage: 40,000,000 gal.
Finished-water storage: 2,300,000 gal.

The treatment plant is about $3\frac{1}{2}$ miles northeast of Tuscaloosa.
Rated capacity of the treatment plant will be increased to 12,000,000 gpd in 1952.

TUSCALOOSA--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.7	5.2	Hardness as $CaCO_3$:		
Iron (Fe)	.42	.18	Total	8	21
Manganese (Mn)	.03	.00	Noncarbonate	3	7
Calcium (Ca)	2.0	6.3			
Magnesium (Mg)	.8	1.4	Color	35	4
Sodium (Na)	1.0	3.2	pH	6.2	7.9
Potassium (K)	.5	.5	Specific conductance (micromhos at 25 C.)	20.4	54.7
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	6	18			
Sulfate (SO_4)	2.6	4.3	Turbidity	3	2
Chloride (Cl)	2.0	4.5	Temperature (F.)	68	69
Fluoride (F)	.1	--	Date of collection	Oct. 19, 1951	Oct. 19, 1951
Nitrate (NO_3)	.6	.6			
Dissolved solids	24	40			

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	11	9	5.9	6.2	5.5	--	--	--	25	40	8
Finished water	16	18	14	8.9	9.1	8.7	--	--	--	0	0	0

WEST HUNTSVILLE
(Population, 8,221)

Ownership: (See Huntsville.)

ANSONIA
(Population, 18,706)

Ownership: Ansonia Water Company; also supplies a small part of Derby and Seymour. Total population supplied, about 19,000.
Source: Beaver Lake Reservoir and diversions from Hopp Brook through 18 in. pipeline. Auxiliary or emergency supplies, Quillinan Reservoir and Fountain Lake Reservoir. In 1950 Quillinan Reservoir furnished about 12 percent of the supply and Fountain Lake, about 13 percent.
Treatment: Chlorination.
Raw-water storage: 610,500,000 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)	7.6	6.6	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.15	Total	20	23
Manganese (Mn)	.0	.0	Noncarbonate	10	15
Calcium (Ca)	5.1	7.2			
Magnesium (Mg)	1.8	1.3	Color	12	8
Sodium (Na)	3.1	2.6	pH	6.5	6.8
Potassium (K)	.8	.8	Specific conductance (micromhos at 25 C.)	60.9	62.8
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	12	10			
Sulfate (SO_4)	12	12	Turbidity	2	2
Chloride (Cl)	4.5	6.1	Temperature (F.)	--	--
Fluoride (F)	.2	.2	Date of collection	July 17, 1951	July 17, 1951
Nitrate (NO_3)	.8	.7			
Dissolved solids	41	41			

[a] Fountain Lake, west-side supply.
[b] Middle Reservoir, east-side supply.

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: --

BRIDGEPORT--Continued

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	
Carbonate (CO_3)	0	25 C.)	54.8
Bicarbonate (HCO_3)	9	Turbidity	0.6
Sulfate (SO_4)	11	Temperature (F.)	--
Chloride (Cl)	2.8	Date of collection	July 12, 1951
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	34		

DANBURY
(Population, 22,067)

Ownership: Municipal; also supplies about 4,000 people outside the city limits. Total population supplied, about 27,000.
Source: (Two separate sources): Padanaram, Marjorie, and East Lake Reservoirs; West Lake, Lower Kohanza, and Upper Kohanza Reservoirs.
Treatment: Coagulation with alum, lime, sedimentation, rapid sand filtration, addition of Calgon, and chlorination.
Rated capacity of treatment plants: 5,000,000 gpd (each of two).
Raw-water storage: 2,800,000,000 gal.
Finished-water storage: 2,500,000 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)	0.5	2.6	Hardness as $CaCO_3$:		
Iron (Fe)	.13	.11	Total	32	30
Manganese (Mn)	--	--	Noncarbonate	15	16
Calcium (Ca)	9.2	8.4			
Magnesium (Mg)	2.3	2.2	Color	6	4
Sodium (Na)	2.6	2.4	pH	6.7	6.6
Potassium (K)	1.0	.6	Specific conductance (micromhos at 25 C.)	89.7	83.6
Carbonate (CO_3)	0	0	Turbidity	1.0	0.9
Bicarbonate (HCO_3)	21	17	Temperature (F.)	--	--
Sulfate (SO_4)	17	17	Date of collection	June 24, 1952	June 24, 1952
Chloride (Cl)	3.1	3.9			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.3	.3			
Dissolved solids	46	45			

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	--	25	8	--	10.0	6.4	--	32	19	--	60	1.0
Finished water	--	25	10	--	7.5	7.0	--	45	20	--	.5	.0

[a] Padanaram, Marjorie, and East Lake Reservoirs.
[b] West Lake, Lower Kohanza, and Upper Kohanza Reservoirs.

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 (controlled by American Water Works Co., Inc.); also sells water wholesale to Port Chester Water Works, Inc., Port Chester, N. Y. which supplies about 40,000 people in Port Chester and Rye, N. Y. Total population supplied, about 84,000.

Source: Putnam Lake, Rockwood Lake, and Brush Dam. 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; Laurel Reservoir of Stamford Water Company, 2,250,000,000 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_2)	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	26	36	18	8.5	8.9	6.8	41	48	38	<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 and Barkhamsted Reservoir are the principal supply reservoirs.
Treatment: Aeration, slow sand filtration; and chlorination.
Rated capacity of treatment plant: 45,000,000 gpd.
Raw-water storage: 42,600,000,000 gal.
Finished-water storage: 30,760,000 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	0.4
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

MERIDEN
(Population, 44,088)

Ownership: Municipal; also supplies about 80 people outside the city limits. Total population supplied, about 44,200.
Source: Broad Brook Reservoir and 3 other reservoirs, 82 percent of supply; 1 well 18 percent of supply. Emergency supply, Black Pond (never has been used).
Treatment: Broad Brook supply: aeration, coagulation with alum, sedimentation, rapid sand filtration, and chlorination. Other supplies: chlorination. Copper sulfate is used when necessary.
Rated capacity of treatment plant: Broad Brook supply: 5,000,000 gpd.
Raw-water storage: 1,623,000,000 gal.
Finished-water storage: 5,000,000 gal.

MERIDEN--Continued

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)	4.2	4.9	Hardness as $CaCO_3$:		
Iron (Fe)	.11	.25	Total	46	34
Manganese (Mn)	.00	.00	Noncarbonate	18	14
Calcium (Ca)	16	11			
Magnesium (Mg)	1.4	1.6	Color	5	5
Sodium (Na)	2.1	1.5	pH	7.9	7.5
Potassium (K)	.2	.2	Specific conductance (micromhos at 25 C.)	112	88.3
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	34	25	Turbidity	3.0	3.5
Sulfate (SO_4)	19	15	Temperature (F.)	--	--
Chloride (Cl)	3.2	3.0	Date of collection	July 7, 1953	July 7, 1953
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.3	.4			
Dissolved solids	68	55			

[a] Broad Brook Reservoir. [b] The other 3 reservoirs.

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	Turbidity	2	2
Sulfate (SO_4)	22	13	Temperature (F.)	--	--
Chloride (Cl)	5.5	7.8	Date of collection	July 18, 1951	July 18, 1951
Fluoride (F)	.2	.0			
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 Water Company. (See New Haven.)

NAUGATUCK
(Population, 17,455)

Ownership: The Naugatuck Water Company. Total population supplied, about 17,650.
Source: Reservoirs (Long Hill, Prospect, and Condee) 96.4 percent of supply; 1 well 78 ft deep, and reported to yield 300 gpm, 3.6 percent of supply.
Treatment: Chlorination.
Raw-water storage: Reservoirs, 700,000,000 gal.
Finished-water storage: --

Water is pumped to Mulbury Reservoir for high service use.

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

	Reservoirs		Reservoirs
Silica (SiO_2)	5.2	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	11
Manganese (Mn)	--	Noncarbonate	6
Calcium (Ca)	3.5		
Magnesium (Mg)	.6	Color	5
Sodium (Na)	2.4	pH	6.1
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	42.2
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	6	Turbidity	1.4
Sulfate (SO_4)	8.0	Temperature (F.)	--
Chloride (Cl)	3.5	Date of collection	June 25, 1952
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	38		

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.

NEW BRITAIN--Continued

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 pipeline serving both supplies. In the year 1950 about 18.5 percent of the total of all supplies was furnished by the wells.

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	0.5
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	0.8	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.

NEW LONDON--Continued

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	0.7
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	Turbidity	2	2
Bicarbonate (HCO_3)	16	27	Temperature (F.)	--	--
Sulfate (SO_4)	15	11	Date of collection	Aug. 20, 1951	August, 1951
Chloride (Cl)	6.9	7.1			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.2	.6			
Dissolved solids	54	54			

[a] First taxing district.

[b] Second taxing district.

NORWICH
(Population, 23,429)

Ownership: Municipal; also supplies about 13,000 people in surrounding areas and other communities. Total population supplied, about 36,500.
Source: Open reservoirs. (Stony Brook Reservoir is in open system with Deep River Reservoir.)
Treatment: Chlorination.
Raw-water storage: 1,250,000,000 gal.
Finished-water storage: --

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

	Stony Brook Reservoir	Deep River Reservoir		Stony Brook Reservoir	Deep River Reservoir
Silica (SiO_2)	6.1	5.2	Hardness as $CaCO_3$:		
Iron (Fe)	.24	.36	Total	12	10
Manganese (Mn)	--	--	Noncarbonate	4	6
Calcium (Ca)	3.1	2.6			
Magnesium (Mg)	1.0	.8	Color	7	40
Sodium (Na)	2.8	2.5	pH	6.1	5.8
Potassium (K)	.5	.7	Specific conductance (micromhos at 25 C.)	47.6	39.4
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	9	5			
Sulfate (SO_4)	7.0	6.0	Turbidity	1.8	1.7
Chloride (Cl)	1.6	4.4	Temperature (F.)	--	--
Fluoride (F)	.1	.0	Date of collection	June 18, 1951	June 18, 1951
Nitrate (NO_3)	.2	.5			
Dissolved solids	33	34			

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		
Bicarbonate (HCO_3)	20		
Sulfate (SO_4)	12	Turbidity	0.8
Chloride (Cl)	7.2	Temperature (F.)	--
Fluoride (F)	.0	Date of collection	July 11, 1951
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.

WALLINGFORD
(Population, 11,994)

Ownership: Municipal; also supplies about 7,000 people outside the city limits. Total population supplied, about 19,000.
Source: Reservoir 1 (Pine River) 33 percent of supply; Reservoir 2, 67 percent of supply.
Treatment: Reservoir 1: coagulation with alum, sedimentation, rapid sand filtration, chlorination, and addition of Calgon. Reservoir 2: chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 1,475,000,000 gal.
Finished-water storage: 1,200,000,000 gal.
The supply from Reservoir 1 is pumped into the distribution system. The supply from Reservoir 2 is distributed by gravity flow.

ANALYSIS

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

	Reservoir 2 (finished water)		Reservoir 2 (finished water)
Silica (SiO_2)	7.6	Hardness as $CaCO_3$:	
Iron (Fe)	.28	Total	34
Manganese (Mn)	.0	Noncarbonate	16
Calcium (Ca)	8.4		
Magnesium (Mg)	3.2	Color	7
Sodium (Na)	2.3	pH	6.7
Potassium (K)	.1	Specific conductance (micromhos at 25 C.)	80.8
Carbonate (CO_3)	0	Turbidity	2
Bicarbonate (HCO_3)	22	Temperature (F.)	--
Sulfate (SO_4)	14	Date of collection	July 19, 1951
Chloride (Cl)	4.9		
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	51		

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[a]	50	70	30	7.2	8.4	6.8	45	80	50	15	200	15
Finished water[a]	35	50	15	6.8	6.9	6.2	45	80	50	3	5	3
Finished water[b]	--	30	20	6.8	7.1	6.7	25	30	20	10	15	5

[a] Reservoir 1. [b] Reservoir 2.

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	Turbidity	1.6
Bicarbonate (HCO_3)	17	Temperature (F.)	--
Sulfate (SO_4)	9.0	Date of collection	June 25, 1952
Chloride (Cl)	5.5		
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.)

BELLEFONT, DELAWARE
(Population, 1,472)

Ownership: Wilmington Suburban Water Co.; supplies also Bellevue, Claymont, Gwinhurst, Holly Oak, Silverside, and other communities in New Castle County. Total population supplied, about 18,000.
Source: Bellevue Quarry (largely spring fed) about 75 percent of the supply. The remaining 25 percent of the supply is furnished by the Delaware Water Co. and Chester Municipal Authority.
Treatment: Wilmington Suburban Water Co. supply: prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 1,440,000 gpd.
Raw-water storage: 100,000,000 gal. (Bellevue quarry).
Finished-water storage: 600,000 gal.

The treatment plant is at Bellevue.

ANALYSES

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

	Raw water [a]	Finished water (city tap)		Raw water [a]	Finished water (city tap)
Silica (SiO_2)	--	9.9	Hardness as $CaCO_3$:		
Iron (Fe)	--	.24	Total	22	70
Manganese (Mn)	--	--	Noncarbonate	9	25
Calcium (Ca)	--	22			
Magnesium (Mg)	--	3.8	Color	20	10
Sodium (Na)	--	5.3	pH	6.4	8.0
Potassium (K)	--	2.2	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	103	197
Bicarbonate (HCO_3)	16	55	Turbidity	--	--
Sulfate (SO_4)	20	24	Temperature (F.)	50	54
Chloride (Cl)	6.0	12	Date of collection	May 24, 1951	May 24, 1951
Fluoride (F)	--	.2			
Nitrate (NO_3)	1.4	1.4			
Dissolved solids	--	122			

[a] Bellevue Quarry.

DOVER
(Population, 6,223)

Ownership: Municipal; also supplies about 500 people outside the city limits. Total population supplied, about 6,700.
Source: 3 deep wells (1 to 3) 208, 231, and 222 ft deep; 1 ("A") open well. The deep wells are at the power plant, on Division Street, and on Dover Street, respectively, and are reported to yield 505, 650, and 657 gpm.
Treatment: None.
Storage: Tank, 100,000 gal.

DOVER--Continued

ANALYSES

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

	Well 1, Power Plant	Well 2, Division Street	Well 3, Dover St.	Well "A", Open well	City tap sample
Silica (SiO_2)	--	--	--	--	35
Iron (Fe)	--	--	--	--	.08
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	--	--	--	--	33
Magnesium (Mg)	--	--	--	--	5.0
Sodium (Na)	--	--	--	--	14
Potassium (K)	--	--	--	--	2.9
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	157	153	153	153	153
Sulfate (SO_4)	6.6	8.9	7.5	7.8	8.0
Chloride (Cl)	3.4	3.4	2.8	3.4	3.0
Fluoride (F)	--	--	--	--	.1
Nitrate (NO_3)	.4	.5	.4	.5	.6
Dissolved solids	--	--	--	--	191
Hardness as $CaCO_3$:					
Total	100	101	108	102	103
Noncarbonate	0	0	0	0	0
Color	5	5	8	5	7
pH	8.0	8.1	8.0	8.0	8.0
Specific conductance (micromhos at 25 C.)	259	254	252	261	263
Turbidity	--	--	--	--	--
Temperature (F.)	60	58	61	68	64
Date of collection	Apr. 25, 1951	Apr. 25, 1951	Apr. 25, 1951	Apr. 25, 1951	Apr. 25, 1951
Depth (feet)	208	231	222	--	--
Diameter (inches)	12	12	16-10	--	--
Date drilled	1926	1938	1948	--	--
Percent of supply	--	--	--	--	--

LEWES
(Population, 2,904)

Ownership: Municipal.
Source: 4 wells. 3 wells (1 to 3) 96, 163, and 87 ft deep are on Kings Highway; 1 at the plant. (Well 2 on Kings Highway temporarily out of operation). Auxiliary or emergency supply, 3 wells 65, 65, and 67 ft deep.
Treatment: Aeration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 80,000 gal.
Finished-water storage: 100,000 gal.

LEWES--Continued

ANALYSES

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

	Well 1	Well 2	Well 3	Well 4	City tap sample[a]
Silica (SiO_2)	--	17	--	--	19
Iron (Fe)	--	.09	--	--	.4
Manganese (Mn)	--	.00	--	--	--
Calcium (Ca)	--	1.5	--	--	5.8
Magnesium (Mg)	--	.7	--	--	1.3
Sodium (Na)	--	8.0	--	--	8.4
Potassium (K)	--	.9	--	--	1.0
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	9	10	9	35	20
Sulfate (SO_4)	5.4	2.6	2.8	31	3.9
Chloride (Cl)	13	10	10	20	12
Fluoride (F)	--	.1	--	--	.0
Nitrate (NO_3)	14	.6	2.6	27	4.7
Dissolved solids	--	49	--	--	67
Hardness as $CaCO_3$:					
Total	24	7	10	77	20
Noncarbonate	17	0	3	48	3
Color	3	3	3	2	2
pH	5.7	6.9	5.9	6.4	7.4
Specific conductance (micromhos at 25 C.)	123	55.7	62.7	259	91.9
Turbidity	--	--	--	--	--
Temperature (F.)	56	--	56	57	55
Date of collection	Apr. 20, 1951	Oct. 4, 1945	Apr. 20, 1951	Apr. 20, 1951	Apr. 20, 1951
Depth (feet)	96	163	87	--	
Diameter (inches)	16-10	16-10	16-10	--	
Date drilled	1945	1945	1945	--	
Percent of supply	--	--	--	--	

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	20	--	--	5.7	--	--	27	--	--	11	--	--
Finished water	--	--	--	7.5	--	--	--	--	--	--	--	--

[a] No treatment at time of collection of sample.

MILFORD

(Population, 5,179)

Ownership: Municipal.
Source: 3 deep wells (1 to 3) 150, 150, and 220 ft deep. Well 3 is reported to yield 346 gpm.
Treatment: Aeration and chlorination.
Rated capacity of treatment plant: 500,000 gpd.
Raw-water storage: None.
Finished-water storage: 250,000 gal.

MILFORD--Continued

ANALYSES

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

	Well 1	Well 3	Finished water [a]
Silica (SiO_2)	--	55	36
Iron (Fe)	--	.13	.27
Manganese (Mn)	--	.01	--
Calcium (Ca)	--	48	46
Magnesium (Mg)	--	6.9	6.6
Sodium (Na)	--	6.4	5.6
Potassium (K)	--	2.5	2.9
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	189	192	187
Sulfate (SO_4)	2.4	2.0	2.9
Chloride (Cl)	2.8	3.4	2.9
Fluoride (F)	--	.1	.0
Nitrate (NO_3)	.5	.0	.3
Dissolved solids	--	217	216
Hardness as $CaCO_3$:			
Total	140	148	142
Noncarbonate	0	0	0
Color	2	2	4
pH	7.9	7.9	8.1
Specific conductance (micromhos at 25 C.)	298	296	301
Turbidity	--	--	--
Temperature (F.)	60	--	57
Date of collection	Apr. 20, 1951	Dec. 12, 1951	Apr. 20, 1951

[a] Well 2 out of operation at time of sampling.

NEWARK
(Population, 6,731)

Ownership: Municipal.
Source: 4 wells (1, 4, 5, 7) 72, 62, 70, and 64 ft deep; yield reported to be 146, 160, 200, and 300 gpm.
Treatment: Chlorination.
Rated capacity of treatment plant: 1,296,000 gpd.
Raw-water storage: 150,000 gal.
Finished-water storage: 752,000 gal.

NEWARK--Continued

ANALYSES

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

	Well 1	Well 4	Well 5	Well 7	Finished water (city tap)
Silica (SiO_2)	--	--	--	--	13
Iron (Fe)	--	--	--	--	.61
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	--	--	--	--	6.8
Magnesium (Mg)	--	--	--	--	4.3
Sodium (Na)	--	--	--	--	7.6
Potassium (K)	--	--	--	--	1.1
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	9	10	14	13	11
Sulfate (SO_4)	5.8	5.9	7.8	10	8.2
Chloride (Cl)	12	12	12	16	15
Fluoride (F)	--	--	--	--	.1
Nitrate (NO_3)	19	20	13	20	16
Dissolved solids	--	--	--	--	95
Hardness as $CaCO_3$:					
Total	30	32	31	34	35
Noncarbonate	23	24	20	23	26
Color	5	5	5	5	3
pH	5.9	5.8	6.5	6.0	6.8
Specific conductance (micromhos at 25 C.)	114	113	111	144	136
Turbidity	--	--	--	--	--
Temperature (F.)	56	58	58	56	57
Date of collection	Apr. 26, 1951	Apr. 26, 1951	Apr. 26, 1951	Apr. 26, 1951	Apr. 26, 1951
Depth (feet)	72	62	70	64	
Diameter (inches)	6	10	10	16	
Date drilled	1906	1920	1920	1931	
Percent of supply	--	--	--	--	

NEW CASTLE
(Population, 5,396)

Ownership: Municipal.
Source: 3 interconnected wells (Cd1, Cd2, Cd3) each 24 ft deep and 3 infiltration galleries, which drain into the wells. Water from well Cd1 flows by gravity through an infiltration gallery to well Cd2; water from well Cd2 flows by gravity to well Cd3 which also receives the combined flow of water from the other two infiltration galleries. Wells Cd1 and Cd2 furnish 50 percent of the supply; well Cd3 with the combined flow of the 2 galleries furnish 50 percent. Reserve supply, 1 well 135 ft deep, yield reported to be 500 gpm (completed in 1952).
Treatment: Aeration, coke contact bed, prechlorination, coagulation with lime, sedimentation, rapid sand filtration, and addition of Calgon.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: 100,000 gal.
Finished-water storage: Clear well, 45,000 gal; elevated tank, 600,000 gal; standpipe, 300,000 gal; emergency reservoir, 1,500,000 gal.

NEW CASTLE--Continued

ANALYSES

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

	Well Cd1	Well Cd2	Infiltration galleries [a]	Finished water
Silica (SiO_2)	--	--	--	16
Iron (Fe)	--	--	--	[b] .40
Manganese (Mn)	--	--	[c] 2.4-	--
Calcium (Ca)	--	--	--	28
Magnesium (Mg)	--	--	--	18
Sodium (Na)	--	--	--	80
Potassium (K)	--	--	--	3.9
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	13	12	43	52
Sulfate (SO_4)	23	16	100	49
Chloride (Cl)	12	9.8	240	162
Fluoride (F)	--	--	--	.0
Nitrate (NO_3)	7.8	8.8	1.6	4.1
Dissolved solids	--	--	--	445
Hardness as $CaCO_3$:				
Total	38	29	161	144
Noncarbonate	27	19	126	101
Color	5	5	10	3
pH	6.2	6.3	6.5	7.7
Specific conductance (micromhos at 25 C.)	138	114	1,000	716
Turbidity	--	--	--	--
Temperature (F.)	57	56	58	56
Date of collection	Apr. 26, 1951	Apr. 26, 1951	Apr. 26, 1951	Apr. 26, 1951
Depth (feet)	24	24		
Diameter (feet)	12	12		
Date drilled	--	--		
Percent of supply	--	--		

[a] Sample from the combined flow from the two galleries flowing into well Cd3.
[b] Total iron. Iron in solution 0.06 ppm. [c] Reported.

SEAFORD
(Population, 3,087)

Ownership: Municipal.
Source: 8 wells: 5 wells, each 80 ft deep; 2 wells, each 40 ft deep; 1 well, 73 ft deep. The wells are pumped in groups of 5, 2, and 1 wells by 3 pumping units, Standby, Power Plant, and Spruce St., respectively.
Treatment: Adjustment of pH with lime.
Rated capacity of treatment plant: 2,016,000 gpd.
Raw-water storage: None.
Finished-water storage: 300,000 gal.

SEAFORD--Continued

ANALYSES

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

	5 wells	2 wells	1 well Spruce St.	Finished water (city tap)
Silica (SiO_2)	--	--	--	14
Iron (Fe)	--	--	--	.07
Manganese (Mn)	--	--	--	--
Calcium (Ca)	--	--	--	5.3
Magnesium (Mg)	--	--	--	3.0
Sodium (Na)	--	--	--	5.9
Potassium (K)	--	--	--	2.6
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	7	20	5	6
Sulfate (SO_4)	7.8	8.7	5.1	7.7
Chloride (Cl)	9.8	11	8.2	9.0
Fluoride (F)	--	--	--	.1
Nitrate (NO_3)	23	23	19	22
Dissolved solids	--	--	--	89
Hardness as $CaCO_3$:				
Total	23	26	20	24
Noncarbonate	17	9.6	16	21
Color	4	2	2	2
pH	5.8	6.2	5.4	5.5
Specific conductance (micromhos at 25 C.)	114	124	96.1	109
Turbidity	--	--	--	--
Temperature (F.)	59	58	57	68
Date of collection	Apr. 20, 1951	Apr. 20, 1951	Apr. 20, 1951	Apr. 20, 1951

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	5.7	--	--	34	38	32	0	--	--
Finished water	--	--	--	7.0	--	--	--	--	--	--	--	--

WILMINGTON
(Population, 110,356)

Ownership: Municipal; supplies also about 30,000 people outside the city limits. Total population supplied, about 140,000.

Source: Brandywine Creek.

Treatment: Porter plant: coagulation with alum and lime, sedimentation, rapid sand filtration, and chlorination. Walnut St. plant: coagulation with alum and lime, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plants: Porter plant, 16,000,000 gpd; Walnut St. plant, 20,000,000 gpd.

Raw-water storage: Hoopes Reservoir, 2,235,000,000 gal.

Finished-water storage: Cool Spring Reservoir, 40,000,000 gal; Rodney St. Reservoir, 7,000,000 gal; clear well, 6,000,000 gal; Rockford Tower, 500,000 gal; Monroe Park tank and Faulk Road tank, each 100,000 gal.

WILMINGTON--Continued

In normal operation, water from Brandywine Creek is pumped to Hoopes Reservoir, which serves as a reserve supply in the event of periods of low flow in the Creek. Water is also taken directly from the Creek to the rapid sand filter plant from which point a portion of the raw water is lifted to the Porter sedimentation reservoir which serves the Porter rapid sand filter plant. The finished water from the Porter treatment plant is used in the high service lines. The Walnut Street plant supplies the low service lines.

ANALYSES

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

	Brandywine Creek		Finished water (city tap)
	Raw water[a]	Raw water	
Silica (SiO_2)	12	12	12
Iron (Fe)	.08	.08	.10
Manganese (Mn)	--	--	--
Calcium (Ca)	14	11	12
Magnesium (Mg)	5.2	4.5	4.4
Sodium (Na)	7.3	6.7	5.4
Potassium (K)			1.0
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	41	38	27
Sulfate (SO_4)	22	17	28
Chloride (Cl)	6.5	4.8	6.0
Fluoride (F)	.1	.1	.0
Nitrate (NO_3)	5.7	5.7	3.9
Dissolved solids	103	89	89
Hardness as $CaCO_3$:			
Total	56	46	48
Noncarbonate	23	15	26
Color	20	5	3
pH	6.5	6.8	7.1
Specific conductance (micromhos at 25 C.)	158	131	137
Turbidity	--	--	--
Temperature (F.)	53	64	60
Date of collection	Oct. 1948, Apr. 1951	May 31, 1950	Apr. 25, 1951

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	35	49	10	7.2	8.4	6.9	--	--	--	40	800	8
Finished water	27	40	3	6.5	6.9	5.3	52	62	40	0	0	0

[a] Average of analyses of 30 monthly samples.

WASHINGTON, DISTRICT OF COLUMBIA
(Population, 802,178)

Ownership: Department of the Army and the District of Columbia; also supplies Arlington County, Virginia; part of Fairfax County, Virginia; the City of Falls Church, Virginia; and a small area in Montgomery County, Maryland. Total population supplied, about 1,000,000.

Source: Potomac River. Emergency supply, connections to the extent of 9.2 mgd to the treated supply of the Washington Suburban Sanitary District. (See Hyattsville, Maryland.)

Treatment: Dalecarlia Plant: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination or dechlorination as may be necessary, chlorine dioxide when necessary for control of tastes and odors, and addition of lime for adjustment of pH. McMillan Plant: Addition of alum at the Dalecarlia Plant. The water then flows by gravity to the Georgetown Reservoir, 2 miles to the southeast, part of which is constructed to serve as a sedimentation basin. The water then flows by gravity through the Washington Tunnel to the Mc Millan Reservoir near the center of the District where further settling takes place, slow sand filtration, chlorination, chlorine dioxide as required, and continuous adjustment of pH with lime. Fluoridation (begun June 23, 1952) with sodium fluosilicate, the compound being fed at Dalecarlia to the filtered water from the Dalecarlia plant and to the raw water along with the alum for the McMillan plant supply. An average fluoride content of 1.1 ppm is maintained in the finished water in the distribution system.

Rated capacity of treatment plants: Dalecarlia Plant, 100,000,000 mgd; McMillan Plant, 125,000,000 mgd.

Raw-water storage: 560,000,000 gal (30 percent available). The three reservoirs, Dalecarlia, Georgetown, and McMillan serve as storage reservoirs for unfiltered water.

Finished-water storage: Clear-water basins, 47,700,000 gal; ground-surface reservoirs, 67,200,000 gal; elevated tanks, 2,740,000 gal.

The water system of the District has two components, the supply division and the distribution system. The supply division comprised of the collection and purification systems is under the control of the Department of the Army and is operated by the Washington District Office of the Corps of Engineers. The distribution system is owned and operated by the District of Columbia.

The diversion dam and the raw water intake are located at Great Falls, Montgomery County, Maryland, about 10 miles from the District line. The raw water flows by gravity through two conduits into the forebay of the Dalecarlia Reservoir at the District line, from which it is lifted into Dalecarlia Reservoir. This reservoir serves not only as storage reservoir but also as plain sedimentation basin, from which the water flows by gravity to the treatment plants.

Arlington County, Falls Church, and areas in Fairfax County are served principally with water from the Dalecarlia Plant.

WASHINGTON--Continued

ANALYSES

(Analyses, in parts per million, by Dalecarlia Laboratory, Washington, D. C.)

	Raw water[a]	Finished water[b]		Finished water[c] (city tap)
		Dalecarlia Plant	McMillan Plant	
Silica (SiO_2)	5.5	5.6	5.5	6.6
Iron (Fe)	.05	.05	.03	.00
Manganese (Mn)	--	--	--	--
Calcium (Ca)	25	30	28	31
Magnesium (Mg)	5.2	6.0	5.4	6.1
Sodium (Na) / Potassium (K)	6.1	4.0	3.5	8.0
Carbonate (CO_3)	--	--	--	0
Bicarbonate (HCO_3)	71	71	64	79
Sulfate (SO_4)	32	38	38	39
Chloride (Cl)	3.8	5.1	5.1	7.0
Fluoride (F)	--	--	--	1.0
Nitrate (NO_3)	1.0	1.0	1.0	2.6
Dissolved solids	139	154	149	156
Hardness as $CaCO_3$:				
Total	84	99	93	102
Noncarbonate	26	41	40	38
Color	--	--	--	3
pH	7.7	7.7	7.5	7.5
Specific conductance (micromhos at 25 C.)	--	--	--	236
Turbidity	--	--	--	--
Temperature (F.)	55	57	57	--
Date of collection	1950	1950	1950	June 30, 1952

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Turbidity July 1948 to July 1949		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	59	82	41	7.7	7.9	7.5	84	114	70	69	165	21
Dalecarlia Plant Finished water	58	79	40	7.7	7.8	7.6	99	127	79	.05	.30	.00
McMillan Plant Finished water	62	74	37	7.5	7.8	7.3	93	120	77	0	0	0

[a] Average of monthly analyses of composites of daily samples, Dalecarlia Reservoir outlet.

[b] Average of monthly analyses of composites of daily samples.

[c] Analysis by U. S. Geological Survey.

BRADENTON, FLORIDA
(Population, 13,604)

Ownership: Municipal.
Source: Lake Ward (Braden River).
Treatment: Aeration, coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: Lake Ward.
Finished-water storage: 2,000,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	7.8	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	113
Manganese (Mn)	.00	Noncarbonate	79
Calcium (Ca)	29		
Magnesium (Mg)	10	Color	0
Sodium (Na)	61	pH	7.3
Potassium (K)	2.5	Specific conductance (micromhos at 25 C.)	555
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	42	Temperature (F.)	--
Sulfate (SO_4)	48	Date of collection	Jan. 19, 1952
Chloride (Cl)	116		
Fluoride (F)	.2		
Nitrate (NO_3)	4.0		
Dissolved solids	308		

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	42	58	30	7.0	7.2	6.8	67	91	43	--	--	--
Finished water	25	31	17	8.8	9.0	8.6	91	111	74	--	--	--

CLEARWATER
(Population, 15,581)

Ownership: Municipal.
Source: 11 wells (7, 8, 11 to 13, 16, 18, 19, and 21 to 23) ranging in depth from 135 to 296 ft (depth not reported for wells 7 and 8).
Treatment: Partial aeration.
Storage: --

Analyses of samples from all of the wells indicate that the chloride content of the water from the wells ranged from 16 to 153 ppm.

CLEARWATER--Continued

ANALYSES

Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.

	Well 7	Well 11	Well 16	Well 19[a]	Well 21
Silica (SiO_2)	17	21	14	24	18
Iron (Fe)	.01	.14	.03	.05	.13
Manganese (Mn)	--	--	--	.00	--
Calcium (Ca)	67	55	61	61	53
Magnesium (Mg)	8.1	6.1	7.3	9.7	4.9
Sodium (Na)	38	4.7	7.1	34	13
Potassium (K)				.9	
Carbonate (CO_3)	--	--	--	0	--
Bicarbonate (HCO_3)	189	183	194	182	170
Sulfate (SO_4)	0	0	0	3.0	0
Chloride (Cl)	91	16	27	80	29
Fluoride (F)	.2	.2	.2	.3	.2
Nitrate (NO_3)	--	--	--	.6	--
Dissolved solids	359	219	261	336	232
Hardness as $CaCO_3$:					
Total	200	163	182	192	153
Noncarbonate	46	13	23	43	13
Color	6	4	2	5	6
pH	7.6	7.5	7.5	7.5	7.6
Specific conductance (micromhos at 25 C.)	--	--	--	550	--
Turbidity	0.6	0.2	0.4	8.2	1.0
Temperature (F.)	--	--	--	--	--
Date of collection	Mar. 14, 1950	Mar. 14, 1950	Mar. 14, 1950	Nov. 22, 1951	Mar. 14, 1950
Depth (feet)	--	206	135	215	296
Diameter (inches)	--	--	--	10	--
Date drilled	1924	--	1938	1941	1943
Percent of supply	--	--	--	--	--

[a] Analyzed by U. S. Geological Survey.

CORAL GABLES
(Population, 19,837)

Ownership: Supplied by Miami. (See Miami.) Population supplied, outside the city limits, about 21,200. Total population supplied, about 41,000.

DAYTONA BEACH
(Population, 30,187)

Ownership: Municipal; also supplies about 6,000 people outside the city limits, and a transient population of about 25,000. Total population supplied, about 61,000.
Source: 26 wells ranging in depth from 165 to 220 ft.
Treatment: Softening with lime and soda ash, coagulation with alum, sedimentation, recarbonation, rapid sand filtration, and chlorination.
Rated capacity of treatment plants: Two plants: one, 4,000,000 gpd; the other, 1,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,850,000 gal.

DAYTONA BEACH--Continued

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.)

	Raw water (composite)	Finished water (composite)	Finished water[a] (composite)
Silica (SiO_2)	17	22	--
Iron (Fe)	.10	.01	.05
Manganese (Mn)	--	--	--
Calcium (Ca)	105	11	--
Magnesium (Mg)	20	14	--
Sodium (Na)	59	75	69
Potassium (K)			
Carbonate (CO_3)	--	9	7
Bicarbonate (HCO_3)	338	46	57
Sulfate (SO_4)	.0	13	15
Chloride (Cl)	139	140	112
Fluoride (F)	.1	.1	.2
Nitrate (NO_3)	--	--	.4
Dissolved solids	618	314	--
Hardness as $CaCO_3$:			
Total	345	85	82
Noncarbonate	68	47	24
Color	--	--	15
pH	7.6	8.9	8.7
Specific conductance (micromhos at 25 C.)	--	--	491
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	Mar. 15, 1950	Mar. 15, 1950	Jan. 1952

[a] Analysis by U. S. Geological Survey.

FORT LAUDERDALE
(Population, 36,328)

Ownership: Municipal; supplies about 4,500 people outside the city limits, and also about 50,000 seasonal visitors. Total maximum population supplied, about 91,000.
Source: 18 wells ranging in depth from 130 to 185 ft.
Treatment: Aeration, softening with lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 14,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,750,000 gal.

FORT LAUDERDALE--Continued

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville; Fla.)

	Raw water[a] (composite)	Finished water[a] (composite)	Finished water[b] (composite)
Silica (SiO_2)	22	9.1	--
Iron (Fe)	1.6	.13	.10
Manganese (Mn)	--	--	--
Calcium (Ca)	92	23	--
Magnesium (Mg)	2.3	1.6	--
Sodium (Na)	8.6	3.0	12
Potassium (K)			
Carbonate (CO_3)	--	5	7
Bicarbonate (HCO_3)	287	39	36
Sulfate (SO_4)	.1	.1	10
Chloride (Cl)	16	21	23
Fluoride (F)	--	--	.2
Nitrate (NO_3)	--	--	.2
Dissolved solids	314	130	--
Hardness as $CaCO_3$:			
Total	239	64	56
Noncarbonate	4	23	18
Color	59	22	29
pH	7.7	9.4	8.9
Specific conductance (micromhos at 25 C.)	--	--	169
Turbidity	3	1	--
Temperature (F.)	--	--	--
Date of collection	Feb. 8, 1950	Feb. 8, 1950	Nov. 23, 1951

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	250	--	--	7.4	--	--	260	--	--	0	0	0
Finished water	40	--	--	9.6	--	--	53	--	--	--	--	--

[a] Wells 1 through 12.

[b] 18 wells. Analysis by U. S. Geological Survey.

FORT MYERS
(Population, 13,195)

Ownership: Municipal.

Source: 20 shallow wells, 20 to 22 ft deep. Auxiliary or emergency supply, 3 deep artesian wells.

Treatment: Softening with lime and soda ash, coagulation with alum and lime, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 1,000,000 gpd.

Raw-water storage: --

Finished-water storage: 1,450,000 gal.

It is reported as of August 18, 1947 that the color of the raw-water from the shallow wells ranged from 12 to 700 units.

FORT MYERS--Continued

ANALYSES

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

	20 Wells[a] (raw water)	Finished water[b]		20 Wells[a] (raw water)	Finished water[b]
Silica (SiO_2)	--	6.6	Hardness as $CaCO_3$:		
Iron (Fe)	--	.01	Total	304	105
Manganese (Mn)	--	.00	Noncarbonate	1	84
Calcium (Ca)	102	36			
Magnesium (Mg)	12	3.7	Color	56	5
Sodium (Na)	29	69	pH	7.2	8.1
Potassium (K)		.9	Specific conductance (micromhos at 25 C.)	--	556
Carbonate (CO_3)	--	0	Turbidity	--	0.5
Bicarbonate (HCO_3)	370	25	Temperature (F.)	78	--
Sulfate (SO_4)	10	122	Date of collection	Jan. 9, 1948	Jan. 25, 1952
Chloride (Cl)	38	77			
Fluoride (F)	--	.2			
Nitrate (NO_3)	--	.5			
Dissolved solids	436	344			

Depth (feet)	20-22
Diameter (inches)	--
Date drilled	--
Percent of supply	100

[a] Analysis by State Board of Health, Jacksonville, Fla.
[b] Composite.

FORT PIERCE
(Population, 13,502)

Ownership: Municipal; also supplies about 700 people outside the city limits. Total population supplied, about 14,200.
Source: Savanna surface water, 60 percent of supply; 6 wells (1 to 6) 165, 170, 126, 127, 135, and 155 ft deep, 40 percent of supply.
Treatment: Well water: Softening with lime, and color removal. Savanna water: Prechlorination, color removal, taste and odor control, final adjustment of pH and stabilization, and postchlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: --
Finished-water storage: 1,500,000 gal.

The ratio of Savanna water to well water used varies throughout the year according to amount of rainfall and demand. Analyses of the well waters indicate that the wells yield water of about the same chemical composition.

FORT PIERCE--Continued

ANALYSES

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

	Savanna Canal (raw water)	Wells 2 and 5 (raw water)	Finished water[a] (city tap)
Silica (SiO_2)	1.4	--	5.0
Iron (Fe)	.01	.16	.00
Manganese (Mn)	--	--	.00
Calcium (Ca)	9.6	98	28
Magnesium (Mg)	3.6	3.3	3.0
Sodium (Na)	21	42	34
Potassium (K)			1.7
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	21	316	56
Sulfate (SO_4)	7.7	5.6	41
Chloride (Cl)	43	60	52
Fluoride (F)	--	.1	.1
Nitrate (NO_3)	.2	.4	.6
Dissolved solids	148	365	205
Hardness as $CaCO_3$:			
Total	39	258	82
Noncarbonate	22	0	36
Color	170	58	12
pH	6.0	7.1	6.9
Specific conductance (micromhos at 25 C.)	208	649	341
Turbidity	--	--	7.5
Temperature (F.)	--	--	--
Date of collection	Mar. 21, 1944	Mar. 24, 1948	Nov. 29, 1951

Regular determinations at treatment plant, 1951 [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	--	--	--	6.5	6.9	6.3	258	258	258	--	--	--
Finished water	--	--	--	8.6	8.8	8.5	112	120	100	--	--	--

[a] Composite, Savanna and well waters.
[b] Well water.

GAINESVILLE
(Population, 26,861)

Ownership: Municipal; also supplies the University of Florida.
Source: 4 wells (1 to 4) 365, 407, 421, and 464 ft deep.
Treatment: Aeration, prechlorination, coagulation with alum, softening with lime and soda ash, sedimentation, recarbonation, fluoridation, and rapid sand filtration.
Rated capacity of treatment plant: 3,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,500,000 gal.

The fluoride content of the raw water is about 0.3 ppm. The fluoride content of the treated water is maintained at about 0.7 ppm from May 1 through October, and about 0.9 ppm from November 1 to May.

GAINESVILLE--Continued

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.)

	Well 1	Well 4	Finished water (composite)
Silica (SiO_2)	20	21	17
Iron (Fe)	.10	.03	.0
Manganese (Mn)	--	--	--
Calcium (Ca)	51	55	17
Magnesium (Mg)	13	13	3.6
Sodium (Na)	11	3.8	22
Potassium (K)			
Carbonate (CO_3)	--	--	--
Bicarbonate (HCO_3)	200	210	58
Sulfate (SO_4)	30	13	43
Chloride (Cl)	7	9	9
Fluoride (F)	--	.2	.3
Nitrate (NO_3)	--	--	--
Dissolved solids	246	248	140
Hardness as $CaCO_3$:			
Total	181	191	57
Noncarbonate	17	19	10
Color	25	7	0
pH	7.6	7.8	8.5
Specific conductance (micromhos at 25 C.)	--	--	--
Turbidity	--	0.2	0.2
Temperature (F.)	--	--	--
Date of collection	Mar. 13, 1948	July 26, 1949	Jan. 19, 1948

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	180	--	--	7.8	--	--	200	--	--	--	--	--
Finished water	55	--	--	8.4	--	--	65	--	--	--	--	--

HIALEAH
(Population, 19,676)

Ownership: Supplied by Miami. (See Miami.)

HOLLYWOOD
(Population, 14,351)

Ownership: Municipal. Population supplied, highly variable, in winter months, about 35,000; in summer, about 21,000.
Source: 5 wells (1 to 5). Wells 1, 2, and 4 are each 85 ft deep. (Depths not reported for wells 3 and 5).
Treatment: Zeolite softening, chlorination, stabilization, and chlorination.
Rated capacity of treatment plant: 4,200,000 gpd.
Raw-water storage: 515,000 gal.
Finished-water storage: 2,000,000 gal.

HOLLYWOOD--Continued

ANALYSES

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

	Raw water [a]	Finished water [a]		Raw water [a]	Finished water [a]
Silica (SiO_2)	--	--	Hardness as $CaCO_3$:		
Iron (Fe)	.08	.06	Total	273	86
Manganese (Mn)	--	--	Noncarbonate	22	0
Calcium (Ca)	102	30			
Magnesium (Mg)	4.4	2.7	Color	25	19
Sodium (Na)	31	116	pH	6.8	6.7
Potassium (K)			Specific conductance (micromhos at 25 C.)	632	620
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	306	300	Temperature (F.)	--	--
Sulfate (SO_4)	28	35	Date of collection	Mar. 29, 1948	Mar. 29, 1948
Chloride (Cl)	42	40			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.7	.3			
Dissolved solids	359	372			

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	225	--	--	7.2	--	--	266	--	--	56	--	--
Finished water	--	140	87	7.2	--	--	--	--	--	60	--	--

[a] Composite.

JACKSONVILLE
(Population, 204,517)

Ownership: Municipal; supplies also about 20,000 people outside the city limits. Total population supplied, about 224,500.

Source: 44 artesian wells most of which range in depth from about 1,000 to about 1,300 ft.

Treatment: Aeration at reservoirs, and chlorination.

Storage: Ground reservoirs, 18,000,000 gal; elevated tanks, 3,000,000 gal.

All of the wells yield water of similar chemical composition. Hydrogen sulfide (H_2S) in quantities of 1.5 to 2.5 ppm is present in all the well supplies. The fluoride content is reported to be 0.6 to 0.7 ppm.

JACKSONVILLE--Continued

ANALYSES

(Analyses, in parts per million, by Department of Chemistry, University of Fla.)

	Well 15[a]	Well 33	Well 38	Well 49	Finished water[b] (city tap)
Silica (SiO_2)	20	23	24	22	--
Iron (Fe)	.08	--	.0	.0	.0
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	67	70	76	75	67
Magnesium (Mg)	27	24	29	28	26
Sodium (Na) / Potassium (K)	11	12	9.7	8.7	14
Carbonate (CO_3)	--	--	--	--	--
Bicarbonate (HCO_3)	150	179	166	173	163
Sulfate (SO_4)	155	135	175	161	137
Chloride (Cl)	12	8	8	8	20
Fluoride (F)	--	--	--	--	--
Nitrate (NO_3)	.3	--	--	--	--
Dissolved solids	384	392	491	439	461
Hardness as $CaCO_3$:					
Total	278	276	310	300	274
Noncarbonate	155	126	172	160	140
Color	--	--	--	--	--
pH	--	7.6	7.5	7.6	7.4
Specific conductance (micromhos at 25 C.)	--	--	--	--	--
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	--	--
Date of collection	Oct. 31, 1941	May 20, 1950	May 20, 1950	May 20, 1950	May 12, 1949
Depth (feet)	1,034	1,064	1,283	1,365	
Diameter (inches)	12	10	10	12	
Date drilled	--	--	--	--	
Percent of supply	--	--	--	--	

[a] Analysis by U. S. Geological Survey.
[b] Analysis by Fla. State Board of Health, Tallahassee, Fla.

KEY WEST
(Population, 26,433)

Ownership: U. S. Navy; also supplies about 5,000 people outside the city limits, and other communities on the Florida Keys. Total population supplied, about 35,000.
Source: 4 wells (1 to 4) 62, 62, 48, and 53 ft deep. The wells are located at Florida City and the water is piped to Key West, a distance of 127 miles.
Treatment: Softening with lime, sedimentation, filtration, and chlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 300,000 gal.

KEY WEST--Continued

ANALYSIS

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

	Wells, Finished water (composite)		Wells, Finished water (composite)
Silica (SiO_2)	3.3	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	60
Manganese (Mn)	.00	Noncarbonate	10
Calcium (Ca)	21		
Magnesium (Mg)	1.8	Color	2
Sodium (Na)	6.3	pH	8.1
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	150
Carbonate (CO_3)	0	Turbidity	0.1
Bicarbonate (HCO_3)	61	Temperature (F.)	--
Sulfate (SO_4)	6.5	Date of collection	Jan. 30, 1952
Chloride (Cl)	10		
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	85		

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	180	185	170	7.4	7.4	7.4	180	185	170	0	0	0
Finished water	86	115	65	8.4	8.4	8.4	76	100	54	0	0	0

LAKELAND
(Population, 30,851)

Ownership: Municipal; supplies also about 5,000 people outside the city limits. Total population supplied, about 35,900.
Source: 7 deep wells (1 to 7). The depths of wells 1 to 5 are reported to be 741, 846, 1,201, 683, and 828 ft. The yield of well 5 is reported to be 4,500 gpm. Wells 1 and 2 are used in emergencies.
Treatment: Aeration and chlorination.
Rated capacity of treatment plant: --
Raw-water storage: 800,000 gal.
Finished-water storage: 750,000 gal.

LAKELAND--Continued

ANALYSES

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

	Well 3[a]	Well 4[b]	Well 5
Silica (SiO_2)	22	--	19
Iron (Fe)	.16	.05	.02
Manganese (Mn)	--	--	--
Calcium (Ca)	91	54	54
Magnesium (Mg)	21	18	16
Sodium (Na)	7.4	8.8	6.8
Potassium (K)			1.0
Carbonate (CO_3)	--	--	0
Bicarbonate (HCO_3)	250	266	242
Sulfate (SO_4)	100	0	2.0
Chloride (Cl)	15	7	10
Fluoride (F)	--	--	.4
Nitrate (NO_3)	--	--	.2
Dissolved solids	425	245	236
Hardness as $CaCO_3$:			
Total	314	209	201
Noncarbonate	109	0	2
Color	--	12	10
pH	--	7.2	7.2
Specific conductance (micromhos at 25 C.)	--	--	393
Turbidity	--	--	7.0
Temperature (F.)	--	--	80
Date of collection	Feb. 18, 1935	Mar. 18, 1946	Nov. 24, 1951
Depth (feet)	1,201	683	828
Diameter (inches)	18	--	24
Date drilled	1926	--	1945
Percent of supply	--	--	--

[a] Analysis by Southern Analytical Laboratory.
[b] Analysis by Florida State Board of Health, Jacksonville, Fla.

LAKE WORTH
(Population, 11,777)

Ownership: Municipal. Total population supplied varies from 12,000 to 20,000.
Source: 7 wells (1 to 3, 5, 7, 9, and 10) 136, 136, 136, 100, 140, 92, and 100 ft deep.
Treatment: None.
Storage: 600,000 gal.

LAKE WORTH--Continued

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.

	Well 1	Well 5	Wells[a] (composite)	All Wells[b] (composite)
Silica (SiO_2)	3.3	6.8	7	--
Iron (Fe)	.96	1.6	.92	.50
Manganese (Mn)	--	--	--	--
Calcium (Ca)	70	85	65	--
Magnesium (Mg)	2.7	2.7	6.6	--
Sodium (Na), Potassium (K)	10	4.3	8.1	14
Carbonate (CO_3)	--	--	--	0
Bicarbonate (HCO_3)	207	244	205	198
Sulfate (SO_4)	4.5	3	6.3	24
Chloride (Cl)	25	21	23	21
Fluoride (F)	--	--	--	.1
Nitrate (NO_3)	--	--	--	2.1
Dissolved solids	262	295	261	--
Hardness as $CaCO_3$:				
Total	186	223	189	186
Noncarbonate	16	23	21	24
Color	29	85	29	70
pH	7.4	7.3	7.4	7.9
Specific conductance (micromhos at 25 C.)	--	--	--	414
Turbidity	0.7	9	1	--
Temperature (F.)	--	--	--	--
Date of collection	Feb. 7, 1950	Feb. 2, 1950	Feb. 7, 1950	Feb. 11, 1952
Depth (feet)	136	100		
Diameter (inches)	12	--		
Date drilled	1925	1947		
Percent of supply	--	--		

[a] All wells, except well 10.
[b] Analysis by U. S. Geological Survey.

MIAMI
(Population, 249,276)

Ownership: Municipal; also supplies Coral Gables, El Portal, Hialeah, Miami Beach, Miami Shores, Miami Springs, Surfside, and other communities. Total population supplied, about 350,000.
Source: 22 wells (1 to 8, 11 to 24) 62 to 110 ft deep serving the Hialeah Plant, and 4 wells (1 to 4) 98 to 101 ft deep serving the Southwest Plant.
Treatment: Hialeah Plant: Softening with lime, sedimentation, recarbonation, rapid sand filtration, chlorination, and fluoridation. Southwest Plant: Softening with lime, sedimentation, and chlorination.
Rated capacity of treatment plants: Hialeah Plant, 60,000,000 gpd; Southwest Plant, 40,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 24,000,000 gal.

MIAMI--Continued

The Southwest supply system is under development. Ultimately it is to provide 80,000,000 gpd from the new well field located about 1 mile west of the County Hospital at Kindall and 4 miles west of the Southwest treatment plant at Galloway Road and Seaboard Airline Railroad, which is 6½ miles from the southwest section of Miami. The treatment for the water will be similar to that given at the Hialeah plant.

The water from the wells of both fields is similar in chemical composition.

ANALYSES

(Analyses, in parts per million, by City of Miami Water Department)

	Well 1, Hialeah Plant	Well 24, Hialeah Plant	Well 2, Southwest Field	Raw water (composite)	Finished water (composite)
Silica (SiO_2)	6.8	10	4.8	9.0	9.0
Iron (Fe)	1.7	1.2	.62	.9	.02
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	93	89	95	98	25
Magnesium (Mg)	4.9	4.4	2.9	7.1	4.0
Sodium (Na) + Potassium (K)	13	8.3	3.2	17	27
Carbonate (CO_3)	0	0	0	0	3
Bicarbonate (HCO_3)	255	278	264	268	49
Sulfate (SO_4)	39	7.4	18	37	40
Chloride (Cl)	22	16	15	35	35
Fluoride (F)	--	--	--	--	[a].2
Nitrate (NO_3)	--	--	--	2.2	2.2
Dissolved solids	330	310	275	350	190
Hardness as $CaCO_3$:					
Total	252	240	249	274	79
Noncarbonate	43	12	32	56	34
Color	--	--	--	80	23
pH	7.3	7.2	7.2	7.3	8.7
Specific conductance (micromhos at 25 C.)	--	--	--	--	--
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	--	--
Date of analysis	1946	1951	1951	November, 1948	November, 1948

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	220	230	215	7.3	--	7.2	260	265	250	0.1	--	--
Finished water	43	52	36	8.8	9.2	8.4	85	100	80	.1	--	--

[a] From partial analysis, July 27, 1951. A fluoride content of about 0.8 ppm in the finished water is maintained throughout the year.

MIAMI BEACH
(Population, 46,282)

Ownership: Supplied by Miami. (See Miami.)

NORTH MIAMI
(Population, 10,734)

Ownership: Municipal. Total population supplied varies from 15,000 to 20,000.
Source: Well Field No. 1: 4 wells (1 to 4) 35 to 45 ft deep; Well Field No. 2: 4 wells (1 to 4) 25 to 55 ft deep.
Treatment: Softening with excess lime, coagulation with activated silica, sedimentation, filtration, and chlorination.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,500,000 gal.

ANALYSES

(Analyses, in parts per million, by Biscayne Chemical Laboratory, Miami)

	Well 1[a] (raw water)	Well 3[a] (raw water)	Raw water[b]	Finished water[b]
Silica (SiO_2)	4.4	5.2	5.2	7.6
Iron (Fe)	2.6	1.8	.32	.12
Manganese (Mn)	--	--	--	--
Calcium (Ca)	76	96	99	29
Magnesium (Mg)	1.9	2.6	3.8	2.4
Sodium (Na) + Potassium (K)	4.6	2.3	8.2	9.5
Carbonate (CO_3)	--	--	--	--
Bicarbonate (HCO_3)	206	254	255	38
Sulfate (SO_4)	20	26	47	47
Chloride (Cl)	13	13	16	16
Fluoride (F)	--	--	.2	.3
Nitrate (NO_3)	--	--	.1	.5
Dissolved solids	250	300	363	178
Hardness as $CaCO_3$:				
Total	198	250	263	82
Noncarbonate	29	42	54	51
Color	--	--	--	--
pH	7.2	7.2	7.5	8.4
Specific conductance (micromhos at 25 C.)	--	--	--	--
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of analysis	Feb. 22, 1951	Feb. 22, 1951	November, 1942	November, 1942

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	--	174	--	--	7.2	--	--	240	--	--	0	--
Finished water	--	24	--	--	--	--	--	40	--	--	0	--

[a] Well Field No. 2.
[b] Well Field No. 1, wells 1 to 4; analysis by U. S. Geological Survey.

OCALA
(Population, 11,741)

Ownership: Municipal; supplies also about 1,500 people outside the city limits. Total population supplied, about 13,200.
Source: 3 wells (1 to 3) 350, 350, and 455 ft deep.
Treatment: Aeration, softening with lime and soda ash, sedimentation, recarbonation, filtration, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 650,000 gal.

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.)

	Well 1 (raw water)	Well 3 (raw water)		Well 1 (raw water)	Well 3 (raw water)
Silica (SiO_2)	13	12	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.03	Total	350	321
Manganese (Mn)	--	--	Noncarbonate	192	171
Calcium (Ca)	109	104			
Magnesium (Mg)	19	15	Color	--	--
Sodium (Na)	10	7.1	pH	7.6	7.8
Potassium (K)			Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	--	--	Turbidity	--	--
Bicarbonate (HCO_3)	194	183	Temperature (F.)	--	--
Sulfate (SO_4)	180	160	Date of collection	June 22, 1950	June 22, 1950
Chloride (Cl)	18	14			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	--	--			
Dissolved solids	489	442			

Regular determinations at treatment plant, 1951

	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	160	--	--	7.3	7.4	7.2	328	332	326	78	--	--
Finished water	39	50	30	9.5	9.7	9.4	100	115	85	75	--	--

ORLANDO
(Population, 52,367)

Ownership: Municipal; also supplies about 17,000 people outside the city limits. Total population supplied, about 69,000.
Source: Lake Underhill, Lake Ivanhoe, and 1 well 908 ft deep. Well water is pumped into Lake Underhill to maintain the water level of the lake. Lake water is then pumped to the treatment plant.
Treatment: Aeration, coagulation with alum and activated silica, lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 20,000,000 gpd.
Raw-water storage: 737,000,000 gal.
Finished-water storage: 5,000,000 gal.

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.)

	Lake Underhill	Lake Ivanhoe	Well 1	Finished water (composite)
Silica (SiO_2)	1.4	1.8	5.7	4.0
Iron (Fe)	.05	.01	.01	.06
Manganese (Mn)	--	--	--	--
Calcium (Ca)	27	13	30	39
Magnesium (Mg)	3.2	.8	7.4	6.3
Sodium (Na)	12	18	11	20
Potassium (K)				
Carbonate (CO_3)	--	--	--	--
Bicarbonate (HCO_3)	102	44	132	93
Sulfate (SO_4)	6.5	9.7	4.2	60
Chloride (Cl)	12	21	12	20
Fluoride (F)	--	--	.1	.1
Nitrate (NO_3)	--	--	--	--
Dissolved solids	125	100	135	180
Hardness as $CaCO_3$:				
Total	81	36	105	123
Noncarbonate	0	0	0	47
Color	--	--	14	--
pH	7.4	7.3	8.8	7.3
Specific conductance (micromhos at 25 C.)	--	--	--	--
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Dec. 15, 1947	Dec. 15, 1947	Apr. 21, 1948	Feb. 1, 1951

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	95	99	74	8.4	8.8	7.6	98	105	86	2.0	2.7	1.4
Finished water	80	87	57	8.4	8.5	8.1	105	115	95	.5	.5	.5

PANAMA CITY
(Population, 25,814)

Ownership: Municipal; also supplies about 500 people outside the city limits. Total population supplied, about 26,300.
Source: 2 well fields: Millville, 4 wells (1 to 4) 80 to 130 ft deep; St. Andrews, 7 wells, each 600 ft deep (cased from 125 to 175 ft).
Treatment: Millville plant: Softening with lime, sedimentation, recarbonation, filtration, and chlorination. St. Andrews: Chlorination only.
Rated capacity of treatment plant: Millville plant, 1,000,000 gpd.
Raw-water storage: St. Andrews water, 1,000,000 gal.
Finished-water storage: Millville water: 3 elevated tanks, 100,000 gal each; clear wells, 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)	8.5	17	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.12	Total	106	211
Manganese (Mn)	.00	.00	Noncarbonate	16	20
Calcium (Ca)	39	45			
Magnesium (Mg)	2.1	24	Color	2	1
Sodium (Na)	8.2	26	pH	8.0	7.6
Potassium (K)	1.2	2.6	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	249	505
Bicarbonate (HCO_3)	110	233	Turbidity	0.5	0.3
Sulfate (SO_4)	12	12	Temperature (F.)	--	--
Chloride (Cl)	14	49	Date of collection	Feb. 15, 1952	Jan. 31, 1952
Fluoride (F)	.0	.3			
Nitrate (NO_3)	.6	.5			
Dissolved solids	147	287			

[a] Composite, Millville well field.
[b] Composite, St. Andrews well field.

PENSACOLA
(Population, 43,479)

Ownership: Municipal. Total population supplied, about 48,000.
Source: 6 wells: Main Plant wells (6 to 9) 245, 240, 169, and 252 ft deep; West Plant well, 226 ft deep; East Plant well, 260 ft deep.
Treatment: Aeration, pH control, and chlorination.
Rated capacity of plants: 19,440,000 gpd.
Raw-water storage: 1,600,000 gal.
Finished-water storage: 1,000,000 gal.

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	9.0	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	20
Manganese (Mn)	.00	Noncarbonate	11
Calcium (Ca)	5.0		
Magnesium (Mg)	1.8	Color	2
Sodium (Na)	7.2	pH	7.1
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	87.0
Carbonate (CO_3)	0	Turbidity	3.0
Bicarbonate (HCO_3)	11	Temperature (F.)	--
Sulfate (SO_4)	5.8	Date of collection	Jan. 5, 1952
Chloride (Cl)	9.8		
Fluoride (F)	.0		
Nitrate (NO_3)	8.5		
Dissolved solids	56		

Depth (feet)	245, 252
Diameter (inches)	30, 16
Date drilled	1940, 1945
Percent of supply	--

[a] Composite, wells 6 and 9.

ST. AUGUSTINE
(Population, 13,555)

Ownership: Municipal; supplies also about 200 people outside the city limits. Total population supplied, about 13,750.
Source: 15 shallow wells (1 to 15) 65 to 90 ft deep for regular supply; 3 deep wells, 325 ft deep, emergency supply. The shallow wells are located 2½ miles west of the treatment plant and the deep wells on the plant grounds.
Treatment: Softening with lime and soda ash, coagulation with alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: --
Finished-water storage: 1,713,000 gal.

Analyses indicate that the water from the individual wells varies to some extent as to chemical composition, but all of it is really hard.

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.)

	Raw water[a]	Finished water[a]	Finished water[b]
Silica (SiO_2)	15	6.6	--
Iron (Fe)	.30	.10	--
Manganese (Mn)	--	--	--
Calcium (Ca)	119	27	--
Magnesium (Mg)	3.3	2.6	--
Sodium (Na)	20	29	49
Potassium (K)			
Carbonate (CO_3)	--	--	0
Bicarbonate (HCO_3)	349	38	31
Sulfate (SO_4)	26	59	90
Chloride (Cl)	30	34	42
Fluoride (F)	--	--	.1
Nitrate (NO_3)	--	--	1.0
Dissolved solids	429	207	--
Hardness as $CaCO_3$:			
Total	312	78	73
Noncarbonate	26	47	48
Color	--	--	3
pH	7.2	8.2	7.5
Specific conductance (micromhos at 25 C.)	--	--	382
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	Jan. 28, 1948	Jan. 28, 1948	Mar. 27, 1952

Regular determinations at treatment plant, 1951

	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	337	365	316	7.0	7.1	6.9	337	365	316	75	75	75
Finished water	38	86	32	8.6	9.4	8.1	82	104	78	--	--	--

[a] Composite, wells 1 to 14.
[b] Composite, wells 4, 7, 8, 11, 12, 13, 14, and 1b. Analysis by U. S. Geological Survey.

ST. PETERSBURG
(Population, 96,738)

Ownership: Municipal; supplies also Gulfport, Pinellas Park, Bay Pines Hospital, and other consumers. Total population regularly supplied, about 110,000. Population supplied during winter tourist season may reach a peak total of 275,000.
Source: 14 wells ranging in depth from 300 to 350 ft located near Cosme in northwest part of Hillsborough County. Emergency supplies from Mirror Lake (Plant) and Crescent Lake (Plant).
Treatment: Softening with lime, coagulation with ferric sulfate, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 330,000 gal.

Analyses of samples from all of the wells indicate that the wells yield water of about the same composition.

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.)

	Well 1C	Well 5	Well 7A	Raw water[a]	Finished water[a]
Silica (SiO_2)	14	16	16	14	11
Iron (Fe)	--	--	.10	.10	.04
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	68	76	80	68	38
Magnesium (Mg)	2.9	4.1	4.9	2.5	2.5
Sodium (Na)	4.0	4.5	3.6	5.5	3.4
Potassium (K)					
Carbonate (CO_3)	--	--	--	--	--
Bicarbonate (HCO_3)	216	244	256	221	109
Sulfate (SO_4)	--	1.5	4.3	1	8.8
Chloride (Cl)	9	10	9	7	10
Fluoride (F)	.2	.2	.2	0	0
Nitrate (NO_3)	--	--	--	--	--
Dissolved solids	218	245	264	221	149
Hardness as $CaCO_3$:					
Total	182	206	220	180	105
Noncarbonate	5	6	10	0	16
Color	--	--	--	.10	4
pH	7.7	7.6	7.5	7.5	7.8
Specific conductance (micromhos at 25 C.)	--	--	--	--	--
Turbidity	--	--	--	1	0.8
Temperature (F.)	--	--	--	--	--
Date of collection	Aug. 24, 1950	Aug. 24, 1950	Aug. 24, 1950	May 21, 1949	May 21, 1949
Depth (feet)	300	350	300		
Diameter (inches)	--	--	--		
Date drilled	1941	1930	1943		
Percent of supply	--	--	--		

[a] Composite.

ST. PETERSBURG--Continued

Regular determinations at treatment plant, 1951

	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	186	196	191	7.3	7.4	7.2	183	192	180	76	76	76
Finished water	88	100	186	7.8	8.0	7.6	92	99	88	79	82	76

SANFORD
(Population, 11,935)

Ownership: Municipal; also supplies about 1,000 people outside the city limits.
Total population supplied, about 12,900.
Source: 7 wells (1 to 7) 135, 80, 135, 135, 135, 135, and 180 ft deep.
Treatment: Aeration and chlorination.
Raw-water storage: 1,000,000 gal.
Finished-water storage: 200,000 gal.

ANALYSES

(Analyses, in parts per million, by Louis C. Herring & Co.).

	Well 1	Well 3	Well 6	Finished water[a]
Silica (SiO_2)	7.2	6.8	7.4	10
Iron (Fe)	1.6	1.2	1.8	.24
Manganese (Mn)	--	--	--	.00
Calcium (Ca)	50	44	43	46
Magnesium (Mg)	9.1	9.0	8.3	8.7
Sodium (Na)	37	36	29	29
Potassium (K)				1.6
Carbonate (CO_3)	--	--	--	0
Bicarbonate (HCO_3)	180	168	161	162
Sulfate (SO_4)	7.3	6.3	6.3	7
Chloride (Cl)	62	56	46	55
Fluoride (F)	--	--	--	.1
Nitrate (NO_3)	1.2	1.2	1.2	.6
Dissolved solids	275	245	238	246
Hardness as $CaCO_3$:				
Total	162	147	141	151
Noncarbonate	15	9	10	18
Color	--	--	--	2
pH	7.6	7.7	7.7	7.6
Specific conductance (micromhos at 25 C.)	--	--	--	430
Turbidity	--	--	--	0.3
Temperature (F.)	--	--	--	--
Date of analysis	Aug. 8, 1950	Aug. 8, 1950	Aug. 8, 1950	Feb. 7, 1952
Depth (feet)	135	135	135	80 to 180
Diameter (inches)	8	8	8	8
Date drilled	--	--	--	--
Percent of supply	--	--	--	--

[a] Composite, wells 1 to 7. Analysis by U. S. Geological Survey.

SARASOTA
(Population, 18,896)

Ownership: Municipal.
Source: 16 deep wells in 5 well fields: Plant well field, 5 wells (1 to 5) 640 to 758 ft deep; Northeast well field, 4 wells (1 to 4) each 600 ft deep; Northwest well field, 3 wells (1 to 3) 350, 580, and 570 ft deep; Payne Terminal wells (1 and 2) 529 and 475 ft deep; St. Armands Key wells (1 and 2) 340 and 400 ft deep. The Plant well field is pumped by means of gasoline power and can be used in case of electric power failure.
Treatment: Softening with zeolite (both pressure and gravity type softeners, sea water regenerated).
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 950,000 gal.
Finished-water storage: 1,935,000 gal.

Partial analyses of samples from all of the wells indicate that the water is of similar chemical composition. The St. Armands Key wells yield water that is lower in dissolved solids and hardness than that from the other wells. The Plant well field yields water with the highest dissolved solids.

ANALYSES

(Analyses, in parts per million, by Black Laboratory, Inc., Gainesville, Fla.)

	Northwest well field		Well 1 [a]	Finished water [b]
	Well 1	Well 3		
Silica (SiO_2)	23	24	30	24
Iron (Fe)	--	--	--	.56
Manganese (Mn)	--	--	--	.00
Calcium (Ca)	220	196	73	14
Magnesium (Mg)	106	151	43	.3
Sodium (Na)	90	57	52	530
Potassium (K)				16
Carbonate (CO_3)	--	--	--	0
Bicarbonate (HCO_3)	146	149	193	161
Sulfate (SO_4)	809	824	216	817
Chloride (Cl)	156	180	64	168
Fluoride (F)	--	--	--	1.5
Nitrate (NO_3)	--	--	--	.5
Dissolved solids	[c] 1,480	[c] 1,500	[c] 573	[c] 1,650
Hardness as $CaCO_3$:				
Total	985	1,110	359	36
Noncarbonate	866	988	201	0
Color	--	--	--	2
pH	7.5	7.4	7.6	7.5
Specific conductance (micromhos at 25 C.)	--	--	--	2,420
Turbidity	--	--	--	0.4
Temperature (F.)	--	--	--	--
Date of analysis	Dec. 11, 1950	Dec, 11, 1950	Dec. 11, 1950	Feb. 12, 1952
Depth (feet)	350	570	340	
Diameter (inches)	--	--	--	
Date drilled	1950	1950	1950	
Percent of supply	--	--	--	

[a] St. Armands Key well field.
[b] Composite, wells 1, 2, 3, and 4, Plant well field; wells 1 and 2 North well field; well 2, West well. Analysis by U. S. Geological Survey.
[c] Sum of determined constituents.

SARASOTA--Continued

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.....	140	145	136	7.8	7.9	7.6	1060	1120	985	--	--	--
Finished water...	140	150	136	8.0	8.2	7.9	45	55	36	--	--	--

TALLAHASSEE
(Population, 27,237)

Ownership: Municipal; supplies also about 7,500 people outside the city limits. Total population supplied, about 34,700.

Source: 9 wells (1 to 9). Wells 1 and 2 are obsolete; 3 and 4, for emergency use only. The depths of wells 5 to 9 are reported to be 246, 414, 400, 427, and 350 ft, respectively. (Wells 10 and 11 were under construction at the time of obtaining well data).

Treatment: Chlorination and fluoridation. [a]

Storage: 1 ground reservoir, 400,000 gal; 2 elevated tanks, 400,000 and 500,000 gal.

ANALYSES

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

	Wells 8 and 9 [b]	Well 9 [c]		Wells 8 and 9 [b]	Well 9 [c]
Silica (SiO_2)	14	8	Hardness as $CaCO_3$:		
Iron (Fe)	.00	.02	Total	152	124
Manganese (Mn)	.00	.00	Noncarbonate.....	10	4
Calcium (Ca)	41	36			
Magnesium (Mg).....	12	8.3	Color.....	2	10
Sodium (Na)	3.0	7.8	pH.....	7.8	7.8
Potassium (K)	.2		Specific conductance (micromhos at 25 C.).....	287	0
Carbonate (CO_3)	0	--			
Bicarbonate (HCO_3)	173	146	Turbidity.....	2.4	--
Sulfate (SO_4)	6.5	5.4	Temperature (F.)...	--	--
Chloride (Cl)	5.4	10	Date of collection...	Jan. 4, 1952	--
Fluoride (F)	.1	--			
Nitrate (NO_3)	.9	1.8			
Dissolved solids.....	164	173			
Depth (feet)				427, 350	350
Diameter (inches)				--	--
Date drilled				1946	1946
Percent of supply				--	--

[a] Fluoridation was begun about Mar. 1, 1952.

[b] Composite. Collected from distribution system. Not fluoridated.

[c] Analysis by Pittsburgh Testing Laboratory, Pittsburgh, Pa.

TAMPA
(Population, 124,681)

Ownership: Municipal; supplies also about 50,000 people outside the city limits. Total population supplied, about 175,000.
Source: Hillsborough River, 97 percent of supply; wells, 3 percent.
Treatment: The treatment varies from mainly color removal with alum during wet seasons to lime softening during dry seasons when the use of well water increases and the hardness of the river water increases.
Rated capacity of treatment plant: 30,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 5,200,000 gal.

The composition of the river water varies considerably throughout the year.

ANALYSES

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

	Finished water	Finished water		Finished water	Finished water
Silica (SiO_2)	5.3	--	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.15	Total	91	72
Manganese (Mn)	.0	--	Noncarbonate	34	43
Calcium (Ca)	29	--			
Magnesium (Mg)	4.5	--	Color	2	30
Sodium (Na)	4.9	7.7	pH	7.5	7.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	203	192
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	69	35	Temperature (F.)	--	--
Sulfate (SO_4)	21	37	Date of collection	Mar. 11, 1949	Nov. 9, 1951
Chloride (Cl)	16	15			
Fluoride (F)	.1	.2			
Nitrate (NO_3)	.4	.3			
Dissolved solids	123	--			

Regular determinations at treatment plant, 1950-1951

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Color		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	89	130	46	7.3	8.3	6.8	111	144	60	96	190	30
Finished water	59	96	34	8.3	8.7	7.8	115	160	58	16	25	8

WARRINGTON
(Population, 13,570)

Ownership: Peoples Water Service Company of Florida. Total population supplied, about 19,100.
Source: 5 wells (1 to 5) 242, 225, 286, 298, and 300 ft deep.
Treatment: Chlorination, and lime for adjustment of pH.
Finished-water storage: 2 tanks, 60,000 and 150,000 gal.

ANALYSIS

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

	Well 3 (finished water)		Well 3 (finished water)
Silica (SiO_2)	9.0	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	25
Manganese (Mn)	.00	Noncarbonate	3
Calcium (Ca)	9.2		
Magnesium (Mg)	.4	Color	2
Sodium (Na)	3.0	pH	6.9
Potassium (K)	.2	Specific conductance (micromhos at 25 C.)	69.2
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	26		
Sulfate (SO_4)	1.5	Turbidity	3.0
Chloride (Cl)	5.8	Temperature (F.)	--
Fluoride (F)	.1	Date of collection	Jan. 5, 1952
Nitrate (NO_3)	.1		
Dissolved solids	44		

Depth (feet)	286
Diameter (inches)	--
Date drilled	1946
Percent of supply	--

WEST PALM BEACH
(Population, 43,162)

Ownership: West Palm Beach Water Company; supplies also Palm Beach. Total population supplied, about 47,000.
Source: Clear Lake and Lake Mangonea (Loxahatchee Marsh).
Treatment: Aeration, coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 26,000,000 gpd.
Raw-water storage: 2,100,000,000 gal.
Finished-water storage: 4,000,000 gal.

At certain periods of the year, well water having an alkalinity of 120 ppm is added to the raw water in amounts varying between 3 to 10 percent of the total to increase the alkalinity of the raw water. The wells are considered as an adjunct to the treatment plant rather than as an auxiliary supply.

ANALYSES

(Analyses, in parts per million, by So. Analytical Laboratory, Jacksonville)

	Raw water	Finished water	Finished water[a]
Silica (SiO_2)	2.2	1.6	--
Iron (Fe)	.56	.10	.05
Manganese (Mn)	--	--	--
Calcium (Ca)	27	35	--
Magnesium (Mg)	2.6	2.2	--
Sodium (Na)	11	32	3.7
Potassium (K)			
Carbonate (CO_3)	--	--	0
Bicarbonate (HCO_3)	61	61	26
Sulfate (SO_4)	12	65	23
Chloride (Cl)	28	34	16
Fluoride (F)	.5	--	.1
Nitrate (NO_3)	--	--	.3
Dissolved solids	173	225	--
Hardness as $CaCO_3$:			
Total	80	96	60
Noncarbonate	30	46	39
Color	25	2	5
pH	7.7	7.9	8.1
Specific conductance (micromhos at 25 C.)	--	--	155
Turbidity	18	5	--
Temperature (F.)	--	--	--
Date of collection	June 21, 1949	June 21, 1949	Nov. 21, 1951

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Color		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	34	66	16	7.6	8.5	6.8	56	82	29	71	95	35
Finished water	22	40	14	8.5	9.7	7.1	76	93	49	6	20	3

[a] Analysis by U. S. Geological Survey.

ALBANY, GEORGIA
(Population, 31,155)

Ownership: Municipal; also supplies suburban areas and Turner Air Force Base. Total population supplied, about 37,000.
Source: 7 deep wells (6 to 12). (Wells 7 and 8 under repair and not in use as of Feb. 2, 1952). The depths of wells 6, 9, 10, 11, 12 are 955, 795, 868, 915, and 725 ft, respectively; yields reported to be 1,500, 1,669, 1,248, 1,250, and 1,175 gpm.
Treatment: Chlorination at wells.
Raw-water storage: None.
Finished-water storage: 3 reservoirs, 310,000, 244,000, and 998,000 gal; 2 elevated tanks, 500,000 gal each.

ANALYSES

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

	Well 11 (raw water)	Finished water [a]	Well 9 (finished water)
Silica (SiO_2)	26	26	32
Iron (Fe)	.11	.10	.11
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	26	30	32
Magnesium (Mg)	7.7	6.5	6.5
Sodium (Na), Potassium (K)	28	33	24
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	173	191	176
Sulfate (SO_4)	11	10	8.6
Chloride (Cl)	2.9	4.4	3.2
Fluoride (F)	.2	.3	.2
Nitrate (NO_3)	.3	.2	.2
Dissolved solids	188	202	194
Hardness as $CaCO_3$:			
Total	96	102	107
Noncarbonate	0	0	0
Color	2	8	1
pH	8.0	7.8	7.8
Specific conductance (micromhos at 25 C.)	295	325	297
Turbidity	0	0	1
Temperature (F.)	73	69	72
Date of collection	Dec. 1, 1951	Dec. 1, 1951	Dec. 1, 1951
Depth (feet)	915		795
Diameter (inches)	20		20
Date drilled	1950		1947
Percent of supply	--		--

[a] Mixed water from wells 7, 8, and 10.

AMERICUS
(Population, 11,389)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 11,400.
Source: 5 wells (1 to 5) 259, 168, 635, 635, and 450 ft deep.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 4 reservoirs, 422,000 gal; elevated tank, 350,000 gal.

AMERICUS--Continued

ANALYSES

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

	Well 1	Well 2	Well 4 (finished water)
Silica (SiO_2)	28	50	62
Iron (Fe)	.18	.36	.38
Manganese (Mn)	--	--	.03
Calcium (Ca)	46	30	27
Magnesium (Mg)	4.5	3.1	3.0
Sodium (Na)	3.4	3.3	2.0
Potassium (K)	3.4	3.0	
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	152	96	85
Sulfate (SO_4)	16	14	9.2
Chloride (Cl)	2.0	2.0	3.2
Fluoride (F)	.0	.0	.1
Nitrate (NO_3)	.1	.1	.1
Dissolved solids	177	155	154
Hardness as $CaCO_3$:			
Total	133	88	80
Noncarbonate	9	9	10
Color	--	--	1
pH	--	--	7.7
Specific conductance (micromhos at 25 C.)	--	--	169
Turbidity	--	--	0
Temperature (F.)	67	--	72
Date of collection	Jan. 21, 1938	Jan. 21, 1938	Dec. 1, 1951
Depth (feet)	259	168	635
Diameter (inches)	12	10	12
Date drilled	1927	1914	1947
Percent of supply	--	--	--

ATHENS
(Population, 28,180)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 32,000.

Source: Oconee River and/or Sandy Creek.

Treatment: Prechlorination, ammoniation, coagulation with alum and lime, carbon for taste and odor control, sedimentation, fluoridation, rapid sand filtration, and adjustment of pH with lime.

Rated capacity of treatment plant: 3,000,000 gpd.

Raw-water storage: Reservoir, 100,000,000 gal.

Finished-water storage: 2 clear wells, 500,000 and 750,000 gal; 2 elevated tanks, 750,000 and 250,000 gal.

The intake on the Oconee River is adjacent to the treatment plant in the north section of the city. Water is pumped from the river directly to the treatment plant. The intake on Sandy Creek is about $\frac{1}{2}$ mile north of the city. Normally, creek water is pumped to a 100,000,000 gal raw-water reservoir, thence to the treatment plant.

ATHENS--Continued

ANALYSES

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

	Oconee River (raw water)	Sandy Creek (raw water)	Finished water [a]	Finished water [b]
Silica (SiO_2)	15	14	12	14
Iron (Fe)	.05	.05	.10	.06
Manganese (Mn)	--	.00	.00	.03
Calcium (Ca)	3.9	3.6	8.8	13
Magnesium (Mg)	1.8	1.3	1.4	1.6
Sodium (Na)	3.8	4.2	3.9	4.4
Potassium (K)	1.2			
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	25	21	22	30
Sulfate (SO_4)	2.9	2.1	13	17
Chloride (Cl)	2.1	2.4	3.0	3.2
Fluoride (F)	.1	.1	.0	.6
Nitrate (NO_3)	.3	.5	.4	.4
Dissolved solids	43	40	55	73
Hardness as $CaCO_3$:				
Total	17	14	28	39
Noncarbonate	0	0	10	14
Color	6	3	2	3
pH	--	6.6	6.8	8.2
Specific conductance (micromhos at 25 C.)	--	42.6	79.4	107
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Nov. 15, 1940	Mar. 1, 1951	Mar. 1, 1951	July 31, 1951

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	14	18	10	6.6	6.7	6.5	--	--	--	20	25	15
Finished water	20	26	15	8.3	8.3	8.2	--	--	--	0	0	0

[a] Sandy Creek.

[b] Mixed sample, Sandy Creek, and Oconee River.

ATLANTA

(Population, 331,314)

Ownership: Municipal; also supplies suburban areas, the cities of Forest Park, Hapeville, Marietta, Smyrna, and communities in Cobb, DeKalb, and Fulton counties. Total population supplied, about 550,000.

Source: Chattahoochee River.

Treatment: Coagulation with alum and bleaching clay, chlorination, ammoniation, activated carbon, sedimentation, rapid sand filtration, and adjustment of pH with lime. Copper sulfate is used for the control of algae.

Rated capacity of treatment plant: 70,000,000 gpd.

Raw-water storage: Reservoirs, 500,000,000 gal.

Finished-water storage: Clear water well, 10,000,000 gal; standpipe, 500,000 gal; elevated tank, 2,000,000 gal.

The intake is about 7 miles northwest of the center of the city and about 4 miles from the treatment plant. The water is pumped from the river to the raw-water reservoirs from which it flows to the treatment plant. The finished water is pumped into the distribution system and to elevated storage.

ATLANTA--Continued
ANALYSES

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

	Raw water	Finished water	Finished water
Silica (SiO_2)	10	9.6	11
Iron (Fe)	.14	.05	.05
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	2.8	5.8	6.2
Magnesium (Mg)	1.0	1.0	1.1
Sodium (Na)	3.3	2.1	3.6
Potassium (K)			
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	16	17	15
Sulfate (SO_4)	2.1	4.2	6.5
Chloride (Cl)	1.9	3.0	5.4
Fluoride (F)	.0	.0	.0
Nitrate (NO_3)	.3	.6	1.4
Dissolved solids	33	40	48
Hardness as $CaCO_3$:			
Total	11	19	20
Noncarbonate	0	5	8
Color	4	2	2
pH	6.9	7.3	6.9
Specific conductance (micromhos at 25 C.)	35.4	56.3	63.0
Turbidity	--	--	--
Temperature (F.)	--	--	57
Date of collection	Mar. 3, 1951	Mar. 5, 1951	Dec. 18, 1951

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	14	10	6.9	7.2	6.5	10	11	8	26	150	7
Finished water	16	17	14	8.7	8.9	8.5	19	23	18	.10	.30	.10

AUGUSTA
(Population, 71,508)

Ownership: Municipal; also supplies suburban areas. Total population supplied, about 110,000.
Source: Savannah River. The intake is 3 miles north of the city.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 21,000,000 gpd.
Raw-water storage: 2 reservoirs, 60,000,000 gal each.
Finished-water storage: 2 clear wells, 3,000,000 and 1,000,000 gal; elevated tank, 500,000 gal; standpipe, 250,000 gal.

AUGUSTA--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	12	Hardness as $CaCO_3$:		
Iron (Fe)	.10	.03	Total	13	20
Manganese (Mn)	.00	.00	Noncarbonate	0	5
Calcium (Ca)	3.0	5.8			
Magnesium (Mg)	1.3	1.3	Color	8	3
Sodium (Na)	3.6	4.0	pH	6.9	7.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	44.2	62.7
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	17	18	Temperature (F.)	--	--
Sulfate (SO_4)	2.8	8.8	Date of collection	Apr. 7, 1951	Apr. 7, 1951
Chloride (Cl)	2.6	3.1			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.3	.3			
Dissolved solids	37	46			

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	16	17	15	7.2	7.3	7.0	--	--	--	66	150	25
Finished water	15	16	14	7.5	7.2	7.2	--	--	--	1	1	1

BAINBRIDGE

(Population, 7,562)

Ownership: Municipal; also supplies suburban areas. Total population supplied, about 11,000.

Source: 4 wells (1 to 4). Depth not reported for well 1; depth of wells 2 to 4, 450, 464, and 434 ft, respectively.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 2 reservoirs, 225,000 gal; standpipe, 93,800 gal. (Additional elevated storage tank of 500,000 gal capacity expected to be in service by July 1, 1952.)

ANALYSIS

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

	Wells 2 and 3 (finished water)		Wells 2 and 3 (finished water)
Silica (SiO_2)	8.7	Hardness as $CaCO_3$:	
Iron (Fe)	.17	Total	122
Manganese (Mn)	.00	Noncarbonate	7
Calcium (Ca)	37		
Magnesium (Mg)	7.3	Color	2
Sodium (Na)	5.4	pH	7.5
Potassium (K)		Specific conductance (micromhos at 25 C.)	261
Carbonate (CO_3)	0	Turbidity	1
Bicarbonate (HCO_3)	141	Temperature (F.)	69
Sulfate (SO_4)	3.6	Date of collection	Dec. 3, 1951
Chloride (Cl)	10		
Fluoride (F)	.0		
Nitrate (NO_3)	.7		
Dissolved solids	139		

BRUNSWICK
(Population, 17,954)

Ownership: Peoples Water Service Company of Georgia; also supplies suburban areas. Total population supplied, about 22,000.
Source: 4 wells (1 to 4) 1,027, 1,000, 1,000, and 750 ft deep. The wells flow, but wells 1, 3, and 4 are equipped with turbine pumps.
Treatment: Chlorination.
Raw-water storage: 3 reservoirs, 200,000, 100,000, and 100,000 gal.
Finished-water storage: None.

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

	Well 3 (raw water)	Well 4 (raw water)	Wells 1 and 2 (finished water)
Silica (SiO_2)	36	37	41
Iron (Fe)	.18	.10	.06
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	39	40	102
Magnesium (Mg)	24	24	67
Sodium (Na)	12	12	108
Potassium (K)			
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	143	143	142
Sulfate (SO_4)	78	79	376
Chloride (Cl)	15	17	181
Fluoride (F)	.6	.5	.7
Nitrate (NO_3)	.2	.0	.2
Dissolved solids	283	290	1,000
Hardness as $CaCO_3$:			
Total	196	198	530
Noncarbonate	79	81	414
Color	3	2	8
pH	7.3	7.4	7.3
Specific conductance (micromhos at 25 C.)	430	436	1,450
Turbidity	0	1	0
Temperature (F.)	75	76	80
Date of collection	Dec. 4, 1951	Dec. 4, 1951	Dec. 4, 1951
Depth (feet)	1,000	750	
Diameter (inches)	18-12	8	
Date drilled	1944	1945	
Percent of supply	--	--	

CARROLLTON
(Population, 7,753)

Ownership: Municipal; also supplies suburban areas. Total population supplied, about 9,000.
Source: Little Tallapoosa River. The intake is about 1.2 miles north of the center of the city. Auxiliary or emergency supply, Curtis Creek impounded in 185 acre lake.
Treatment: Coagulation with alum and lime, ammoniation (ammonium sulfate), chlorination, sedimentation, rapid sand filtration, and final adjustment of pH with lime.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: Lake, 250,000,000 gal.
Finished-water storage: Clear well, 150,000 gal; standpipe, 145,000 gal; elevated tank, 500,000 gal.

CARROLLTON--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	14	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	32
Manganese (Mn)	.00	Noncarbonate	4
Calcium (Ca)	10		
Magnesium (Mg)	1.6	Color	2
Sodium (Na)	4.9	pH	8.6
Potassium (K)		Specific conductance (micromhos at 25 C.)	88.6
Carbonate (CO_3)	5	Turbidity	1
Bicarbonate (HCO_3)	22	Temperature (F.)	48
Sulfate (SO_4)	5.3	Date of collection	Nov. 29, 1951
Chloride (Cl)	6.5		
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	59		

CARTERSVILLE

(Population, 7,270)

Ownership: Municipal; also supplies suburban areas and town of Atco. Total population supplied, about 10,300.

Source: Etowah River about 90 percent of supply; spring about 10 percent of supply. The percentage taken from each source varies with the stage of the river. The intake in the river is about 1.5 miles south of the city adjacent to the treatment plant.

Treatment: Prechlorination, coagulation with alum and lime, activated carbon (Nuchar) at times, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.

Rated capacity of treatment plant: 2,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 2 reservoirs, 1,100,000, and 100,000 gal; elevated tank, 60,000 gal.

ANALYSES

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

	Raw water [a]	Finished water [a]		Raw water [a]	Finished water [a]
Silica (SiO_2)	8.1	7.9	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.02	Total	55	70
Manganese (Mn)	.00	.00	Noncarbonate	2	11
Calcium (Ca)	12	18			
Magnesium (Mg)	6.2	6.1	Color	5	5
Sodium (Na)	3.0	4.3	pH	7.9	7.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	122	154
Carbonate (CO_3)	0	0	Turbidity	5	1
Bicarbonate (HCO_3)	65	72	Temperature (F.)	57	57
Sulfate (SO_4)	2.8	11	Date of collection	Nov. 28, 1951	Nov. 28, 1951
Chloride (Cl)	3.1	5.4			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.6	1.3			
Dissolved solids	68	92			

[a] Etowah River (90 percent); Spring (10 percent).

CARTERSVILLE--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	36	38	33	7.4	7.5	7.2	--	--	--	170	332	97
Finished water	--	--	--	7.9	8.0	7.8	--	--	--	10	15	5

CEDARTOWN
(Population, 9,470)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 10,250.
Source: Spring.
Treatment: Chlorination.
Raw-water storage: 2 standpipes, 185,000 and 1,575,000 gal.
Finished-water storage: None.

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

	Finished water		Finished water
Silica (SiO_2)	9.1	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	139
Manganese (Mn)	.00	Noncarbonate	8
Calcium (Ca)	31		
Magnesium (Mg)	15	Color	2
Sodium (Na)	.7	pH	7.3
Potassium (K)		Specific conductance (micromhos at 25 C.)	253
Carbonate (CO_3)	0	Turbidity	0
Bicarbonate (HCO_3)	160	Temperature (F.)	62
Sulfate (SO_4)	3.5	Date of collection	Dec. 29, 1951
Chloride (Cl)	2.8		
Fluoride (F)	.2		
Nitrate (NO_3)	1.7		
Dissolved solids	144		

COLLEGE PARK
(Population, 14,535)

Ownership: Municipal.
Source: Supplied by East Point. (See East Point.)

COLUMBUS
(Population, 79,611)

Ownership: Municipal; also supplies Bealwood, Bibb City, and suburban districts. Total population supplied, about 120,000.
Source: Chattahoochee River.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 18,000,000 gpd.
Raw-water storage: Reservoir, 30,000,000 gal.
Finished-water storage: 3 clear wells, 3,000,000, 2,500,000, and 250,000 gal; 3 elevated tanks, 1,000,000 gal.

The treatment plant is about 4 miles north of the center of the city near the intake in the river. The water is pumped from the river into a raw-water reservoir from which it flows to the treatment plant.

COLUMBUS--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	8.9	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.03	Total	12	25
Manganese (Mn)	.00	.00	Noncarbonate	0	8
Calcium (Ca)	3.0	7.8			
Magnesium (Mg)	1.1	1.3	Color	7	3
Sodium (Na)	4.7	6.2	pH	6.6	7.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	45.6	88.2
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	16	21	Temperature (F.)	--	--
Sulfate (SO_4)	3.8	11	Date of collection	July 7, 1951	July 31, 1951
Chloride (Cl)	2.9	5.8			
Fluoride (F)	.1	.2			
Nitrate (NO_3)	1.1	1.2			
Dissolved solids	40	55			

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	14	16	8	7.0	7.5	6.8	15	22	8	35	185	5
Finished water	14	22	12	8.2	8.8	7.9	18	21	14	0	0	0

CORDELE

(Population, 9,462)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 9,500.

Source: 3 wells (1 to 3) 396, 735, and 540 ft deep. The yield of well 1 is reported to be 900 gpm; of well 3, 1,000 gpm; of well 2, not reported.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: Reservoir, 250,000 gal; standpipe, 250,000 gal.

ANALYSES

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

	Well 1	Well 1	Well 3 (raw water)	Wells 1, 2, 3 (finished water)
Silica (SiO_2)	13	13	32	31
Iron (Fe)	.01	--	.06	.09
Manganese (Mn)	--	--	.00	.00
Calcium (Ca)	44	--	52	52
Magnesium (Mg)	1.5	--	2.4	2.4
Sodium (Na)	3.4	--	2.5	--
Potassium (K)	.5	--		
Carbonate (CO_3)	--	0	0	0
Bicarbonate (HCO_3)	135	134	163	160
Sulfate (SO_4)	1.4	--	7.5	7.0
Chloride (Cl)	4.8	--	2.4	.9
Fluoride (F)	.0	--	.1	.0
Nitrate (NO_3)	3.2	--	.0	.0
Dissolved solids	142	--	184	180
Hardness as $CaCO_3$:				
Total	116	117	140	140
Noncarbonate	5	7	6	8

CORDELE, Analyses--Continued

	Well 1	Well 1	Well 3 (raw water)	Wells 1, 2, 3 (finished water)
Color	--	--	1	3
pH	--	7.8	7.5	7.3
Specific conductance (micromhos at 25 C.)	--	243	271	269
Turbidity	--	--	0	1
Temperature (F.)	--	62	70	63
Date of collection	Jan. 21, 1938	Dec. 1, 1951	Dec. 1, 1951	Dec. 1, 1951
Depth (feet)	396	396	540	
Diameter (inches)	8	8	26-10	
Date drilled	1900	1900	1948	
Percent of supply	--	--	--	

DALTON
(Population, 15,968)

Ownership: Municipal; also supplies suburban areas. Total population supplied, about 19,000.

Source: Mill Creek. The intake is at the treatment plant about 1.4 miles northwest of the center of the city.

Treatment: Softening with lime, coagulation with ferric sulfate or alum, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 5,000,000 gpd.

Raw-water storage: None.

Finished-water storage: Clear well, 200,000 gal; 2 elevated tanks, 2,000,000 and 750,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	9.2	8.5	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.01	Total	118	69
Manganese (Mn)	.00	.00	Noncarbonate	3	6
Calcium (Ca)	33	14			
Magnesium (Mg)	8.6	8.2	Color	4	3
Sodium (Na)	1.6	1.7	pH	7.3	8.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	225	145
Carbonate (CO_3)	0	7	Turbidity	1	1
Bicarbonate (HCO_3)	140	62	Temperature (F.)	47	50
Sulfate (SO_4)	2.5	7.9	Date of collection	Nov. 29, 1951	Nov. 29, 1951
Chloride (Cl)	2.0	2.4			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.9	.9			
Dissolved solids	130	80			

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	100	125	10	7.1	7.3	6.5	100	140	12	50	5000	10
Finished water	50	65	20	8.6	9.1	8.2	50	65	2.0	--	--	--

DECATUR
(Population, 21,635)

Ownership: DeKalb County Water System; supplies Decatur and suburban areas, Avondale, Chamblee, Doraville, and a large number of consumers in DeKalb County. Total population supplied, about 93,000.
Source: Chattahoochee River. The intake is at Holcombe Bridge about 22 miles north of Decatur.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, fluoridation, and adjustment of pH with lime.
Rated capacity of treatment plant: 16,000,000 gpd.
Raw-water storage: Reservoir, 75,000,000 gal.
Finished-water storage: Clear well, 1,500,000 gal; 2 clear wells, 400,000 gal (owned by Decatur, leased by county); 3 elevated tanks, 1,000,000, 500,000, and 85,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	12	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.03	Total	12	19
Manganese (Mn)	.00	.00	Noncarbonate	0	5
Calcium (Ca)	3.0	5.8			
Magnesium (Mg)	1.1	1.2	Color	9	2
Sodium (Na)	4.1	3.4	pH	6.8	6.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	56.4	58.1
Carbonate (CO_3)	0	0	Turbidity	16	1
Bicarbonate (HCO_3)	15	18	Temperature (F.)	50	51
Sulfate (SO_4)	3.6	5.6	Date of collection	Nov. 27, 1951	Nov. 27, 1951
Chloride (Cl)	2.9	3.2			
Fluoride (F)	.2	.6			
Nitrate (NO_3)	.2	.2			
Dissolved solids	42	40			

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	20	23	19	8.0	8.5	7.8	30	--	--	38	--	--

DUBLIN
(Population, 10,232)

Ownership: Municipal; also supplies Veterans Hospital. Total population supplied, about 11,000.
Source: 4 wells (1 to 4) 290, 290, 490, and 650 ft deep. The wells are all flowing wells. The yield of well 4 is reported to be 350 gpm.
Treatment: Aeration, ammoniation, softening with lime, chlorination, sedimentation, recarbonation, and rapid sand filtration.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: None.
Finished-water storage: Clear well, 500,000 gal; 2 elevated tanks, 63,000, and 250,000 gal.

DUBLIN--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	21	21	Hardness as $CaCO_3$:		
Iron (Fe)	.81	.04	Total	170	53
Manganese (Mn)	.00	.00	Noncarbonate	13	12
Calcium (Ca)	63	17			
Magnesium (Mg)	3.1	2.6	Color	4	4
Sodium (Na)	2.9	4.1	pH	7.1	7.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	333	130
Carbonate (CO_3)	0	0	Turbidity	0	1
Bicarbonate (HCO_3)	191	50	Temperature (F.)	67	64
Sulfate (SO_4)	15	15	Date of collection	Nov. 30, 1951	Nov. 30, 1951
Chloride (Cl)	2.4	3.5			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.1	.4			
Dissolved solids	207	92			

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	175	186	162	7.2	7.2	7.2	176	180	174	--	--	--
Finished water	54	77	40	8.5	8.6	8.4	66	88	58	--	--	--

EAST POINT

(Population, 21,080)

Ownership: Municipal; also supplies College Park and suburban areas. Total population supplied, about 38,000.

Source: Sweetwater Creek. The intake is about 12 miles west of East Point.

Treatment: Prechlorination, ammoniation, coagulation with alum, sedimentation, rapid sand filtration, chlorine dioxide, and adjustment of pH with lime.

Rated capacity of treatment plant: 4,000,000 gpd.

Raw-water storage: Reservoir, 10,000,000 gal (An additional reservoir of 47,000,000 gal capacity is being constructed).

Finished-water storage: Clear well, 750,000 gal; 2 elevated tanks, 500,000 gal each; 1 elevated tank (in College Park).

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	19	18	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.03	Total	19	35
Manganese (Mn)	.00	.00	Noncarbonate	0	7
Calcium (Ca)	4.9	11			
Magnesium (Mg)	1.7	1.9	Color	12	3
Sodium (Na)	6.1	5.7	pH	7.3	8.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	79.1	96.6
Carbonate (CO_3)	0	8	Turbidity	8	1
Bicarbonate (HCO_3)	24	18	Temperature (F.)	50	51
Sulfate (SO_4)	6.3	11	Date of collection	Nov. 28, 1951	Nov. 28, 1951
Chloride (Cl)	3.9	5.0			
Fluoride (F)	.2	.3			
Nitrate (NO_3)	.3	.2			
Dissolved solids	59	70			

EAST POINT--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.....	17	28	13	6.9	7.3	6.7	16	20	14	60	320	10
Finished water...	24	30	20	8.7	9.2	8.4	29	30	26	.2	.5	0

FITZGERALD

(Population, 8,130)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,600.

Source: 3 wells (1 to 3) 576, 825, 750 ft deep. The wells are located at the pumping plant.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 3 reservoirs, 34,000, 120,000, and 750,000 gal; 1 standpipe, 98,000 gal.

ANALYSES

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

	Well 1[a]	Well 3 (finished water)		Well 1[a]	Well 3 (finished water)
Silica (SiO_2)	22	23	**Hardness as $CaCO_3$:**		
Iron (Fe)	.02	.17	Total	94	98
Manganese (Mn)	--	.00	Noncarbonate.....	0	5
Calcium (Ca)	24	23			
Magnesium (Mg).....	8.4	9.8	Color.....	--	2
Sodium (Na)	3.0	.8	pH.....	--	7.8
Potassium (K)	.6		Specific conductance (micromhos at 25 C.).....	--	189
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	120	113	Turbidity.....	--	1
Sulfate (SO_4)	1.6	.9	Temperature (F.)...	71	71
Chloride (Cl)	2.5	3.8	Date of collection...	Feb. 1, 1938	Dec. 3, 1951
Fluoride (F)	.0	.2			
Nitrate (NO_3)	.1	.0			
Dissolved solids.....	122	120			
Depth (feet)				576	750
Diameter (inches)				10	12
Date drilled				1921	--
Percent of supply				--	--

[a] U. S. Geological Survey Water-Supply Paper 912, 1940.

GAINESVILLE

(Population, 11,936)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 18,000.

Source: Chattahoochee River (75 percent of supply); Crier Creek and Peeler Branch (25 percent of supply). The intake on Chattahoochee River is about 3.4 miles northeast of the center of the city.

Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination when necessary.

Rated capacity of treatment plant: 2,000,000 gpd.

Raw-water storage: Impounding reservoir about 3,000,000 gal.

Finished-water storage: Clear well, 480,000 gal; 2 standpipes, 300,000 and 210,000 gal.

GAINESVILLE--Continued

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	11	10	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.03	Total	9	12
Manganese (Mn)	.00	.00	Noncarbonate	0	4
Calcium (Ca)	2.2	3.6			
Magnesium (Mg)	.8	.8	Color	15	5
Sodium (Na)	3.4	3.0	pH	6.4	6.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	28.4	44.5
Carbonate (CO_3)	0	0	Turbidity	2	3
Bicarbonate (HCO_3)	15	10	Temperature (F.)	--	53
Sulfate (SO_4)	1.3	5.7	Date of collection	Nov. 27, 1951	Nov. 27, 1951
Chloride (Cl)	1.5	3.1			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.4	.1			
Dissolved solids	28	31			

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	12	8	6.9	7.2	6.8	20	25	16	120	500	30
Finished water	11	13	9	6.9	7.1	6.8	25	28	18	1	1	1

[a] Chattahoochee River 75 percent; Crier Creek and Peeler Branch 25 percent.

GRIFFIN

(Population, 13,982)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 20,000.

Source: Flint River. The intake is about 10 miles northwest of the city.

Treatment: Prechlorination during fall and winter months, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.

Rated capacity of treatment plant: 4,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 2 clear wells, 1,500,000 and 3,000,000 gal; 2 elevated tanks, 275,000 and 300,000 gal.

GRIFFIN--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	20	19	Hardness as $CaCO_3$:		
Iron (Fe)	.18	.03	Total	15	35
Manganese (Mn)	.00	.00	Noncarbonate	0	5
Calcium (Ca)	3.5	11			
Magnesium (Mg)	1.6	1.8	Color	32	3
Sodium (Na)	6.9	6.1	pH	6.9	8.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	60.6	103
Carbonate (CO_3)	0	0	Turbidity	4	1
Bicarbonate (HCO_3)	26	36	Temperature (F.)	--	55
Sulfate (SO_4)	2.5	9.8	Date of collection	Nov. 30, 1951	Nov. 30, 1951
Chloride (Cl)	3.6	5.4			
Fluoride (F)	.4	.3			
Nitrate (NO_3)	.4	.1			
Dissolved solids	53	75			

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	20	28	13	6.8	7.0	6.5	18	21	16	35	700	20
Finished water	27	36	19	8.0	8.4	7.8	28	32	26	.15	.20	.10

HAPEVILLE

(Population, 8,560)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 11,000.

Source: Finished-water from Atlanta 85 percent of supply ; 2 wells (Atlanta Avenue and Jonesboro Road) 800 and 600 ft deep, 15 percent of supply.

Treatment: Well water: None.

Raw-water storage: None.

Finished-water storage: 3 elevated tanks, 500,000, 100,000, and 100,000 gal.

Partial analyses of samples from the wells, Nov. 28, 1951, indicated no essential change has occurred in the chemical character of the water since 1938.

ANALYSES

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

	Atlanta Avenue Well[a]	Well[b]		Atlanta Avenue Well[a]	Well[b]
Silica (SiO_2)	34	34	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.04	Total	63	56
Manganese (Mn)	--	--	Noncarbonate	0	0
Calcium (Ca)	20	13			
Magnesium (Mg)	3.2	5.8	Color	--	--
Sodium (Na)	11	7.6	pH	--	--
Potassium (K)	2.2	5.3	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	--	--			
Bicarbonate (HCO_3)	93	80	Turbidity	--	--
Sulfate (SO_4)	10	9.3	Temperature (F.)	66	64
Chloride (Cl)	1.8	2.5	Date of collection	May 2, 1938	May 2, 1938
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.0	.08			
Dissolved solids	128	115			

[a] U. S. Geological Survey Water-Supply Paper 912. 1940. [b] Jonesboro Road.

HAPEVILLE--Continued

	Atlanta Avenue Well[a]	Well[b]
Depth (feet)	800	600
Diameter (inches)	10	10
Date drilled	1932	1930
Percent of supply	--	--

[a] U. S. Geological Survey Water-Supply Paper 912. 1940. [b] Jonesboro Road.

LAGRANGE
(Population, 25,025)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 25,500.
Source: Chattahoochee River. The intake in the river is about 3.5 miles west of the city.
Treatment: Coagulation with alum and lime, chlorination, sedimentation, rapid sand filtration, and adjustment of pH with lime.
Rated capacity of treatment plant: 6,000,000 gal.
Raw-water storage: Reservoir, 12,000,000 gal.
Finished-water storage: Clear well, 1,000,000 gal; elevated tank, 1,000,000 gal; standpipe, 300,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	14	13	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.02	Total	16	28
Manganese (Mn)	.00	.00	Noncarbonate	3	8
Calcium (Ca)	4.2	9.2			
Magnesium (Mg)	1.3	1.3	Color	17	1
Sodium (Na)	5.4	5.8	pH	6.9	8.8
Potassium (K)			Specific conductance (micromhos at 25 C.)	60.0	88.8
Carbonate (CO_3)	0	5	Turbidity	10	1
Bicarbonate (HCO_3)	16	15	Temperature (F.)	52	53
Sulfate (SO_4)	4.6	10	Date of collection	Nov. 29, 1951	Nov. 29, 1951
Chloride (Cl)	5.6	6.0			
Fluoride (F)	.3	.2			
Nitrate (NO_3)	1.1	1.1			
Dissolved solids	48	60			

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	15	20	8	6.8	7.2	6.4	20	--	--	--	300	10
Finished water	28	30	26	8.7	9.0	8.4	28	--	--	--	5	.5

MACON
(Population, 70,252)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 100,000.
Source: Ocmulgee River. The intake in the river is about 3 miles north of the center of the city.
Treatment: Coagulation with alum, ammoniation, chlorination, activated carbon at times, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 12,000,000 gal.
Raw-water storage: None.
Finished-water storage: Clear well, 275,000 gal; 2 reservoirs, 1,500,000 and 3,000,000 gal; 2 standpipes, 200,000 and 1,000,000 gal.

ANALYSES

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

	Raw water[a]	Raw water	Finished water
Silica (SiO_2)	12	9.6	12
Iron (Fe)	.06	.04	.03
Manganese (Mn)	--	.00	.00
Calcium (Ca)	3.6	3.4	10
Magnesium (Mg)	1.6	1.5	1.6
Sodium (Na)	4.6	5.6	4.9
Potassium (K)	1.6		
Carbonate (CO_3)	--	0	0
Bicarbonate (HCO_3)	22	21	25
Sulfate (SO_4)	3.9	3.3	14
Chloride (Cl)	2.9	3.6	4.5
Fluoride (F)	.0	.2	.1
Nitrate (NO_3)	1.0	.7	.7
Dissolved solids	44	42	64
Hardness as $CaCO_3$:			
Total	16	15	32
Noncarbonate	--	0	11
Color	9	4	3
pH	--	7.0	7.2
Specific conductance (micromhos at 25 C.)	--	55.5	98.2
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	1937-38	Apr. 26, 1951	Apr. 26, 1951

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	15	16	15	7.4	7.2	7.2	--	--	--	--	35	18
Finished water	25	26	24	8.5	8.6	7.4	--	--	--	0	0	0

[a] Average of 36 analyses of 10-day composites of daily samples, May 1, 1937, to Apr. 30, 1938. (U. S. Geol. Survey Water Supply Paper 889-E. 1944)

MARIETTA
(Population, 20,687)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 20,700.
Source: Finished water from City of Atlanta, 2/3 of supply; 21 wells, 1/3 of supply. The wells range in depth from 259 to 910 ft and are reported to yield a total of 567 gpm.
Treatment: Well water: none.
Storage: 2 reservoirs, 243,000 and 1,000,000 gal; 2 standpipes, 500,000 gal each.

ANALYSES

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

	Well 8[a]	Well 18[a]	Well 21[a]	Well 25[a]	Wells[b]
Silica (SiO_2)	19	34	27	22	33
Iron (Fe)	.10	.09	.50	.43	.06
Manganese (Mn)	--	--	--	--	.00
Calcium (Ca)	6.0	32	10	9.8	16
Magnesium (Mg)	3.6	10	3.3	3.9	8.7
Sodium (Na)	3.1	15	5.4	12	4.5
Potassium (K)	1.5	3.1	2.2	1.8	
Carbonate (CO_3)	--	--	--	--	0
Bicarbonate (HCO_3)	31	103	40	33	73
Sulfate (SO_4)	3.0	25	16	3.4	8.0
Chloride (Cl)	4.0	16	1.8	15	7.4
Fluoride (F)	.0	.0	.0	.0	.0
Nitrate (NO_3)	2.5	28	.2	20	8.4
Dissolved solids	59	226	88	119	123
Hardness as $CaCO_3$:					
Total	30	121	39	40	76
Noncarbonate	4	37	6	13	16
Color	--	--	--	--	2
pH	--	--	--	--	6.9
Specific conductance (micromhos at 25 C.)	--	--	--	--	180
Turbidity	--	--	--	--	1
Temperature (F.)	63	62	62	62	62
Date of collection	Apr. 22, 1938	Apr. 22, 1938	Apr. 22, 1938	Apr. 22, 1938	Nov. 28, 1951
Depth (feet)	272	910	382	297	
Diameter (inches)	10	10	10	10	
Date drilled	--	1927	1928	1937	
Percent of supply	--	--	--	--	

[a] U. S. Geol. Water Supply Paper 912. 1942
[b] Composite sample of water from wells 1, 3, 5, and 8.

MILLEDGEVILLE
(Population, 8,835)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 9,850.
Source: Fishing Creek. The intake is about $2\frac{1}{4}$ miles west of the center of the city.
Treatment: Coagulation with alum, activated carbon, ammoniation, chlorination, sedimentation, rapid sand filtration, final adjustment of pH with lime, and addition of polyphosphate (Calgon).
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: Reservoir, 2,100,000 gal; sedimentation basin, 3,000,000 gal.
Finished-water storage: 2 clear wells, 35,000 and 165,000 gal; standpipe, 150,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	27	26	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.03	Total	36	67
Manganese (Mn)	.00	.00	Noncarbonate	0	16
Calcium (Ca)	7.9	20			
Magnesium (Mg)	4.0	4.2	Color	3	4
Sodium (Na)	11	11	pH	7.2	8.1
Potassium (K)			Specific conductance (micromhos at 25 C.)	123	190
Carbonate (CO_3)	0	0	Turbidity	3	1
Bicarbonate (HCO_3)	54	62	Temperature (F.)	49	50
Sulfate (SO_4)	3.6	18	Date of collection	Nov. 30, 1951	Nov. 30, 1951
Chloride (Cl)	8.4	15			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.1	.2			
Dissolved solids	89	126			

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	47	57	32	7.2	7.6	6.2	--	--	--	20	300	5
Finished water	42	60	18	6.7	7.3	6.1	--	41	39	1	2	1

MOULTRIE
(Population, 11,639)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 17,600.
Source: 3 wells (1 to 3) 750, 825, and 752 ft deep. The yield of wells 2 and 3 is reported to be 1,350 and 831 gpm respectively.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 2 reservoirs, 250,000 gal each; 2 elevated tanks, 150,000 and 500,000 gal.

MOULTRIE--Continued

ANALYSES

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

	Well 2 (raw water)	Well 3 (finished water)		Well 2 (raw water)	Well 3 (finished water)
Silica (SiO_2)	26	24	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.07	Total	113	391
Manganese (Mn)	.00	.00	Noncarbonate	4	283
Calcium (Ca)	24	86			
Magnesium (Mg)	13	43	Color	2	7
Sodium (Na)	26	34	pH	7.7	7.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	333	859
Carbonate (CO_3)	0	0	Turbidity	0	1
Bicarbonate (HCO_3)	134	132	Temperature (F.)	74	70
Sulfate (SO_4)	48	329	Date of collection	Dec. 2, 1951	Dec. 2, 1951
Chloride (Cl)	6.6	8.6			
Fluoride (F)	.6	.9			
Nitrate (NO_3)	.1	.4			
Dissolved solids	210	635			
Depth (feet)				825	752
Diameter (inches)				12	16
Date drilled				1943	1948-49
Percent of supply				--	--

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	--	125	116	7.4	--	--	--	388	118	--	--	--

NEWNAN

(Population, 8,218)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 10,000.

Source: 4 springs 80 percent of supply; 5 wells (1, 2, 4 to 6) 400, 806, 350, 350, and 350 ft deep, 20 percent of supply.

Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and aeration at times.

Rated capacity of treatment plant: 3,000,000 gpd.

Raw-water storage: Reservoir, 130,000,000 gal.

Finished-water storage: 2 clear wells, 250,000 and 1,250,000 gal; elevated tank, 500,000 gal; standpipe, 300,000 gal.

NEWNAN--Continued

ANALYSES

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

	Raw water [a]	Raw water [b]	Finished water [c]
Silica (SiO_2)	11	25	12
Iron (Fe)	.45	.03	.03
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	4.4	17	17
Magnesium (Mg)	1.4	1.4	1.4
Sodium (Na), Potassium (K)	4.3	9.0	5.5
Carbonate (CO_3)	0	0	15
Bicarbonate (HCO_3)	21	43	12
Sulfate (SO_4)	2.5	27	14
Chloride (Cl)	3.5	2.4	6.8
Fluoride (F)	.2	.2	.4
Nitrate (NO_3)	.9	.6	.2
Dissolved solids	41	105	82
Hardness as $CaCO_3$:			
Total	17	48	48
Noncarbonate	0	13	13
Color	5	1	3
pH	6.6	7.0	9.4
Specific conductance (micromhos at 25 C.)	53.4	144	123
Turbidity	1	1	1
Temperature (F.)	54	--	55
Date of collection	Nov. 29, 1951	Nov. 29, 1951	Nov. 29, 1951

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	15	18	13	7.0	7.2	6.8	--	--	--	40	60	20
Finished water	22	28	16	8.4	8.8	8.0	36	46	26	.05	1	0

[a] From 4 springs.

[b] Mixed sample from wells 4, 5, and 6.

[c] From 4 springs (80 percent), and wells (20 percent).

ROME

(Population, 29,615)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 35,000.

Source: Oostanaula River. The intake is 2 miles north of the center of the city.

Treatment: Coagulation with alum, chlorination, ammoniation, carbon, sedimentation, rapid sand filtration, and adjustment of pH with lime.

Rated capacity of treatment plant: 6,000,000 gpd.

Raw-water storage: None.

Finished-water storage: Clear well, 1,000,000 gal; reservoir, 3,000,000 gal.

ROME--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.4	5.2	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.03	Total	21	39
Manganese (Mn)	.00	.00	Noncarbonate	1	12
Calcium (Ca)	6.3	13			
Magnesium (Mg)	1.4	1.7	Color	7	4
Sodium (Na) / Potassium (K)	2.5	3.2	pH	6.3	6.9
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	52.0	99.2
Bicarbonate (HCO_3)	25	33	Turbidity	--	--
Sulfate (SO_4)	3.0	14	Temperature (F.)	--	--
Chloride (Cl)	1.6	3.0	Date of collection	Apr. 23, 1951	Apr. 23, 1951
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.5	.3			
Dissolved solids	37	59			

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	39	48	32	7.1	7.3	6.9	42	52	18	153	297	36
Finished water	46	58	39	8.1	8.2	8.1	52	60	22	.1	.1	.1

SAVANNAH

(Population, 119,638)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 120,000.

Source: 5 Artesian wells (5, 7 to 10) 60 percent of supply; Abercorn Creek 40 percent of supply. The intake in the creek is about 15 miles north of the city. The wells are 82, 56, 68, 59, and 62 ft deep; the yield is reported to be 3,470, 2,800, 3,200, 3,470, and 1,400 gpm, respectively.

Treatment: Coagulation with alum, lime, and clay, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.

Rated capacity of treatment plant: 40,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 2 clear wells, 500,000 gal each; elevated tank, 4,000,000 gal; reservoir, 2,000,000 gal.

SAVANNAH--Continued

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)	13	12	Hardness as $CaCO_3$:		
Iron (Fe)	.10	.17	Total	18	36
Manganese (Mn)	.00	.00	Noncarbonate	0	8
Calcium (Ca)	5.2	12			
Magnesium (Mg)	1.3	1.5	Color	22	7
Sodium (Na)	5.6	5.7	pH	6.5	7.1
Potassium (K)			Specific conductance (micromhos at 25 C.)	59.1	108
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	26	34	Temperature (F.)	--	--
Sulfate (SO_4)	3.5	13	Date of collection	June 4, 1951	June 4, 1951
Chloride (Cl)	3.1	4.8			
Fluoride (F)	.2	.0			
Nitrate (NO_3)	.8	.4			
Dissolved solids	48	67			

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	18	26	10	6.6	7.2	6.0	19	26	12	70	125	15
Finished water	23	32	15	7.9	8.9	6.9	37	53	21	2.5	5	0

[a] From Abercorn Creek.

[b] From wells and Abercorn Creek.

THOMASVILLE
(Population, 14,424)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 14,800.

Source: 4 wells (2 to 5) 300, 550, 305, and 400 ft deep; yield reported to be 600, 1,200, 1,000, and 1,300 gpm respectively.

Treatment: Aeration, prechlorination, softening with lime and soda ash, coagulation with alum, bleaching clay, sedimentation, recarbonation, and rapid sand filtration.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: None.

Finished-water storage: Reservoir, 500,000 gal; elevated tank, 300,000 gal.

THOMASVILLE--Continued

ANALYSES

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

	Well 5 (raw water)	Finished water [a]		Well 5 (raw water)	Finished water [a]
Silica (SiO_2)	24	16	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.02	Total	208	94
Manganese (Mn)	.00	.00	Noncarbonate	79	49
Calcium (Ca)	47	23			
Magnesium (Mg)	22	8.9	Color	1	1
Sodium (Na)	6.9	20	pH	7.9	9.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	416	289
Carbonate (CO_3)	0	19	Turbidity	0	0
Bicarbonate (HCO_3)	157	16	Temperature (F.)	71	71
Sulfate (SO_4)	79	77	Date of collection	Dec. 2, 1951	Dec. 2, 1951
Chloride (Cl)	7.6	8.8			
Fluoride (F)	.4	.4			
Nitrate (NO_3)	.1	.1			
Dissolved solids	271	182			

Depth (feet)	400
Diameter (inches)	16
Date drilled	1949
Percent of supply	--

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	130	130	130	7.5	7.5	7.5	200	200	200	0	0	0
Finished water	32	47	27	8.9	9.6	8.4	85	110	75	0	0	0

[a] From wells 3 and 4.

VALDOSTA
(Population, 20,046)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 23,000.
Source: 3 wells (3, 4, Pendleton Park). The depths of wells 3 and 4 (Plant well) are 409 ft and 380 ft, respectively.
Treatment: Aeration, chlorination, Nalco, lime.
Rated capacity of treatment plant: None.
Raw-water storage: None.
Finished-water storage: 2 reservoirs, 250,000 and 1,000,000 gal; 3 elevated tanks, 100,000, 400,000, and 500,000 gal.

VALDOSTA--Continued

ANALYSES

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

	Well 3		Well 4 (finished water)	Finished water [a]
Silica (SiO_2)	15	23	16	28
Iron (Fe)	.01	--	.12	.13
Manganese (Mn)	--	--	.00	.00
Calcium (Ca)	32	--	35	24
Magnesium (Mg)	4.4	--	5.0	8.4
Sodium (Na)	2.3	--	1.6	.3
Potassium (K)	1.0	--		
Carbonate (CO_3)	--	0	0	0
Bicarbonate (HCO_3)	78	80	78	107
Sulfate (SO_4)	30	26	27	4.1
Chloride (Cl)	3.8	--	13	1.2
Fluoride (F)	.2	--	.3	.5
Nitrate (NO_3)	.3	--	.3	.1
Dissolved solids	136	--	143	128
Hardness as $CaCO_3$:				
Total	98	101	108	94
Noncarbonate	34	--	44	7
Color	--	--	20	5
pH	--	7.4	7.3	7.9
Specific conductance (micromhos at 25 C.)	--	218	220	187
Turbidity	--	--	1	1
Temperature (F.)	72	68	68	68
Date of collection	Sept. 30, 1941	Dec. 2, 1951	Dec. 2, 1951	Dec. 2, 1951
Depth (feet)	409	409	380	--
Diameter (inches)	15	15	15	--
Date drilled	1923	1923	1946	1949
Percent of supply	--	--	--	--

[a] Pendleton Park Well.

WARNER ROBINS

(Population, 7,986)

Ownership: U. S. Government. (Other data confidential.)

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	8.0	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	46
Manganese (Mn)	.00	Noncarbonate	3
Calcium (Ca)	17		
Magnesium (Mg)	.9	Color	22
Sodium (Na)	1.5	pH	7.3
Potassium (K)		Specific conductance (micromhos at 25 C.)	186
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	52	Temperature (F.)	58
Sulfate (SO_4)	.9	Date of collection	Sept. 22, 1952
Chloride (Cl)	2.2		
Fluoride (F)	.0		
Nitrate (NO_3)	3.3		
Dissolved solids	60		

WAYCROSS
(Population, 18,899)

Ownership: Municipal; also supplies suburban districts.
Source: 2 wells (1 and 2) in Legion Park and at pumping plant 700 and 703 ft deep. The yield of wells is reported to be 1,700 and 2,000 gpm.
Treatment: Chlorination.
Raw-water storage: Reservoir, 798,830 gal.
Finished-water storage: Standpipe, 281,000 gal.

ANALYSES

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

	Well 1	Well 2 (finished water)		Well 1	Well 2 (finished water)
Silica (SiO_2)	46	43	Hardness as $CaCO_3$:		
Iron (Fe)	.21	.11	Total	142	172
Manganese (Mn)	--	.00	Noncarbonate	--	42
Calcium (Ca)	34	41			
Magnesium (Mg)	14	17	Color	--	2
Sodium (Na)	16	16	pH	--	7.6
Potassium (K)	2.4		Specific conductance (micromhos at 25 C.)	--	394
Carbonate (CO_3)	--	0			
Bicarbonate (HCO_3)	159	159	Turbidity	--	0
Sulfate (SO_4)	29	48	Temperature (F.)	74	76
Chloride (Cl)	14	18	Date of collection	May 28, 1941	Dec. 3, 1951
Fluoride (F)	.4	.5			
Nitrate (NO_3)	.2	.1			
Dissolved solids	224	258			

Depth (feet)	658	703
Diameter (inches)	12	12-10
Date drilled	1893	1904
Percent of supply	--	--

ALTON, ILLINOIS
(Population, 32,550)

Ownership: Alton Water Company (controlled by American Water Works Company); supplies also about 1,450 people outside Alton. Total population supplied, about 34,000.
Source: Mississippi River.
Treatment: Coagulation with alum, softening with lime and soda ash, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 7,600,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,045,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.2	3.6	Hardness as $CaCO_3$:		
Iron (Fe)	[a].02	.12	Total	184	106
Manganese (Mn)	.18	.00	Noncarbonate	43	54
Calcium (Ca)	45	23			
Magnesium (Mg)	17	12	Color	20	5
Sodium (Na)	10	7.6	pH	7.7	7.7
Potassium (K)	1.6	2.4	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	410	275
Bicarbonate (HCO_3)	170	65	Turbidity	--	--
Sulfate (SO_4)	49	55	Temperature (F.)	76	76
Chloride (Cl)	10	10	Date of collection	Sept. 16, 1952	Sept. 16, 1952
Fluoride (F)	.4	.3			
Nitrate (NO_3)	.3	2.3			
Dissolved solids	251	166			

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	151	191	97	7.7	7.4	7.9	205	252	127	218	1,228	25
Finished water	52	90	29	9.3	10.2	7.9	117	150	90	0	0	0

[a] Iron in solution when analysed. Sample turbid when collected.

AURORA
(Population, 50,576)

Ownership: Municipal.
Source: 10 drilled wells (5 to 12, 12a, 14), 2,185 to 2,460 ft deep.
Treatment: Aeration for iron removal, chlorination of part of supply, filtration of part of supply.
Rated capacity of treatment plant: --
Raw-water storage: None.
Finished-water storage: 7,200,000 gal.

AURORA--Continued
ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Well 7	Wells (finished water)[a]		Well 7	Wells (finished water)[a]
Silica (SiO_2)	--	7.8	Hardness as $CaCO_3$:		
Iron (Fe)	1.2	.13	Total	329	350
Manganese (Mn)	--	.00	Noncarbonate	85	93
Calcium (Ca)	83	93			
Magnesium (Mg)	29	29	Color	0	2
Sodium (Na)	204	129	pH	--	6.8
Potassium (K)		16	Specific conductance (micromhos at 25 C.)	--	1,370
Carbonate (CO_3)	--	0	Turbidity	10	--
Bicarbonate (HCO_3)	[b]297	315	Temperature (F.)	--	--
Sulfate (SO_4)	45	37	Date of collection	Oct. 19, 1946	Sept., 1952
Chloride (Cl)	340	248			
Fluoride (F)	--	1.0			
Nitrate (NO_3)	.2	.2			
Dissolved solids	885	730			

Depth (feet)	2,262	--
Diameter (inches)	18	--
Date drilled	1915	--
Percent of supply	--	--

[a] Analysis by U. S. Geological Survey.
[b] Total alkalinity as bicarbonate (HCO_3).

BELLEVILLE
(Population, 32,721)

Ownership: East St. Louis and Interurban Water Company.
Source: Supplied by East St. Louis. (See East St. Louis.)

BERWYN
(Population, 51,280)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)
Finished-water storage: 2,650,000 gal.

BLOOMINGTON
(Population, 34,163)

Ownership: Municipal.
Source: Money Creek, impounded.
Treatment: Coagulation with alum, softening with lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 2,250,000,000 gal.
Finished-water storage: 8,160,000 gal.

BLOOMINGTON--Continued

ANALYSES

(Analyses, in parts per million, by Illinois Dept. of Public Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.0	--	Hardness as $CaCO_3$:		
Iron (Fe)	--	--	Total	221	98
Manganese (Mn)	.1	.08	Noncarbonate	57	36
Calcium (Ca)	49	22			
Magnesium (Mg)	24	10	Color	--	--
Sodium (Na)	.0	.0	pH	7.9	7.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	404	--
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	200	76	Temperature (F.)	--	--
Sulfate (SO_4)	49	22	Date of collection	Apr. 9, 1945	Mar. 12, 1951
Chloride (Cl)	1.0	.0			
Fluoride (F)	.1	--			
Nitrate (NO_3)	.3	11			
Dissolved solids	216	264			

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	150	171	100	8.2	9.0	7.6	206	252	150	65	800	10
Finished water	28	47	20	9.3	9.5	9.0	88	112	74	0	0	0

BLUE ISLAND
(Population, 17,622)

Ownership: Municipal; supplies also about 8,000 people outside Blue Island. Total population supplied, about 25,600.
Source: Supplied by Chicago. (See Chicago.)

BROOKFIELD
(Population, 15,472)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)

CALUMET CITY
(Population, 15,799)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)

CHAMPAIGN
(Population, 39,563)

Ownership: Northern Illinois Water Corporation.
Source: 40 drilled wells, 154 to 299 ft deep.
Treatment: Aeration for iron removal, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: --
Raw-water storage: None.
Finished-water storage: 3,050,000 gal.

CHAMPAIGN--Continued
ANALYSES

(Analyses, in parts per million, by Ill. Dept. of Health and by State Water Survey)

	Well 48	Well 50	Finished water
Silica (SiO_2)	24	19	18
Iron (Fe)	3.2	.8	.03
Manganese (Mn)	.0	--	.1
Calcium (Ca)	61	50	55
Magnesium (Mg)	23	27	34
Sodium (Na)	63	26	38
Potassium (K)			
Carbonate (CO_3)	--	--	0
Bicarbonate (HCO_3)	[a]473	[a]356	417
Sulfate (SO_4)	1.0	.0	12
Chloride (Cl)	3.0	2.0	3.0
Fluoride (F)	.5	.1	.3
Nitrate (NO_3)	.4	.2	.1
Dissolved solids	403	288	360
Hardness as $CaCO_3$:			
Total	248	237	277
Noncarbonate	0	0	0
Color	0	0	--
pH	--	--	7.7
Specific conductance (micromhos at 25 C.)	--	--	638
Turbidity	22	--	--
Temperature (F.)	--	--	--
Date of collection	Mar. 15, 1949	Jan. 19, 1949	Apr. 10, 1951
Depth (feet)	231	299	
Diameter (inches)	38-17	38-17	
Date drilled	1947	1947	
Percent of supply	--	--	

[a] Total alkalinity as bicarbonate (HCO_3).

CHICAGO
(Population, 3,620,962)

Ownership: Municipal; supplies also Berwyn, Blue Island, Brookfield, Calumet City, Cicero, Elmwood Park, Harvey, Maywood, Oak Park, Park Ridge, and a number of other cities and towns, of a total population of about 487,000. Total population supplied, about 4,108,000.

Source: Lake Michigan.

Treatment: North and Central Districts (about 67 percent of supply): chlorination. South District (about 33 percent of supply): prechlorination, coagulation with alum (and acid treated sodium silicate during winter months), activated carbon, addition of lime for corrosion control, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 320,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 8 basins, 14,600,000 gal; 2 reservoirs, 32,300,000 gal.

CHICAGO--Continued

The city is divided into three water districts: North District, Central District, and South District, served by 4 intakes in the Lake. Wilson Avenue Crib intake, 2.1 miles offshore at Wilson Avenue, supplies the North District; Wm. E. Dever Crib intake, 2.7 miles offshore at Chicago Avenue, and Four Mile Crib intake, 3.2 miles offshore at 14th Street, supply the Central District; Dunne Crib intake, 2 miles offshore at 68th Street, supplies the South District Filtration Plant and the South District. The water supply system includes 15 pumping stations. The treatment plant is on 79th Street at the Lake on the southeast side of the City. The plant serves a total population of about 1,510,000.

ANALYSES

(Analyses, in parts per million, by Chicago Department of Public Works)

	Raw water[a]	Finished water[a]	Finished water[b]	Finished water[c]
Silica (SiO_2)	2.3	1.8	2.1	2.2
Iron (Fe)	.09	.09	.21	.19
Manganese (Mn)	.00	.00	.00	.00
Calcium (Ca)	32	39	36	36
Magnesium (Mg)	10	10	10	10
Sodium (Na)	3.5	3.3	3.4	3.9
Potassium (K)	1.0	.7	.7	.6
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	138	132	135	138
Sulfate (SO_4)	17	23	17	18
Chloride (Cl)	6.5	7.2	6.3	6.4
Fluoride (F)	.1	.1	.1	.1
Nitrate (NO_3)	--	--	--	--
Dissolved solids	171	168	150	148
Hardness as $CaCO_3$:				
Total	121	138	131	131
Noncarbonate	8	30	20	18
Color	3	1	3	3
pH	8.2	7.9	8.2	8.2
Specific conductance (micromhos at 25 C.)	263	273	225	240
Turbidity	12	0	14	13
Temperature (F.)	40	39	37	38
Date of collection	Apr. 9, 1952	Apr. 9, 1952	Apr. 9, 1952	Apr. 9, 1952

Regular determinations at treatment plant, 1952[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	113	119	107	8.3	8.7	8.1	134	144	126	9.2	83	2.0
Finished water	107	115	95	8.1	8.5	7.7	137	148	126	0.0	0.1	0.0

[a] South District Filtration Plant.
[b] Chicago Ave. Pumping Station.
[c] Jefferson Ave. Pumping Station.

CHICAGO HEIGHTS
(Population, 24,551)

Ownership: Municipal.
Source: 8 drilled wells (15 to 19, 21 to 23), 200, 235, 1,832, 251, 330, 203, 270, and 260 ft deep. Auxiliary supply, 1 well (14), 174 ft deep.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 2,065,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Well 21	Wells (finished water)[a]		Well 21	Wells (finished water)[a]
Silica (SiO_2)	19	19	Hardness as $CaCO_3$:		
Iron (Fe)	.4	.29	Total	466	565
Manganese (Mn)	--	.00	Noncarbonate	102	163
Calcium (Ca)	112	130			
Magnesium (Mg)	45	58	Color	0	4
Sodium (Na)	33	21	pH	7.0	7.1
Potassium (K)		5.2	Specific conductance (micromhos at 25 C.)	--	1,040
Carbonate (CO_3)	--	0	Turbidity	10	--
Bicarbonate (HCO_3)	444	488	Temperature (F.)	51.6	--
Sulfate (SO_4)	159	200	Date of collection	Oct. 20, 1945	Sept. 27, 1952
Chloride (Cl)	4.0	3.5			
Fluoride (F)	--	.3			
Nitrate (NO_3)	4.1	1.5			
Dissolved solids	618	687			

Depth (feet)	203
Diameter (inches)	24
Date drilled	1945
Percent of supply	--

[a] Analysis by U. S. Geological Survey.

CICERO
(Population, 67,544)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)
Finished-water storage: 1,000,000 gal.

DANVILLE
(Population, 37,864)

Ownership: Interstate Water Company; supplies also about 5,400 people outside Danville. Total population supplied, about 43,300.
Source: North Fork Vermilion River, impounded.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination to breakpoint.
Rated capacity of treatment plant: 7,000,000 gpd.
Raw-water storage: 2,500,000,000 gal.
Finished-water storage: 900,000 gal.

DANVILLE--Continued

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water[a]		Raw water	Finished water[a]
Silica (SiO_2)	10	2.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	1.2	Total	238	232
Manganese (Mn)	.2	.00	Noncarbonate	70	52
Calcium (Ca)	56	47			
Magnesium (Mg)	24	28	Color	--	3
Sodium (Na)	1	4.8	pH	7.9	7.3
Potassium (K)		1.6	Specific conductance (micromhos at 25 C.)	567	465
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	205	220	Temperature (F.)	--	--
Sulfate (SO_4)	59	46	Date of collection	June 11, 1945	Sept. 17, 1952
Chloride (Cl)	5	11			
Fluoride (F)	.3	.2			
Nitrate (NO_3)	5	.4			
Dissolved solids	270	265			

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	157	240	20	7.7	8.4	6.2	--	--	--	133	2,000	6.5
Finished water	144	238	12	7.3	8.2	6.0	183	324	159	2.4	35	0

[a] Analysis by U. S. Geological Survey.

DECATUR

(Population, 66,269)

Ownership: Municipal.
Source: Sangamon River, impounded in Lake Decatur.
Treatment: Coagulation with alum, softening with lime, recarbonation, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 18,000,000 gpd.
Raw-water storage: 8,000,000,000 gal.
Finished-water storage: 4,300,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois Dept. of Public Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	5.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	.01	Total	268	100
Manganese (Mn)	.1	.0	Noncarbonate	52	56
Calcium (Ca)	61	14			
Magnesium (Mg)	28	16	Color	--	--
Sodium (Na)	2.0	8.0	pH	8.0	9.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	590	301
Carbonate (CO_3)	0	--	Turbidity	--	--
Bicarbonate (HCO_3)	263	[a] 54	Temperature (F.)	--	--
Sulfate (SO_4)	44	62	Date of collection	July 10, 1945	July 10, 1945
Chloride (Cl)	3.0	4.0			
Fluoride (F)	--	.4			
Nitrate (NO_3)	6.0	5.0			
Dissolved solids	280	132			

[a] Total alkalinity as bicarbonate (HCO_3).

DECATUR--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.....	182	252	96	8.0	8.4	7.3	225	284	132	107	650	40
Finished water...	73	134	32	9.6	10.2	8.9	116	172	76	.6	1.9	.2

EAST ST. LOUIS
(Population, 82,295)

Ownership: East St. Louis and Interurban Water Company; supplies also about 68,200 people outside East St. Louis. Total population supplied, about 150,500.

Source: Mississippi River.

Treatment: Coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, chlorination, and chlorine dioxide for taste and odor control.

Rated capacity of treatment plant: 28,500,000 gpd.

Raw-water storage: None.

Finished-water storage: 7,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.5	4.7	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.13	Total	166	182
Manganese (Mn)	.00	.00	Noncarbonate.....	30	52
Calcium (Ca)	40	47			
Magnesium (Mg).....	16	16	Color.....	35	8
Sodium (Na)	7.6	6.8	pH	7.5	7.1
Potassium (K)	2.3	1.7	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.).....	363	395
Bicarbonate (HCO_3)	166	160	Turbidity	--	--
Sulfate (SO_4)	32	53	Temperature (F.)...	--	--
Chloride (Cl)	7.0	9.2	Date of collection...	Sept. 16, 1952	Sept. 16, 1952
Fluoride (F)	.1	.2			
Nitrate (NO_3)	2.0	2.1			
Dissolved solids.....	216	237			

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.....	144	190	90	7.7	8.0	7.2	189	226	138	457	3,400	25
Finished water...	142	192	100	7.6	8.1	7.2	196	246	154	.3	2.5	.1

ELGIN
(Population, 44,223)

Ownership: Municipal.
Source: 10 drilled wells. Wells (1 to 4) 2,000, 1,300, 1,300, and 1,300 ft deep are on Slade Avenue. The location and depth of the remaining wells are as follows: Slade Avenue, 53 ft; St. Charles Street, 105 ft; North State Street, 43 ft; Creighton Avenue, 53 ft; Lavoie Avenue, 650 ft; Shuler Street, 1,940 ft.
Treatment: (1) Aeration, coagulation with alum and iron salts, softening with lime, recarbonation, sedimentation, rapid sand filtration, and chlorination. (2) Aeration, rapid sand filtration, softening with cation exchange, and chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,000,000 gal.

ANALYSES
(Analyses, in parts per million, by Illinois State Water Survey)

	Well 1	Well Slade Ave.	Well Lavoie Ave.	Finished water
Silica (SiO_2)	12	16	14	9.0
Iron (Fe)	.1	.5	.1	.2
Manganese (Mn)	.0	.0	.0	.0
Calcium (Ca)	68	80	62	15
Magnesium (Mg)	24	32	25	13
Sodium (Na), Potassium (K)	22	9.0	36	16
Carbonate (CO_3)	--	--	--	--
Bicarbonate (HCO_3)	[a] 356	[a] 302	[a] 380	[a] 98
Sulfate (SO_4)	13	85	13	30
Chloride (Cl)	7.0	11	9.0	11
Fluoride (F)	.4	.1	.7	.4
Nitrate (NO_3)	.2	.8	.1	.7
Dissolved solids	332	386	360	145
Hardness as $CaCO_3$:				
Total	267	332	258	91
Noncarbonate	0	84	0	11
Color	0	0	0	--
pH	--	--	--	--
Specific conductance (micromhos at 25 C.)	--	--	--	--
Turbidity	--	5	--	--
Temperature (F.)	57	54	55	--
Date of collection	June 29, 1948	June 28, 1948	June 28, 1948	June, 1948
Depth (feet)	2,000	53	650	
Diameter (inches)	12	12	16	
Date drilled	1904	1934	1931	
Percent of supply	--	--	--	

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	292	302	278	7.3	7.3	7.3	280	288	256	--	--	--
Finished water	95	132	72	9.1	9.7	8.7	80	112	54	0	0	0

[a] Total alkalinity as bicarbonate (HCO_3).

ELMHURST
(Population, 21,273)

Ownership: Municipal.
Source: 5 drilled wells (1, 2, 3a, 4, 5), 1,480, 2,227, 1,502, 1,400, and 1,480 ft deep, respectively.
Treatment: None.
Storage: 1,450,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Well 4	Well 5		Well 4	Well 5
Silica (SiO_2)	14	16	Hardness as $CaCO_3$:		
Iron (Fe)	.4	.0	Total	312	243
Manganese (Mn)	.0	.0	Noncarbonate	56	13
Calcium (Ca)	90	61			
Magnesium (Mg)	21	22	Color	0	0
Sodium (Na)	77	43	pH	--	--
Potassium (K)			Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	--	--			
Bicarbonate (HCO_3)	[a] 312	[a] 280	Turbidity	2	--
Sulfate (SO_4)	84	80	Temperature (F.)	60	60
Chloride (Cl)	98	15	Date of collection	June 9, 1949	Feb. 9, 1943
Fluoride (F)	1.1	--			
Nitrate (NO_3)	--	3.6			
Dissolved solids	540	380			
Depth (feet)				1,400	1,480
Diameter (inches)				10	16
Date drilled				1927	1940
Percent of supply				--	--

[a] Total alkalinity as bicarbonate (HCO_3).

ELMWOOD PARK
(Population, 18,801)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)

EVANSTON
(Population, 73,641)

Ownership: Municipal.
Source: Lake Michigan.
Treatment: Coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, fluoridation, and chlorination.
Rated capacity of treatment plant: 24,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 9,900,000 gal.

EVANSTON--Continued
ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water) [a]		Raw water	Finished water [a]
Silica (SiO_2)	2.0	.9	Hardness as $CaCO_3$:		
Iron (Fe)	--	.10	Total	114	126
Manganese (Mn)	.1	.00	Noncarbonate	4	24
Calcium (Ca)	26	34			
Magnesium (Mg)	12	10	Color	--	2
Sodium (Na)	6.0	2.8	pH	8.2	7.3
Potassium (K)		.5	Specific conductance (micromhos at 25 C.)	--	273
Carbonate (CO_3)	--	0	Turbidity	--	--
Bicarbonate (HCO_3)	[b] 134	124	Temperature (F.)	--	--
Sulfate (SO_4)	12	22	Date of collection	July, 1944	Sept. 17, 1952
Chloride (Cl)	2.0	6.5			
Fluoride (F)	.1	1.0			
Nitrate (NO_3)	5.0	.5			
Dissolved solids	129	150			

[a] Analysis by U. S. Geological Survey.
[b] Total alkalinity as bicarbonate (HCO_3).

FREEPORT
(Population, 22,467)

Ownership: Municipal.
Source: 3 drilled wells (2 to 4), 303, 446, and 500 ft deep.
Treatment: Aeration, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 8,450,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Well 2	Well 4	Wells [a] (finished water)
Silica (SiO_2)	22	7.6	8.7
Iron (Fe)	.6	.6	.20
Manganese (Mn)	.1	--	.00
Calcium (Ca)	108	62	76
Magnesium (Mg)	53	36	46
Sodium (Na)	13	6.0	4.7
Potassium (K)			2.5
Carbonate (CO_3)	--	--	0
Bicarbonate (HCO_3)	[b] 400	[b] 371	392
Sulfate (SO_4)	104	10	48
Chloride (Cl)	45	1.0	7.8
Fluoride (F)	.1	.0	.1
Nitrate (NO_3)	21	.2	.2
Dissolved solids	556	310	390
Hardness as $CaCO_3$:			
Total	489	303	380
Noncarbonate	161	0	58

[a] Analysis by U. S. Geological Survey.
[b] Total alkalinity as bicarbonate (HCO_3).

FREEPORT, Analyses--Continued

	Well 2	Well 4	Wells [a] (finished water)
Color	0	0	0
pH	--	--	7.4
Specific conductance (micromhos at 25 C.)	--	--	694
Turbidity	10	--	--
Temperature (F.)	50.5	--	--
Date of collection	Nov. 14, 1947	Nov. 13, 1947	Sept. 18, 1952
Depth (feet)	303	446	--
Diameter (inches)	16	16	--
Date drilled	1914	1928	--
Percent of supply	--	--	--

[a] Analysis by U. S. Geological Survey.

GALESBURG
(Population, 31,425)

Ownership: Municipal.
Source: 5 drilled wells: Bradley 1 and 2, 1,252 and 2,450 ft deep; Henderson Street 1 and 2, 2,414 and 2,408 ft deep; Florence Avenue, 2,473 ft deep.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 6,375,000 gal.

ANALYSES
(Analyses, in parts per million, by Illinois State Water Survey)

	Bradley		Henderson St.		Florence Avenue Well
	Well 1	Well 2	Well 1	Well 2	
Silica (SiO_2)	10	12	10	13	10
Iron (Fe)	.6	2.1	.3	.1	.5
Manganese (Mn)	.0	.0	0	.0	.0
Calcium (Ca)	113	72	56	56	68
Magnesium (Mg)	53	33	22	21	26
Sodium (Na), Potassium (K)	432	358	282	298	382
Carbonate (CO_3)	0	--	--	--	--
Bicarbonate (HCO_3)	263	[a] 293	[a] 280	[a] 281	[a] 278
Sulfate (SO_4)	930	560	333	364	560
Chloride (Cl)	184	195	185	190	215
Fluoride (F)	--	2.5	2.0	2.0	3.0
Nitrate (NO_3)	1.6	1.1	5.4	.5	1.2
Dissolved solids	[b] 1,850	[b] 1,380	[b] 1,030	[b] 1,080	[b] 1,400
Hardness as $CaCO_3$:					
Total	501	316	229	227	279
Noncarbonate	285	76	0	0	51
Color	0	0	0	0	--
pH	7.8	--	--	--	--
Specific conductance (micromhos at 25 C.)	--	--	--	--	--
Turbidity	--	10	0	0	--
Temperature (F.)	63	68	69	70	68
Date of collection	Feb. 11, 1944	Jan. 9, 1946	Jan. 9, 1946	Jan. 9, 1946	Jan. 9, 1946

[a] Total alkalinity as bicarbonate (HCO_3).
[b] Sum of determined constituents.

GALESBURG, Analyses--Continued

	Bradley		Henderson St.		Florence Avenue Well
	Well 1	Well 2	Well 1	Well 2	
Depth (feet)	1,252	2,450	2,414	2,408	2,473
Diameter (inches)	24	12	22	22	24
Date drilled	1917	1919	1919	1928	1944
Percent of supply	--	--	--	--	--

GRANITE CITY
(Population, 29,465)

Ownership: East St. Louis and Interurban Water Company.
Source: Mississippi River; from East St. Louis.
Treatment: Coagulation, filtration, chlorination. (See also East St. Louis.)
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 900,000 gal.

HARVEY
(Population, 20,683)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)
Treatment: See Chicago. Rechlorination at Harvey.
Finished-water storage: 3,225,000 gal.

HIGHLAND PARK
(Population, 16,808)

Ownership: Municipal.
Source: Lake Michigan.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, ammoniation, and postchlorination.
Rated capacity of treatment plant: 7,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,750,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water[a]		Raw water	Finished water[a]
Silica (SiO_2)	3.0	2.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	.09	Total	119	129
Manganese (Mn)	.1	.00	Noncarbonate	11	28
Calcium (Ca)	28	34			
Magnesium (Mg)	12	11	Color	--	2
Sodium (Na)	3.0	2.4	pH	8.0	7.2
Potassium (K)		.4	Specific conductance (micromhos at 25 C.)	--	278
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	132	124	Temperature (F.)	--	--
Sulfate (SO_4)	12	24	Date of collection	June, 1944	Sept 15, 1952
Chloride (Cl)	3.0	8.0			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	1.0	1.0			
Dissolved solids	132	147			

[a] Analysis by U. S. Geological Survey.

JACKSONVILLE
(Population, 20,387)

Ownership: Municipal; supplies also about 1,200 people outside Jacksonville. Total population supplied, about 21,600.
Source: Mauvisterre Creek, impounded in Lake Mauvisterre; Sandy Creek, impounded in Lake Jacksonville.
Treatment: Coagulation with alum, softening with lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 2,875,000,000 gal.
Finished-water storage: 815,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	8.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	.1	Total	169	90
Manganese (Mn)	--	.1	Noncarbonate	55	64
Calcium (Ca)	38	16			
Magnesium (Mg)	18	12	Color	--	--
Sodium (Na) } Potassium (K)	1.0	4.0	pH	7.4	9.5
			Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	--			
Bicarbonate (HCO_3)	139	[a]32	Turbidity	--	--
Sulfate (SO_4)	45	51	Temperature (F.)	--	--
Chloride (Cl)	2.0	6.0	Date of collection	March, 1951	March, 1951
Fluoride (F)	--	.3			
Nitrate (NO_3)	10	13			
Dissolved solids	295	164			

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	168	206	50	7.8	8.0	7.4	194	240	170	111	3000	15
Finished water	48	90	15	9.6	10.3	8.5	102	160	80	0.5	2	0

[a] Total alkalinity as bicarbonate (HCO_3).

JOLIET
(Population, 51,601)

Ownership: Municipal.
Source: 5 drilled wells (1, Ottawa St., Williamson Ave., Jasper St., and Ruby St.), 1,677, 1,621, 1,610, 1,565, and 1,544 ft deep, respectively.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 6,200,000 gal.

JOLIET--Continued

ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Well 1	Well Ottawa St.	Well Williamson Ave.	Well Ruby St.
Silica (SiO_2)	12	12	12	12
Iron (Fe)	.2	.2	.1	.5
Manganese (Mn)	.0	--	--	--
Calcium (Ca)	82	80	130	70
Magnesium (Mg)	25	25	59	22
Sodium (Na), Potassium (K)	58	79	29	68
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	322	336	400	317
Sulfate (SO_4)	122	136	289	105
Chloride (Cl)	30	42	3.0	31
Fluoride (F)	1.0	1.1	.6	1.1
Nitrate (NO_3)	.9	.4	.9	.3
Dissolved solids	505	534	735	475
Hardness as $CaCO_3$:				
Total	307	303	569	263
Noncarbonate	43	27	241	3
Color	0	0	0	0
pH	7.1	7.2	7.1	7.1
Specific conductance (micromhos at 25 C.)	--	--	--	--
Turbidity	0	0	0	10
Temperature (F.)	61	61	57	62
Date of collection	Oct. 30, 1946	Oct. 30 1946	Oct. 30, 1946	Oct. 31, 1946
Depth (feet)	1,677	1,621	1,610	1,544
Diameter (inches)	--	16	16	12
Date drilled	1937	1907	1924	1915
Percent of supply	--	--	--	--

KANKAKEE
(Population, 25,856)

Ownership: Kankakee Water Company.
Source: Kankakee River.
Treatment: Coagulation with alum, softening with lime, sedimentation, recarbonation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,300,000 gal.

KANKAKEE--Continued

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.0	9.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	--	Total	263	75
Manganese (Mn)	.1	0	Noncarbonate	71	47
Calcium (Ca)	66	17			
Magnesium (Mg)	24	8.0	Color	--	--
Sodium (Na)	16	26	pH	7.9	9.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	566	310
Carbonate (CO_3)	0	--	Turbidity	--	--
Bicarbonate (HCO_3)	234	[a] 34	Temperature (F.)	--	--
Sulfate (SO_4)	96	91	Date of collection	June, 1944	June, 1944
Chloride (Cl)	4.0	6.0			
Fluoride (F)	.3	.2			
Nitrate (NO_3)	5.0	5.0			
Dissolved solids	338	185			

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	170	216	84	7.9	8.3	7.5	276	373	150	90	2,000	5
Finished water	33	56	25	9.4	10.1	8.7	89	116	74	--	--	--

[a] Total alkalinity as bicarbonate (HCO_3).

KEWANEE

(Population, 16,821)

Ownership: Municipal.

Source: 3 drilled wells (1 to 3), 2,497, 2,438, and 2,484 ft deep. Not all of the wells are pumped at the same time. The water from the wells is mixed before it is distributed.

Treatment: Chlorination.

Raw-water storage: 700,000 gal.

Finished-water storage: None.

ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Well 2	Wells (finished water)[a]		Well 2	Wells (finished water)[a]
Silica (SiO_2)	14	9.2	Hardness as $CaCO_3$:		
Iron (Fe)	.3	1.3	Total	389	370
Manganese (Mn)	.0	.00	Noncarbonate	157	136
Calcium (Ca)	97	88			
Magnesium (Mg)	36	36	Color	0	2
Sodium (Na)	474	449	pH	--	7.1
Potassium (K)		3.4	Specific conductance (micromhos at 25 C.)	--	2,880
Carbonate (CO_3)	--	0	Turbidity	0	--
Bicarbonate (HCO_3)	[b] 283	282	Temperature (F.)	70	--
Sulfate (SO_4)	278	265	Date of collection	July 28, 1938	Sept. 16, 1952
Chloride (Cl)	640	625			
Fluoride (F)	.8	1.0			
Nitrate (NO_3)	.9	1.2			
Dissolved solids	1,700	1,670			

[a] Analysis by U. S. Geological Survey.

[b] Total alkalinity as bicarbonate (HCO_3).

KEWANEE--Continued

	Well 2	Wells (finished water) [a]
Depth (feet)	2,438	
Diameter (inches)	20	
Date drilled	1927	
Percent of supply	--	

[a] Analysis by U. S. Geological Survey.

MATTOON
(Population, 17,547)

Ownership: Municipal.
Source: Little Wabash River, impounded (86 percent of supply); 6 drilled wells and 8 auxiliary wells ranging in depth from 37.5 to 43 ft (14 percent of supply).
Treatment: Coagulation with alum and lime, softening with lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 2,200,000 gpd.
Raw-water storage: 585,000 gal.
Finished-water storage: 585,000,000 gal.

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

	Well 5 [a]	Little Wabash River	
		Raw water	Finished water
Silica (SiO_2)	22	3.9	4.0
Iron (Fe)	3.8	.14	.09
Manganese (Mn)	--	.00	.00
Calcium (Ca)	94	43	18
Magnesium (Mg)	37	19	14
Sodium (Na)	2.3	22	22
Potassium (K)		1.1	.9
Carbonate (CO_3)	0	0	20
Bicarbonate (HCO_3)	414	176	26
Sulfate (SO_4)	58	32	33
Chloride (Cl)	4.0	42	42
Fluoride (F)	.2	.2	.2
Nitrate (NO_3)	1.6	1.2	1.0
Dissolved solids	440	284	185
Hardness as $CaCO_3$:			
Total	386	188	104
Noncarbonate	46	41	48
Color	0	8	2
pH	7.4	7.4	9.6
Specific conductance (micromhos at 25 C.)	--	482	339
Turbidity	40	--	--
Temperature (F.)	56	80	--
Date of collection	June 22, 1948	Sept. 16, 1952	Sept. 16, 1952

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	123	160	80	7.6	7.6	7.6	152	272	110	146	2,000	15
Finished water	56	80	38	9.9	9.9	9.6	120	125	85	1.4	4.7	.6

[a] Analysis by Illinois State Water Survey.

MAYWOOD
(Population, 27,473)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)
Finished-water storage: 3,925,000 gal.

MOLINE
(Population, 37,397)

Ownership: Municipal.
Source: Mississippi River.
Treatment: Aeration, coagulation with alum and lime, ammoniation, chlorination, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,700,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water[a]		Raw water	Finished water[a]
Silica (SiO_2)	3.0	5.3	Hardness as $CaCO_3$:		
Iron (Fe)	.3	.13	Total	122	59
Manganese (Mn)	.00	.00	Noncarbonate	18	34
Calcium (Ca)	30	22			
Magnesium (Mg)	11	1.0	Color	--	2
Sodium (Na)	1.0	4.0	pH	7.7	7.2
Potassium (K)		1.9	Specific conductance (micromhos at 25 C.)	--	166
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	127	30	Temperature (F.)	--	--
Sulfate (SO_4)	14	29	Date of collection	May, 1940	Sept. 15, 1952
Chloride (Cl)	3.0	8.0			
Fluoride (F)	--	.2			
Nitrate (NO_3)	--	.3			
Dissolved solids	164	104			

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	115	150	66	7.7	8.4	7.4	139	176	82	142	800	2
Finished water	84	128	25	7.6	10.9	6.9	150	198	69	.13	.35	0

[a] Analysis by U. S. Geological Survey.

MOUNT VERNON
(Population, 15,600)

Ownership: Illinois Cities Water Company.
Source: Casey Fork, impounded.
Treatment: Coagulation, activated carbon, sedimentation, rapid sand filtration, zeolite softening, and chlorination.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 225,000 gal.

MOUNT VERNON--Continued

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	8.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	.3	Total	94	103
Manganese (Mn)	.5	.7	Noncarbonate	38	57
Calcium (Ca)	18	29			
Magnesium (Mg)	12	7.5	Color	--	--
Sodium (Na)	18	57	pH	6.8	7.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	68	56	Turbidity	--	--
Sulfate (SO_4)	69	168	Temperature (F.)	--	--
Chloride (Cl)	4	4	Date of collection	1946	March, 1947
Fluoride (F)	--	.2			
Nitrate (NO_3)	--	--			
Dissolved solids	[a] 155	[a] 302			

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	49	68	32	7.5	8.4	7.1	151	206	114	26	80	7
Finished water	51	74	30	8.7	9.4	7.0	83	86	72	0	0	0

[a] Sum of determined constituents.

OAK PARK
(Population, 63,529)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)
Treatment: (See Chicago.) Rechlorination at Oak Park.
Finished-water storage: 5,000,000 gal.

OTTAWA
(Population, 16,957)

Ownership: Municipal.
Source: 3 drilled wells (7, 8, and 9); depth, not reported for well 7, 1,180, and 315 ft.
Treatment: None.
Storage: 1,205,000 gal.

OTTAWA--Continued

ANALYSIS

(Analysis, in parts per million, by Illinois State Water Survey)

	Well 7		Well 7
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.1	Total	298
Manganese (Mn)	--	Noncarbonate	30
Calcium (Ca)	73		
Magnesium (Mg)	28	Color	0
Sodium (Na)	42	pH	--
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	--		
Bicarbonate (HCO_3)	[a] 327	Turbidity	0
Sulfate (SO_4)	11	Temperature (F.)	59
Chloride (Cl)	76	Date of collection	July 11, 1947
Fluoride (F)	.7		
Nitrate (NO_3)	2.9		
Dissolved solids	429		

[a] Total alkalinity as bicarbonate (HCO_3).

PARK RIDGE

(Population, 16,602)

Ownership: Municipal.
Source: Supplied by Chicago. (See Chicago.)
Finished water storage: 2,000,000 gal.

PEKIN

(Population, 21,858)

Ownership: Pekin Water Works Company.
Source: Drilled wells.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 2,690,000 gal.

ANALYSIS

(Analysis, in parts per million, by Illinois State Water Survey)

	Well 4		Well 4
Silica (SiO_2)	23	Hardness as $CaCO_3$:	
Iron (Fe)	.1	Total	345
Manganese (Mn)	.0	Noncarbonate	113
Calcium (Ca)	82		
Magnesium (Mg)	34	Color	0
Sodium (Na)	9.2	pH	--
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_2)	--		
Bicarbonate (HCO_3)	[a] 283	Turbidity	0
Sulfate (SO_4)	99	Temperature (F.)	--
Chloride (Cl)	10	Date of collection	Aug. 11, 1947
Fluoride (F)	.1		
Nitrate (NO_3)	19		
Dissolved solids	425		
Depth (feet)			119
Diameter (inches)			42
Date drilled			1946
Percent of supply			--

[a] Total alkalinity as bicarbonate (HCO_3).

PEORIA
(Population, 111,856)

Ownership: American Waterworks Service Co., Inc.
Source: 11 drilled wells, 89 to 140 ft deep (data reported for 8 wells).
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 19,350,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Well 10	Wells[a] 1 and 2		Well 10	Wells[a] 1 and 2
Silica (SiO_2)	22	27	Hardness as $CaCO_3$:		
Iron (Fe)	--	.7	Total	394	455
Manganese (Mn)	.4	.1	Noncarbonate	46	163
Calcium (Ca)	91	110			
Magnesium (Mg)	40	44	Color	0	0
Sodium (Na)	14	17	pH	--	--
Potassium (K)			Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	--	--			
Bicarbonate (HCO_3)	[b]424	[b]356	Turbidity	0	10
Sulfate (SO_4)	51	144	Temperature (F.)	54	--
Chloride (Cl)	16	24	Date of collection	Jan. 31, 1949	Nov. 15, 1946
Fluoride (F)	.3	--			
Nitrate (NO_3)	.3	19			
Dissolved solids	448	583			

Depth (feet)	--	$118\frac{1}{2}$, $113\frac{2}{3}$
Diameter (inches)	--	17, 17
Date drilled	--	1944, 1946
Percent of supply	--	-- --

[a] Dodge St.
[b] Total alkalinity as bicarbonate (HCO_3).

QUINCY
(Population, 41,450)

Ownership: Municipal.
Source: Mississippi River.
Treatment: Coagulation and softening with alum and lime, activated carbon, sedimentation, recarbonation, ammoniation, chlorination, and rapid sand filtration.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 20,900,000 gal.

QUINCY--Continued

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water [a]		Raw water	Finished water [a]
Silica (SiO_2)	3	6.5	Hardness as $CaCO_3$:		
Iron (Fe)	--	.08	Total	141	75
Manganese (Mn)	--	.00	Noncarbonate	21	39
Calcium (Ca)	35	26			
Magnesium (Mg)	13	2.5	Color	--	3
Sodium (Na)	5.7	5.2	pH	7.7	7.6
Potassium (K)		2.3	Specific conductance (micromhos at 25 C.)	--	207
Carbonate (CO_3)	--	0	Turbidity	--	--
Bicarbonate (HCO_3)	146	44	Temperature (F.)	--	--
Sulfate (SO_4)	25	39	Date of collection	May, 1940	Sept. 13, 1952
Chloride (Cl)	5.0	9.0			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	--	1.0			
Dissolved solids	157	126			

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	120	165	57	7.6	8.3	6.5	152	194	90	280	3,400	15
Finished water	38	70	22	9.4	9.7	8.4	106	194	77	.95	2.9	.18

[a] Analysis by U. S. Geological Survey.

ROCKFORD
(Population, 92,927)

Ownership: Municipal.

Source: 17 drilled wells, 200 to 1,631 ft deep. Eleven of the wells are unit wells and six are group wells located at the steam plant. The unit wells are located throughout the city so that the water supplied to any section of the city depends on which wells are being pumped at the time.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 10,885,000 gal.

ROCKFORD--Continued

ANALYSES

(Analyses, in parts per million, by Illinois State Water Survey)

	Group Well 6	Unit Well 7	Unit Well 1	Finished water [a]
Silica (SiO_2)	--	--	--	13
Iron (Fe)	.6	2.7	.2	1.1
Manganese (Mn)	--	--	--	.17
Calcium (Ca)	--	--	--	78
Magnesium (Mg)	--	--	--	38
Sodium (Na)	--	--	--	3.8
Potassium (K)	--	--	--	1.2
Carbonate (CO_3)	--	--	--	0
Bicarbonate (HCO_3)	[b]366	[b]390	[b]366	376
Sulfate (SO_4)	84	56	36	40
Chloride (Cl)	17	9.0	11	7.0
Fluoride (F)	--	--	--	.0
Nitrate (NO_3)	14	12	3.3	3.2
Dissolved solids	446	402	364	381
Hardness as $CaCO_3$:				
Total	389	400	353	352
Noncarbonate	89	80	53	43
Color	0	0	0	2
pH	--	--	--	7.3
Specific conductance (micromhos at 25 C.)	--	--	--	675
Turbidity	--	20	--	--
Temperature (F.)	53	53	55	--
Date of collection	Mar. 5, 1948	June 10, 1948	Jan. 17, 1948	Sept. 13, 1952
Depth (feet)	1,608	1,503	--	--
Diameter (inches)	16	--	18	--
Date drilled	1926	1913	--	--
Percent of supply	--	--	--	--

[a] Analysis by U. S. Geological Survey.
[b] Total alkalinity as bicarbonate (HCO_3).

ROCK ISLAND
(Population, 48,710)

Ownership: Municipal.
Source: Mississippi River.
Treatment: Coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plant: 11,700,000 gpd.
Raw-water storage: None.
Finished-water storage: 11,200,000 gal.

ROCK ISLAND--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.8	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	215
Manganese (Mn)	.00	Noncarbonate	109
Calcium (Ca)	58		
Magnesium (Mg)	17	Color	4
Sodium (Na)	6.0	pH	7.1
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	437
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	129	Temperature (F.)	--
Sulfate (SO_4)	93	Date of collection	June 17, 1952
Chloride (Cl)	16		
Fluoride (F)	.2		
Nitrate (NO_3)	1.7		
Dissolved solids	287		

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	117	156	66	7.7	8.5	7.1	156	212	88	143	1,200	2
Finished water	100	154	46	7.2	8.1	6.4	190	240	120	.43	35	.01

SPRINGFIELD

(Population, 81,628)

Ownership: Municipal; supplies also about 13,600 people in other places and outside of the city limits. Total population supplied, about 95,200.

Source: Sugar Creek, impounded.

Treatment: Ammoniation, prechlorination, coagulation and softening with alum and lime, activated carbon, sedimentation, rapid sand filtration.

Rated capacity of treatment plant: 12,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 7,000,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	1.0	1.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	--	Total	142	69
Manganese (Mn)	0	0	Noncarbonate	40	39
Calcium (Ca)	34	12			
Magnesium (Mg)	14	9.8	Color	--	--
Sodium (Na)	2	14	pH	8.0	9.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	--	Turbidity	--	--
Bicarbonate (HCO_3)	124	[a] 37	Temperature (F.)	--	--
Sulfate (SO_4)	39	55	Date of collection	1944	1944
Chloride (Cl)	2.0	4			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	2.6	2.0			
Dissolved solids	159	[b] 116			

[a] Total alkalinity as bicarbonate (HCO_3).

[b] Sum of determined constituents.

SPRINGFIELD--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	111	139	85	8.4	9.0	8.0	170	202	131	40	152	7
Finished water	36	74	26	10.5	10.9	9.5	94	103	79	.2	12	0

STREATOR

(Population, 16,469)

Ownership: Northern Illinois Water Corporation.
Source: Vermilion River, impounded.
Treatment: Coagulation with alum and lime, prechlorination, activated carbon, sedimentation, rapid sand filtration, ammoniation, and postchlorination.
Rated capacity of treatment plant: 4,800,000 gpd.
Raw water storage: --
Finished water storage: 2,000,000 gal.

ANALYSES

(Analyses, in parts per million, by Illinois Department of Public Health)

	Raw water	Finished water[a]		Raw water	Finished water[a]
Silica (SiO_2)	9	4.9	Hardness as $CaCO_3$:		
Iron (Fe)	--	.09	Total	259	220
Manganese (Mn)	0	.00	Noncarbonate	45	72
Calcium (Ca)	54	43			
Magnesium (Mg)	30	27	Color	--	2
Sodium (Na)	20	9.8	pH	7.8	7.1
Potassium (K)		2.0	Specific conductance (micromhos at 25 C.)	--	489
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	261	179	Temperature (F.)	--	--
Sulfate (SO_4)	74	75	Date of collection	1944	Sept. 15, 1952
Chloride (Cl)	6	15			
Fluoride (F)	.3	.3			
Nitrate (NO_3)	2.6	.4			
Dissolved solids	[b]324	284			

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	194	280	80	8.1	8.7	7.5	267	380	110	316	6,500	4
Finished water	178	268	30	7.4	7.9	6.1	--	--	--	0	1	0

[a] Analysis by U. S. Geological Survey.
[b] Sum of determined constituents.

URBANA

(Population, 22,834)

Ownership: Northern Illinois Water Corporation.
Source: Supplied by Champaign. (See Champaign.)

WAUKEGAN
(Population, 38,946)

Ownership: Municipal.
Source: Lake Michigan.
Treatment: Aeration, coagulation with alum, sedimentation, rapid sand filtration, fluoridation, and chlorination.
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,766,000 gal.

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)	.07	Total	126
Manganese (Mn)	.00	Noncarbonate	29
Calcium (Ca)	33		
Magnesium (Mg)	11	Color	0
Sodium (Na)	3.5	pH	7.3
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	271
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	120	Turbidity	--
Sulfate (SO_4)	25	Temperature (F.)	--
Chloride (Cl)	5.0	Date of collection	Sept. 17, 1952
Fluoride (F)	1.0		
Nitrate (NO_3)	.9		
Dissolved solids	149		

WILMETTE
(Population, 18,162)

Ownership: Municipal.
Source: Lake Michigan.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, ammoniation, and postchlorination.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,640,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	1.6	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	129
Manganese (Mn)	.00	Noncarbonate	32
Calcium (Ca)	34		
Magnesium (Mg)	11	Color	3
Sodium (Na)	2.6	pH	7.5
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	276
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	120	Temperature (F.)	--
Sulfate (SO_4)	21	Date of collection	Sept. 16, 1952
Chloride (Cl)	8.5		
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	148		

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	115	126	113	8.3	8.4	8.1	--	--	--	44	360	3
Finished water	102	109	96	7.6	7.7	7.4	--	--	--	.03	.9	0

ANDERSON
(Population, 46,820)

Ownership: Municipal; supplies also about 10,000 people outside the city limits. Total population supplied, about 57,000.
Source: 6 drilled wells (Ranney wells, 85 percent of supply); White River (15 percent of supply).
Treatment: Well supply: chlorination, filtration; White River supply: prechlorination, coagulation with alum and lime, ammoniation, sedimentation, and rapid sand filtration.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,500,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	7.9	Hardness as $CaCO_3$:	
Iron (Fe)	2.0	Total	316
Manganese (Mn)	.00	Noncarbonate	102
Calcium (Ca)	55		
Magnesium (Mg)	43	Color	4
Sodium (Na)	5.0	pH	7.4
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	578
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	259	Temperature (F.)	--
Sulfate (SO_4)	94	Date of collection	Jan. 22, 1952
Chloride (Cl)	8.0		
Fluoride (F)	.0		
Nitrate (NO_3)	8.8		
Dissolved solids	379		

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	239	275	185	7.5	7.8	7.2	--	--	--	4	30	4
Finished water	230	275	165	7.4	7.7	7.2	--	--	--	3	3	3

BEDFORD
(Population, 12,562)

Ownership: Municipal; supplies also Oolitic, and about 1,600 people outside the city limits. Total population supplied, about 15,300.
Source: East Fork White River.
Treatment: Prechlorination, coagulation, copper sulfate, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,150,000 gal.

BEDFORD--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	7.1	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	197
Manganese (Mn)	.00	Noncarbonate	55
Calcium (Ca)	53		
Magnesium (Mg)	16	Color	2
Sodium (Na)	4.7	pH	7.9
Potassium (K)	1.5	Specific conductance (micromhos at 25 C.)	385
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	175	Temperature (F.)	--
Sulfate (SO_4)	50	Date of collection	Jan. 15, 1952
Chloride (Cl)	9.0		
Fluoride (F)	.1		
Nitrate (NO_3)	4.4		
Dissolved solids	245		

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	262	1500	65	7.8	8.3	7.4	--	--	--	271	1500	30
Finished water	156	220	40	7.2	7.5	6.7	--	--	--	--	--	--

BLOOMINGTON

(Population, 28,163)

Ownership: Municipal.
Source: Griffey Creek, impounded. Auxiliary supply from Bean Blossom Creek.
Treatment: Prechlorination, aeration, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: 750,000,000 gal.
Finished-water storage: 1,726,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	6.1	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	111
Manganese (Mn)	.00	Noncarbonate	28
Calcium (Ca)	36		
Magnesium (Mg)	5.3	Color	0
Sodium (Na)	2.4	pH	7.8
Potassium (K)	.2	Specific conductance (micromhos at 25 C.)	229
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	102	Temperature (F.)	--
Sulfate (SO_4)	27	Date of collection	Jan. 24, 1952
Chloride (Cl)	4.2		
Fluoride (F)	.1		
Nitrate (NO_3)	2.3		
Dissolved solids	139		

BLOOMINGTON--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	100	110	83	7.5	8.3	7.3	--	--	--	10	25	5
Finished water	105	120	85	8.0	8.2	7.9	--	--	--	1	2	0

COLUMBUS
(Population, 18,370)

Ownership: Municipal.
Source: Drilled wells.
Treatment: Aeration and filtration for iron removal, chlorination, and fluoridation.
Rated capacity of treatment plant: --
Raw-water storage: --
Finished-water storage: --

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	13	Hardness as $CaCO_3$:		
Iron (Fe)	1.8	.46	Total	299	311
Manganese (Mn)	.14	.11	Noncarbonate	47	56
Calcium (Ca)	76	80			
Magnesium (Mg)	26	27	Color	7	0
Sodium (Na)	2.1	2.7	pH	7.6	7.8
Potassium (K)	.5	1.1	Specific conductance (micromhos at 25 C.)	519	549
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	304	311	Turbidity	--	--
Sulfate (SO_4)	50	53	Temperature (F.)	--	--
Chloride (Cl)	3.2	4.1	Date of collection	Jan. 22, 1952	Feb. 6, 1952
Fluoride (F)	.0	1.4			
Nitrate (NO_3)	.6	.0			
Dissolved solids	319	328			

CONNERSVILLE
(Population, 15,550)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 16,000.
Source: 14 drilled wells, about 80 ft deep. The yield of the wells is reported to be 500 gpm each.
Treatment: Chlorination of part of supply.
Raw-water storage: 3,500,000 gal.
Finished-water storage: --

CONNERSVILLE--Continued

ANALYSIS

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

	Raw water		Raw water
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	1.3	Total	360
Manganese (Mn)	.16	Noncarbonate	56
Calcium (Ca)	94		
Magnesium (Mg)	31	Color	5
Sodium (Na)	10	pH	7.5
Potassium (K)	2.3	Specific conductance (micromhos at 25 C.)	697
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	374	Temperature (F.)	62
Sulfate (SO_4)	66	Date of collection	Apr. 14, 1952
Chloride (Cl)	9.0		
Fluoride (F)	.0		
Nitrate (NO_3)	6.0		
Dissolved solids	423		

Depth (feet)	80
Diameter (inches)	12
Date drilled	1949
Percent of supply	--

CRAWFORDSVILLE

(Population, 12,851)

Ownership: Indiana Gas and Water Company.
Source: 3 drilled wells: 1 (west); 2 (middle); and 3 (east). The yield of the wells is reported to be 800-900, 500, and 600 gpm, respectively.
Treatment: Chlorination.
Raw-water storage: 600,000 gal.
Finished-water storage: 300,000 gal.

ANALYSIS

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

	Well 1 (finished water)		Well 1 (finished water)
Silica (SiO_2)	15	Hardness as $CaCO_3$:	
Iron (Fe)	3.0	Total	454
Manganese (Mn)	.18	Noncarbonate	118
Calcium (Ca)	123		
Magnesium (Mg)	35	Color	2
Sodium (Na)	10	pH	7.5
Potassium (K)	1.5	Specific conductance (micromhos at 25 C.)	846
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	406	Temperature (F.)	54
Sulfate (SO_4)	122	Date of collection	Apr. 9, 1952
Chloride (Cl)	19		
Fluoride (F)	.0		
Nitrate (NO_3)	.1		
Dissolved solids	549		

Depth (feet)	82
Diameter (inches)	15
Date drilled	1941
Percent of supply	--

EAST CHICAGO
(Population, 54,263)

Ownership: Municipal.
Source: Lake Michigan.
Treatment: Ammoniation, chlorine dioxide at times, prechlorination, coagulation, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 18,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,200,000 gal.

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)	.08	Total	133
Manganese (Mn)	.03	Noncarbonate	29
Calcium (Ca)	35		
Magnesium (Mg)	11	Color	2
Sodium (Na)	4.4	pH	7.9
Potassium (K)	1.5	Specific conductance (micromhos at 25 C.)	273
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	126	Temperature (F.)	--
Sulfate (SO_4)	30	Date of collection	Jan. 15, 1952
Chloride (Cl)	8.5		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	159		

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	--	--	--	8.1	8.3	8.0	--	--	--	55	940	14
Finished water	--	--	--	7.1	7.5	6.9	--	--	--	.35	.4	.3

ELKHART
(Population, 35,646)

Ownership: Municipal; supplies also about 50 people outside the city limits. Total population supplied, about 35,700.
Source: 9 drilled wells, 44 to 60 ft deep, yield reported to be 800 gpm each; 3 dug wells, interconnected, 35 ft deep, combined yield reported to be 2,400 gpm. Auxiliary supply, 2 drilled wells, 43 ft deep.
Treatment: Chlorination.
Raw-water storage: 3,400,000 gal.
Finished-water storage: 500,000 gal.

ELKHART--Continued

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)	.20	Total	203
Manganese (Mn)	--	Noncarbonate	18
Calcium (Ca)	50		
Magnesium (Mg)	19	Color	10
Sodium (Na)	3.8	pH	7.9
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	386
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	226	Temperature (F.)	--
Sulfate (SO_4)	23	Date of collection	Jan. 15, 1952
Chloride (Cl)	7.0		
Fluoride (F)	.0		
Nitrate (NO_3)	.8		
Dissolved solids	212		

EVANSVILLE

(Population, 128,636)

Ownership: Municipal; supplies also about 30,000 people outside the city limits. Total population supplied, about 158,600.

Source: Ohio River.

Treatment: Breakpoint chlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, final adjustment of pH by addition of lime, and postchlorination. Activated carbon and sodium chlorite when needed.

Rated capacity of treatment plant: 36,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 24,500,000 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)	.12	Total	100
Manganese (Mn)	.00	Noncarbonate	55
Calcium (Ca)	30		
Magnesium (Mg)	6.1	Color	2
Sodium (Na)	4.8	pH	8.0
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	229
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	55	Temperature (F.)	--
Sulfate (SO_4)	52	Date of collection	Jan. 14, 1952
Chloride (Cl)	10		
Fluoride (F)	.0		
Nitrate (NO_3)	3.5		
Dissolved solids	137		

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	62	72	51	7.5	7.9	7.3	112	132	94	160	283	55
Finished water	64	74	55	8.1	8.5	7.8	132	152	114	--	--	--

FRANKFORT
(Population, 15,028)

Ownership: Municipal; supplies also about 125 people outside the city limits. Total population supplied, about 15,200.
Source: 7 drilled wells (6, 8, 10, 11 to 14) 84, 84, 84, 84, 160, 301, and 300 ft deep. The yield of the wells is reported to be 700, 1,000, 400, 600, 200, 1,000, and 790 gpm.
Treatment: Supply from 5 wells: aeration over coke, rapid sand filtration, chlorination. Supply from 2 wells: chlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: 200,000 gal.
Finished-water storage: 1,250,000 gal.

ANALYSES

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

	Well 14 (raw water)	Finished water[a]		Well 14 (raw water)	Finished water[a]
Silica (SiO_2)	17	13	Hardness as $CaCO_3$:		
Iron (Fe)	.61	1.0	Total	266	304
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	63	70			
Magnesium (Mg)	26	32	Color	4	2
Sodium (Na)	32	32	pH	8.0	7.6
Potassium (K)	2.1	2.2	Specific conductance (micromhos at 25 C.)	595	641
Carbonate (CO_3)	10	0			
Bicarbonate (HCO_3)	380	385			
Sulfate (SO_4)	8.6	34	Turbidity	--	--
Chloride (Cl)	6.5	13	Temperature (F.)	--	--
Fluoride (F)	1.4	1.2	Date of collection	Feb. 13, 1952	Jan. 22, 1952
Nitrate (NO_3)	.1	3.5			
Dissolved solids	352	390			

[a] Well 10 (38 percent), well 11 (62 percent).

FORT WAYNE
(Population, 133,607)

Ownership: Municipal; supplies also about 1,800 people outside the city limits. Total population supplied, about 135,400.
Source: St. Joseph River, impounded.
Treatment: Coagulation with alum, activated carbon, softening with lime and soda ash, chlorine dioxide, carbonation, chlorination, sedimentation, rapid sand filtration, ammoniation, stabilization with polyphosphates, and fluoridation. The water is softened to a hardness of about 76 ppm.
Rated capacity of treatment plant: 24,000,000 gpd.
Raw-water storage: 210,000,000 gal.
Finished-water storage: 23,500,000 gal.

FORT WAYNE--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.0	4.3	Hardness as $CaCO_3$:		
Iron (Fe)	.16	.07	Total	133	76
Manganese (Mn)	.00	.00	Noncarbonate	43	58
Calcium (Ca)	40	26			
Magnesium (Mg)	8.3	2.4	Color	35	0
Sodium (Na)	2.5	3.2	pH	7.4	8.6
Potassium (K)	1.7	1.7	Specific conductance (micromhos at 25 C.)	267	180
Carbonate (CO_3)	0	2			
Bicarbonate (HCO_3)	111	17	Turbidity	--	--
Sulfate (SO_4)	35	47	Temperature (F.)	--	--
Chloride (Cl)	3.5	5.8	Date of collection	Jan. 21, 1952	Jan. 21, 1952
Fluoride (F)	.0	1.0			
Nitrate (NO_3)	9.0	6.4			
Dissolved solids	174	115			

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	180	292	69	8.1	8.4	7.6	234	348	98	113	975	10
Finished water	30	51	19	9.8	10.4	9.2	76	91	69	--	--	--

GARY

(Population, 133,911)

Ownership: Gary-Hobart Water Company.
Source: Lake Michigan.
Treatment: Chlorination, chlorine dioxide.
Rated capacity of treatment plant: --
Raw-water storage: None.
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)	3.2	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	136
Manganese (Mn)	.02	Noncarbonate	24
Calcium (Ca)	35		
Magnesium (Mg)	12	Color	15
Sodium (Na)	3.7	pH	7.7
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	277
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	137	Turbidity	--
Sulfate (SO_4)	24	Temperature (F.)	--
Chloride (Cl)	9.0	Date of collection	Jan. 15, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	.8		
Dissolved solids	159		

GOSHEN
(Population, 13,003)

Ownership: Municipal.
Source: 8 wells. Main Plant: 6 wells (1 to 6) 170, 170, 171, 171, 166, and 154 ft deep, 500 gpm each; South Side: 1 well, 177 ft deep, yield reported to be 500 gpm; West Side: 1 well, 135 ft deep, yield reported to be 600 gpm.
Treatment: None.
Storage: 765,000 gal.

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	16	Hardness as $CaCO_3$:	
Iron (Fe)	1.3	Total	278
Manganese (Mn)	.00	Noncarbonate	27
Calcium (Ca)	73		
Magnesium (Mg)	23	Color	13
Sodium (Na)	6.6	pH	7.6
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	509
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	305	Temperature (F.)	--
Sulfate (SO_4)	35	Date of collection	Jan. 22, 1952
Chloride (Cl)	6.2		
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	304		

[a] Wells 1, 2, 4, 5, and 6. Tap at the main pumping plant.

HAMMOND
(Population, 87,594)

Ownership: Municipal; supplies also Highland, Munster, about 500 people outside the city limits, and Lansing (Ill.). Total population supplied, about 104,100.
Source: Lake Michigan.
Treatment: Ammoniation, prechlorination, carbon, coagulation with alum, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 20,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 6,500,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	2.1	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	136
Manganese (Mn)	.00	Noncarbonate	26
Calcium (Ca)	35		
Magnesium (Mg)	12	Color	2
Sodium (Na)	4.3	pH	7.9
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	280
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	135	Temperature (F.)	--
Sulfate (SO_4)	29	Date of collection	Jan. 15, 1952
Chloride (Cl)	7.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.7		
Dissolved solids	160		

HUNTINGTON
(Population, 15,079)

Ownership: Municipal.
Source: 12 drilled wells. Minton Field: 5 wells (1 to 5) 75 to 180 ft deep (60 percent of supply); Plant Field: 5 wells, 100 to 180 ft deep (10 percent of supply); College Street: 2 wells, 130 ft deep (30 percent of supply).
Treatment: Chlorination.
Raw-water storage: 500,000 gal.
Finished-water storage: 1,400,000 gal.

ANALYSES

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

	Wells, Plant Field[a]	Well 1, Minton Field[a]		Wells, Plant Field[a]	Well 1, Minton Field[a]
Silica (SiO_2)	14	11	Hardness as $CaCO_3$:		
Iron (Fe)	2.3	1.5	Total	380	322
Manganese (Mn)	.26	.09	Noncarbonate	34	5
Calcium (Ca)	93	81			
Magnesium (Mg)	36	29	Color	7	2
Sodium (Na)	16	8.5	pH	7.5	7.6
Potassium (K)	2.4	1.8	Specific conductance (micromhos at 25 C.)	702	623
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	423	386			
Sulfate (SO_4)	49	22	Turbidity	--	--
Chloride (Cl)	11	7.0	Temperature (F.)	--	--
Fluoride (F)	.5	.5	Date of collection	Jan. 17, 1952	Jan. 17, 1952
Nitrate (NO_3)	.2	.2			
Dissolved solids	428	360			

[a] Raw water.

INDIANAPOLIS
(Population, 427,173)

Ownership: Indianapolis Water Company; supplies also Beech Grove, Ben Davis, Mars Hill, Meridian Hills, Southport, and Woodruff Place. Total population supplied, about 439,800.
Source: West Fork White River (66 percent of supply); Fall Creek (34 percent of supply). Emergency supply from 60 tubular wells.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, auxiliary slow sand filtration at times, ammoniation, fluoridation, and postchlorination.
Rated capacity of treatment plants: White River Plant: 48,000,000 gpd (normal operation), 60,000,000 gpd (with 3 slow sand filters in operation). Fall Creek Plant: 32,000,000 gpd.
Raw-water storage: 7,000,000,000 gal (Geist Reservoir).
Finished-water storage: Ground reservoir, 23,500,000 gal; elevated storage, 3,000,000 gal.

INDIANAPOLIS--Continued

ANALYSES

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

	White River (finished water)	Fall Creek (finished water)	White River (finished water)[a]	Fall Creek (finished water)[a]
Silica (SiO_2)	7.0	4.7	--	--
Iron (Fe)	.11	.12	.05	.03
Manganese (Mn)	.00	.00	--	--
Calcium (Ca)	67	50	76	58
Magnesium (Mg)	20	23	26	22
Sodium (Na)	6.2	10	22	13
Potassium (K)	1.6	1.7		
Carbonate (CO_3)	0	0	--	--
Bicarbonate (HCO_3)	206	201	[b] 277	[b] 189
Sulfate (SO_4)	67	56	71	51
Chloride (Cl)	10	8.0	21	11
Fluoride (F)	1.0	1.0	.8	.8
Nitrate (NO_3)	12	11	--	--
Dissolved solids	295	266	--	--
Hardness as $CaCO_3$:				
Total	251	222	294	236
Noncarbonate	81	55	--	--
Color	6	3	--	--
pH	7.4	7.6	7.6	7.4
Specific conductance (micromhos at 25 C.)	486	442	--	--
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Mar. 28, 1952	Mar. 28, 1952	1951	1951

[a] Averages obtained from analyses made during 1951 by Indianapolis Water Co. Results for alkalinity, fluoride, total hardness, and pH are from one or more daily determinations.

[b] Total alkalinity as bicarbonate (HCO_3).

JEFFERSONVILLE
(Population, 14,685)

Ownership: Indiana Gas & Water Company, Inc.; also supplies Clarksville. Total population supplied, about 20,600.

Source: 39 drilled wells: 10th St. Station, 3 deep wells; Hertzsch Station, 2 wells each 70 ft deep; and 34 shallow wells each 35 ft deep.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: Reservoir, 500,000 gal; standpipe, 10,000 gal.

JEFFERSONVILLE--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	14	Hardness as $CaCO_3$:	
Iron (Fe)	.30	Total	296
Manganese (Mn)	.14	Noncarbonate	57
Calcium (Ca)	60		
Magnesium (Mg)	35	Color	7
Sodium (Na)	15	pH	7.5
Potassium (K)	1.6	Specific conductance (micromhos at 25 C.)	633
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	289	Temperature (F.)	--
Sulfate (SO_4)	79	Date of collection	Jan. 30, 1952
Chloride (Cl)	18		
Fluoride (F)	.0		
Nitrate (NO_3)	3.3		
Dissolved solids	393		

KOKOMO
(Population, 38,672)

Ownership: Kokomo Water Works Company; supplies about 1,500 people outside the city limits. Total population supplied, about 40,200.
Source: 12 drilled wells, 287 to 500 ft deep. Auxiliary supply, Wild Cat Creek. During 1950 97.9 percent of the supply was taken from the wells.
Treatment: Aeration, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: --
Finished-water storage: 2,000,000 gal.

ANALYSIS

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

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	16	Hardness as $CaCO_3$:	
Iron (Fe)	.16	Total	402
Manganese (Mn)	.07	Noncarbonate	115
Calcium (Ca)	112		
Magnesium (Mg)	30	Color	2
Sodium (Na)	35	pH	7.6
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	848
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	351	Temperature (F.)	--
Sulfate (SO_4)	167	Date of collection	April 1952
Chloride (Cl)	23		
Fluoride (F)	.4		
Nitrate (NO_3)	1.0		
Dissolved solids	568		

LAFAYETTE
(Population, 35,568)

Ownership: Municipal.
Source: 11 drilled wells, 105 to 114 ft deep, in Wabash River flood plain. Emergency supply, 2 drilled wells.
Treatment: Ammoniation and chlorination.
Rated capacity of treatment plant: --
Raw-water storage: 150,000 gal.
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)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	402
Manganese (Mn)	.18	Noncarbonate	94
Calcium (Ca)	102		
Magnesium (Mg)	36	Color	0
Sodium (Na)	13	pH	7.1
Potassium (K)	3.6	Specific conductance (micromhos at 25 C.)	778
Carbonate (CO_2)	0		
Bicarbonate (HCO_3)	376	Turbidity	--
Sulfate (SO_4)	96	Temperature (F.)	53
Chloride (Cl)	20	Date of collection	Mar. 31, 1952
Fluoride (F)	.2		
Nitrate (NO_3)	11		
Dissolved solids	496		

LA PORTE
(Population, 17,882)

Ownership: Municipal; supplies also about 150 people outside the city limits. Total population supplied, about 18,000.
Source: 3 wells (Wernecke, Lake St., Brighton St.) 128, 134, and 135 ft deep. The yield of the wells is reported to be 700, 1,400, and 2,100 gpm. Auxiliary supply, 3 dug wells, 28 ft deep, reported to yield 550, 1,100, and 1,400 gpm.
Treatment: Aeration, coagulation, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,000,000 gal.

LA PORTE--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	15	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	308
Manganese (Mn)	.14	Noncarbonate	44
Calcium (Ca)	81		
Magnesium (Mg)	26	Color	2
Sodium (Na)	15	pH	7.9
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	615
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	324	Temperature (F.)	--
Sulfate (SO_4)	60	Date of collection	Jan. 15, 1952
Chloride (Cl)	23		
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	388		

Regular determinations at treatment plant, 1950-51

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm) a			Turbidity [2]		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	330	360	260	7.0	7.4	6.8	310	369	274	25	50	5
Finished water	310	350	260	7.1	7.4	6.9	316	--	--	--	--	--

[a] From analyses by Indiana State Board of Health.

LOGANSPORT

(Population, 21,031)

Ownership: Municipal; supplies also about 100 people outside the city limits. Total population supplied, about 21,100.

Source: Eel River.

Treatment: Prechlorination, coagulation with alum, ammoniation, sedimentation, chlorination, and rapid sand filtration.

Rated capacity of treatment plant: 8,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 260,000 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)	.17	Total	246
Manganese (Mn)	.00	Noncarbonate	126
Calcium (Ca)	71		
Magnesium (Mg)	17	Color	3
Sodium (Na)	5.1	pH	6.8
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	494
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	148	Temperature (F.)	--
Sulfate (SO_4)	118	Date of collection	Mar. 26, 1952
Chloride (Cl)	12		
Fluoride (F)	.2		
Nitrate (NO_3)	8.5		
Dissolved solids	320		

LOGANSPORT--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	175	292	86	8.2	8.6	7.8	--	--	--	--	--	--
Finished water	160	266	60	7.1	7.3	7.0	--	--	--	--	--	--

MARION

(Population, 30,081)

Ownership: Municipal; supplies also about 320 people outside the city limits. Total population supplied, about 30,400.

Source: 6 drilled wells: West 8th St. Field, 4 wells (5, 6, 7, 8) 135, 138, 138, and 136 ft deep, yield reported to be 1,500, 1,500, 1,500, and 1,800 gpm; Shunk St. Field, 2 wells (9, 10) 147 and 150 ft deep, yield reported to be 1,500 and 1,400 gpm.

Treatment: Softening with lime and soda ash, coagulation with alum and lime, sedimentation, recarbonation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: --

Raw-water storage: None.

Finished-water storage: 2 reservoirs, 1,750,000 and 650,000 gal; 2 elevated tanks, each 50,000 gal.

ANALYSES

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

	Well 5 (raw water)	Well 10 (raw water)	Finished water
Silica (SiO_2)	13	20	15
Iron (Fe)	2.7	2.7	.06
Manganese (Mn)	.00	.01	.00
Calcium (Ca)	148	112	17
Magnesium (Mg)	41	53	23
Sodium (Na)	20	22	48
Potassium (K)	2.1	1.8	3.9
Carbonate (CO_3)	0	0	9
Bicarbonate (HCO_3)	442	437	67
Sulfate (SO_4)	188	158	141
Chloride (Cl)	29	19	19
Fluoride (F)	.4	.7	.3
Nitrate (NO_3)	.4	.3	.0
Dissolved solids	683	618	314
Hardness as $CaCO_3$:			
Total	538	500	138
Noncarbonate	176	139	67
Color	5	3	3
pH	7.0	7.3	8.9
Specific conductance (micromhos at 25 C.)	990	922	496
Turbidity	--	--	--
Temperature (F.)	51	--	51
Date of collection	Apr. 17, 1952	Jan. 4, 1952	Apr. 17, 1952
Depth (feet)	135	150	
Diameter (inches)	26	26	
Date drilled	1946	1948	
Percent of supply	30.6	19.8	

MICHIGAN CITY
(Population, 28,395)

Ownership: Municipal; supplies also Long Beach, Indiana State Prison, and about 400 people outside the city limits. Total population supplied, about 33,400.
Source: Lake Michigan.
Treatment: Prechlorination, aeration, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, ammoniation, and postchlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
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)	3.1	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	133
Manganese (Mn)	.00	Noncarbonate	27
Calcium (Ca)	35		
Magnesium (Mg)	11	Color	2
Sodium (Na)	4.1	pH	8.1
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	273
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	129	Temperature (F.)	--
Sulfate (SO_4)	27	Date of collection	Jan. 11, 1952
Chloride (Cl)	8.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.6		
Dissolved solids	158		

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	114	117	112	8.0	8.1	7.9	--	--	--	13	450	5
Finished water	108	111	105	7.2	7.3	7.2	138	143	135	0	0	0

MISHAWAKA
(Population, 32,913)

Ownership: Municipal; supplies also about 100 people outside the city limits. Total population supplied, about 33,000.
Source: 8 drilled wells (1 to 8) 106, 97, 98, 92, 120, 112, 92, and 330 ft deep. The yield of the wells is reported to range from 400 to 1,500 gpm (yield not reported for well 8).
Treatment: Aeration of part, and chlorination.
Raw-water storage: 1,500,000 gal.
Finished-water storage: 3,000,000 gal.

MISHAWAKA--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.65	Total	296
Manganese (Mn)	.12	Noncarbonate	72
Calcium (Ca)	78		
Magnesium (Mg)	25	Color	3
Sodium (Na)	7.3	pH	7.7
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	564
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	275	Temperature (F.)	53
Sulfate (SO_4)	86	Date of collection	Jan. 15, 1952
Chloride (Cl)	8.0		
Fluoride (F)	.1		
Nitrate (NO_3)	2.3		
Dissolved solids	369		

MUNCIE

(Population, 58,479)

Ownership: Muncie Water Works Corp.

Source: White River. Auxiliary supply, 18 tubular wells and Buck Creek. During 1950, 99.4 percent of the supply was taken from surface source.

Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 8,500,000 gpd.

Raw-water storage: None.

Finished-water storage: 1,200,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.0	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	286
Manganese (Mn)	.00	Noncarbonate	62
Calcium (Ca)	73		
Magnesium (Mg)	25	Color	3
Sodium (Na)	4.2	pH	7.5
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	546
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	272	Temperature (F.)	--
Sulfate (SO_4)	58	Date of collection	Mar. 29, 1952
Chloride (Cl)	9.5		
Fluoride (F)	.2		
Nitrate (NO_3)	9.9		
Dissolved solids	331		

NEW ALBANY

(Population, 29,346)

Ownership: Indiana Gas and Water Company, Inc.; supplies also about 1,275 people outside the city limits. Total population supplied, about 30,600.

Source: Ohio River.

Treatment: Prechlorination, activated carbon, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH by addition of soda ash.

Rated capacity of treatment plant: 4,000,000 gpd.

Raw-water storage: 16,500,000 gal.

Finished-water storage: 1,500,000 gal.

NEW ALBANY--Continued

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)	.12	Total	96
Manganese (Mn)	.00	Noncarbonate	42
Calcium (Ca)	28		
Magnesium (Mg)	6.6	Color	3
Sodium (Na)	19	pH	7.3
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	296
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	67	Temperature (F.)	--
Sulfate (SO_4)	64	Date of collection	Jan. 30, 1952
Chloride (Cl)	13		
Fluoride (F)	.1		
Nitrate (NO_3)	3.0		
Dissolved solids	176		

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	70	300	30	7.2	8.0	6.1	--	--	--	318	2000	35
Finished water	80	164	52	7.3	7.8	7.0	--	--	--	.06	.06	.05

NEW CASTLE
(Population, 18,271)

Ownership: Municipal.
Source: 8 tubular wells: 7 wells at pumping station (90 percent of supply); Baker Park well (10 percent of supply). The wells are 111 to 291 ft deep, and the yield is reported to be from 135 to 500 gpm each.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: Ground reservoir, 1,100,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	16	Hardness as $CaCO_3$:	
Iron (Fe)	2.0	Total	368
Manganese (Mn)	.00	Noncarbonate	25
Calcium (Ca)	94		
Magnesium (Mg)	32	Color	0
Sodium (Na)	23	pH	7.6
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	767
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	416	Temperature (F.)	55
Sulfate (SO_4)	37	Date of collection	Mar. 31, 1952
Chloride (Cl)	37		
Fluoride (F)	.4		
Nitrate (NO_3)	1.6		
Dissolved solids	456		

PERU
(Population, 13,308)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 13,800.
Source: 5 drilled wells (1 to 5) 120, 76, 452, 454, and 74 ft deep, in the northeast part of the city, 0.6 mile from the treatment plant. The yield of the wells is reported to be 1,000 gpm each (yield not reported for well 4). Auxiliary supply, Wabash River, intake located at the treatment plant.
Treatment: Aeration, prechlorination, coagulation with alum and lime, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,500,000 gal.

ANALYSIS

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

	Well 2 (finished water)		Well 2 (finished water)
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	640
Manganese (Mn)	.00	Noncarbonate	296
Calcium (Ca)	184		
Magnesium (Mg)	44	Color	5
Sodium (Na)	34	pH	7.8
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	1,230
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	420	Temperature (F.)	56
Sulfate (SO_4)	215	Date of collection	Feb. 26, 1952
Chloride (Cl)	102		
Fluoride (F)	.2		
Nitrate (NO_3)	.1		
Dissolved solids	816		

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	332	340	324	7.1	7.1	7.1	--	--	--	--	--	--
Finished water	340	346	330	7.8	7.9	7.5	--	--	--	--	--	--

RICHMOND
(Population, 39,539)

Ownership: Richmond Water Works Corp; supplies also Spring Grove, and about 1,000 people outside the city limits. Total population supplied, about 40,900.
Source: 4 wells (Foster 1 to 4) each 28 ft deep, 7 percent of supply; 3 dug wells (Cooper 1 to 3) 30, 30, and 18 ft deep, 4 infiltration galleries, and 1 spring, 58.5 percent of supply; 2 wells (N. W. 7 and 8) 91 and 152 ft deep, 22 percent of supply; East Fork Whitewater River, 12.5 percent of supply.
Treatment: East Plant: (Surface water and part of ground water) coagulation with alum and lime, sedimentation, rapid sand filtration, and chlorination. Part of ground water, chlorination. West Plant: (Wells N. W. 7 and 8) iron removal, pressure filtration, and chlorination.
Rated capacity of treatment plants: 4,000,000 gpd.
Raw-water storage: --
Finished-water storage: Hill reservoir, 10,500,000 gal; clear well, 300,000 gal.

RICHMOND--Continued

ANALYSES

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

	Well N. W. 7 [a]	Finished water [b]		Well N. W. 7 [a]	Finished water [b]
Silica (SiO_2)	10	6.8	Hardness as $CaCO_3$:		
Iron (Fe)	.18	.23	Total	453	274
Manganese (Mn)	.23	.00	Noncarbonate	106	17
Calcium (Ca)	114	62			
Magnesium (Mg)	41	29	Color	0	0
Sodium (Na)	9.6	18	pH	7.4	7.5
Potassium (K)	1.8	1.6	Specific conductance (micromhos at 25 C.)	813	569
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	424	313	Temperature (F.)	--	--
Sulfate (SO_4)	109	50	Date of collection	Apr. 3, 1952	Mar. 31, 1952
Chloride (Cl)	12	7.0			
Fluoride (F)	.4	.2			
Nitrate (NO_3)	1.0	7.4			
Dissolved solids	522	338			

[a] Raw water.
[b] Ground water 88 percent, surface water 12 percent.

SOUTH BEND
(Population, 115,911)

Ownership: Municipal; supplies also about 200 people outside the city limits. Total population supplied, about 116,100.

Source: 41 wells: North Station: 6 wells, 102 to 110½ ft deep, yield reported to be 1,500 to 2,220 gpm (29 percent of supply); Oliver Station: 26 wells, 121 to 170 ft deep, yield reported to be 328 to 2,300 gpm (31 percent of supply); South Station: 5 wells, 81 to 108½ ft deep, yield reported to be 425 to 1,400 gpm (12 percent of supply); Coquillard Station: 2 wells, 200 and 206 ft deep, yield reported to be 1,500 and 2,200 gpm (16 percent of supply); Central Station: 1 well, 105 ft deep, yield reported to be 2,100 gpm (11 percent of supply); Airport Station: 1 well, 102½ ft deep, yield reported to be 1,750 gpm (1 percent of supply).

Treatment: Chlorination. Raw water stored at North Station prechlorinated and rechlorinated when pumped to mains.

Raw-water storage: 6,000,000 gal (at North Station).

Finished-water storage: 7,250,000 gal.

SOUTH BEND--Continued

ANALYSES

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

	Well 1 South Station [a]	Well 2 North Station [a]	Wells, Oliver Station [b]
Silica (SiO_2)	15	12	15
Iron (Fe)	.15	.80	.11
Manganese (Mn)	.00	.13	.03
Calcium (Ca)	73	72	141
Magnesium (Mg)	28	28	46
Sodium (Na)	4.4	5.5	7.1
Potassium (K)	1.5	1.0	1.2
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	324	294	357
Sulfate (SO_4)	23	65	242
Chloride (Cl)	4.5	8.0	7.8
Fluoride (F)	.0	.1	.0
Nitrate (NO_3)	20	.7	21
Dissolved solids	318	340	681
Hardness as $CaCO_3$:			
Total	298	295	544
Noncarbonate	32	54	248
Color	3	2	3
pH	7.6	7.6	7.4
Specific conductance (micromhos at 25 C.)	529	565	895
Turbidity	--	--	--
Temperature (F.)	--	52	--
Date of collection	Jan. 17, 1952	Jan. 17, 1952	Jan. 17, 1952
Depth (feet)	92¼	108	--
Diameter (inches)	18	50 by 38	--
Date drilled	1927	1940	--
Percent of supply	--	--	31

[a] Raw water.
[b] Finished water.

TERRE HAUTE
(Population, 64,214)

Ownership: Terre Haute Water Company; supplies also Allendale, Seelyville, Youngstown, and about 4,650 people outside the city limits. Total population supplied, about 70,500.
Source: Wabash River.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, and rapid sand filtration.
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 843,000 gal.

TERRE HAUTE--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.5	Hardness as $CaCO_3$:	
Iron (Fe)	.09	Total	208
Manganese (Mn)	.00	Noncarbonate	98
Calcium (Ca)	56		
Magnesium (Mg)	17	Color	5
Sodium (Na)	3.6	pH	7.4
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	421
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	136	Temperature (F.)	44
Sulfate (SO_4)	89	Date of collection	Feb. 5, 1952
Chloride (Cl)	6.1		
Fluoride (F)	.1		
Nitrate (NO_3)	10		
Dissolved solids	257		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness[a] as $CaCO_3$ (ppm)			Turbidity		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	174	272	60	7.8	8.3	7.5	--	--	--	282	1500	30
Finished water	154	250	48	7.1	7.7	6.7	278	313	243	0	3	0

[a] From analyses made by Indiana State Board of Health.

VALPARAISO
(Population, 12,028)

Ownership: Municipal; supplies also Flint Lake Water Company and about 300 people outside the city limits. Total population supplied, about 13,800.

Source: Flint Lake (96 percent of supply); 2 wells (4 and 5), 122 and 128¾ ft deep, yield reported to be 600 gpm each (4 percent of supply). Water from the wells is pumped at times to Flint Lake to maintain lake level. Auxiliary supply, 2 gravel packed wells.

Treatment: Breakpoint chlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 3,000,000 gpd.

Raw-water storage: --

Finished-water storage: 212,000 gal.

VALPARAISO--Continued

ANALYSES

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

	Well 5 (raw water)	Finished water		Well 5 (raw water)	Finished water
Silica (SiO_2)	12	2.4	Hardness as $CaCO_3$:		
Iron (Fe)	4.9	.11	Total	284	122
Manganese (Mn)	.21	.00	Noncarbonate	52	62
Calcium (Ca)	71	35			
Magnesium (Mg)	26	8.5	Color	4	7
Sodium (Na)	2.6	1.9	pH	7.4	7.7
Potassium (K)	1.1	2.6	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	501	260
Bicarbonate (HCO_3)	283	74	Turbidity	--	--
Sulfate (SO_4)	53	56	Temperature (F.)	--	--
Chloride (Cl)	2.5	10	Date of collection	Jan. 15, 1952	Jan. 15, 1952
Fluoride (F)	.0	.2			
Nitrate (NO_3)	.6	1.3			
Dissolved solids	308	161			

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	67	110	50	7.5	7.9	7.1	130	160	104	9.0	310	5.0
Finished water	62	248	38	7.4	7.8	7.1	140	168	86	.2	10	0

VINCENNES
(Population, 18,831)

Ownership: Municipal; supplies also about 1,800 people outside the city limits. Total population supplied, about 20,600.

Source: 5 wells (1 to 5) 90 to 91.5 ft deep. The yield of the wells is reported to be 800, 1,400, 1,050, 1,400, and 1,050 gpm, respectively. Auxiliary or emergency supply, Wabash River.

Treatment: Well supply: chlorination. Surface supply: aeration, breakpoint chlorination, copper sulfate, coagulation with alum, lime for pH control, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 3,200,000 gpd.

Raw-water storage: None.

Finished-water storage: Clear well, 480,000 gal; standpipe, 580,000 gal; elevated storage, 1,000,000 gal.

VINCENNES--Continued

ANALYSIS

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

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.62	Total	305
Manganese (Mn)	.09	Noncarbonate	80
Calcium (Ca)	86		
Magnesium (Mg)	22	Color	5
Sodium (Na)	6.4	pH	7.5
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	563
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	274	Turbidity	--
Sulfate (SO_4)	69	Temperature (F.)	57
Chloride (Cl)	7.2	Date of collection	Mar. 17, 1952
Fluoride (F)	.2		
Nitrate (NO_3)	10		
Dissolved solids	351		

WEST LAFAYETTE
(Population, 11,873)

Ownership: West Lafayette Water Company, Inc.; supplies also about 1,250 people outside the city limits. Total population supplied, about 13,100.
Source: 5 drilled wells (1 to 5) 109, 112, 103, 115, and 115 ft deep. The yield of the wells is reported to be 500, 500, 750, 1,000, and 1,200 gpm.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 330,000 gal.

ANALYSIS

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

	Well 2 (finished water)		Well 2 (finished water)
Silica (SiO_2)	16	Hardness as $CaCO_3$:	
Iron (Fe)	.27	Total	352
Manganese (Mn)	.00	Noncarbonate	70
Calcium (Ca)	83		
Magnesium (Mg)	35	Color	2
Sodium (Na)	3.8	pH	7.5
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	632
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	343	Turbidity	--
Sulfate (SO_4)	70	Temperature (F.)	54
Chloride (Cl)	6.0	Date of collection	Apr. 18, 1952
Fluoride (F)	.0		
Nitrate (NO_3)	3.4		
Dissolved solids	396		

Depth (feet)	112
Diameter (inches)	12
Date drilled	1939
Percent of supply	--

ASHLAND
(Population, 31,131)

Ownership: Municipal; supplies also Russell (which supplies Worthington, Flatwoods, Bellefonte, Westwood, and Raceland) and about 600 people outside the city limits. Total population supplied, about 39,800.
Source: Ohio River.
Treatment: Aeration, prechlorination, coagulation with alum and lime, ammoniation, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 4,700,000 gpd.
Raw-water storage: 25,000,000 gal.
Finished-water storage: 6,500,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.4	Hardness as $CaCO_3$:	
Iron (Fe)	.21	Total	93
Manganese (Mn)	.00	Noncarbonate	56
Calcium (Ca)	26		
Magnesium (Mg)	6.6	Color	0
Sodium (Na)	10	pH	7.2
Potassium (K)	1.5	Specific conductance (micromhos at 25 C.)	245
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	44	Temperature (F.)	--
Sulfate (SO_4)	60	Date of collection	May 8, 1951
Chloride (Cl)	11		
Fluoride (F)	.1		
Nitrate (NO_3)	1.5		
Dissolved solids	145		

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	32	52	17	7.0	7.7	6.2	90	156	43	176	2000	25
Finished water	41	59	24	8.3	8.7	7.2	107	170	72	--	--	--

BELLEVUE
(Population, 9,040)

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

BOWLING GREEN
(Population, 18,347)

Ownership: Municipal; supplies also about 1,500 people outside the city limits. Total population supplied, about 19,800.
Source: Barren River.
Treatment: Coagulation with alum and lime, adjustment of pH by addition of lime, sedimentation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plant: 4,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,150,000 gal.

BOWLING GREEN--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.3	Hardness as $CaCO_3$:	
Iron (Fe)	.20	Total	102
Manganese (Mn)	.00	Noncarbonate	16
Calcium (Ca)	32		
Magnesium (Mg)	5.3	Color	0
Sodium (Na)	2.2	pH	7.8
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	202
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	104	Temperature (F.)	--
Sulfate (SO_4)	13	Date of collection	Apr. 17, 1951
Chloride (Cl)	5.0		
Fluoride (F)	.0		
Nitrate (NO_3)	3.4		
Dissolved solids	114		

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	104	134	58	7.8	8.2	7.3	102	140	54	139	2100	5
Finished water	103	142	58	7.9	8.2	7.4	112	142	72	--	--	--

COVINGTON
(Population, 64,452)

Ownership: Municipal; supplies also Edgewood, Elsmere, Erlanger, Florence, Fort Thomas, Highland Heights, Ludlow, Park Hills, South Fort Mitchell, and a number of smaller communities. Total population supplied, about 105,000.

Source: Ohio River. The intake and pumping station is about 7 miles upstream from Covington. The treatment plant is on Alexandria Pike, 3 miles southeast of Covington.

Treatment: Plain sedimentation with addition of copper sulfate for algae control, prechlorination, coagulation with alum or ferric sulfate and lime, ammoniation, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 36,000,000 gpd.

Raw-water storage: 72,000,000 gal.

Finished-water storage: 7,000,000 gal.

COVINGTON--Continued

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)	.21	Total	112
Manganese (Mn)	.00	Noncarbonate	68
Calcium (Ca)	33		
Magnesium (Mg)	7.3	Color	2
Sodium (Na)	9.5	pH	7.1
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	280
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	54	Temperature (F.)	--
Sulfate (SO_4)	77	Date of collection	May 16, 1951
Chloride (Cl)	10		
Fluoride (F)	.1		
Nitrate (NO_3)	1.8		
Dissolved solids	173		

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	29	39	14	7.4	8.1	7.0	129	196	90	241	1200	5
Finished water	39	49	27	8.1	9.0	7.2	136	198	110	0	0	0

DANVILLE

(Population, 8,686)

Ownership: Municipal; supplies also Hustonville, Junction City, Moreland, and about 1,200 people outside the city limits. Total population supplied, about 11,800.

Source: Dix River impounded in Herrington Lake.

Treatment: Aeration, prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: --

Finished-water storage: 2 elevated tanks, 200,000 and 150,000 gal.

The treatment plant is half a mile north-northeast of the city. The pumping station at Herrington Lake is 3 miles northeast of the treatment plant.

DANVILLE--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.3	Hardness as $CaCO_3$:	
Iron (Fe)	.23	Total	124
Manganese (Mn)	.00	Noncarbonate	21
Calcium (Ca)	38		
Magnesium (Mg)	6.8	Color	4
Sodium (Na)	4.2	pH	7.9
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	258
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	124	Temperature (F.)	--
Sulfate (SO_4)	21	Date of collection	May 14, 1951
Chloride (Cl)	4.0		
Fluoride (F)	.0		
Nitrate (NO_3)	5.0		
Dissolved solids	153		

Regular determinations at treatment plant, 1950

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	96	130	80	7.3	7.5	7.0	--	--	--	25	3500	20
Finished water	100	130	80	7.8	8	7.6	112	140	100	--	--	--

DAYTON
(Population, 8,977)

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

FORT THOMAS
(Population, 10,870)

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

FRANKFORT
(Population, 11,916)

Ownership: Municipal; supplies also about 3,500 people outside the city limits. Total population supplied, about 15,400.
Source: Kentucky River. The pumping station and treatment plant are one mile upstream from the center of Frankfort.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, lime, and postchlorination. Finished water from reservoirs is rechlorinated during summer months.
Rated capacity of treatment plant: 7,500,000 gpd.
Raw-water storage: 900,000 gal.
Finished-water storage: 6,800,000 gal.

FRANKFORT--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	6.3	Hardness as $CaCO_3$:	
Iron (Fe)	.29	Total	74
Manganese (Mn)	.00	Noncarbonate	32
Calcium (Ca)	23		
Magnesium (Mg)	4.1	Color	5
Sodium (Na)	4.9	pH	7.7
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	181
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	52	Temperature (F.)	--
Sulfate (SO_4)	30	Date of collection	May 14, 1951
Chloride (Cl)	7.5		
Fluoride (F)	.1		
Nitrate (NO_3)	1.4		
Dissolved solids	114		

Regular determinations at treatment plant, 1947

	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	56	77	30	7.3	7.4	6.8	120	142	89	25	3000	20
Finished water	62	83	26	7.5	7.7	7.0	130	155	95	--	--	--

HENDERSON

(Population, 16,837)

Ownership: Municipal; supplies also about 1,500 people outside the city limits. Total population supplied, about 18,300.

Source: Ohio River.

Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, ammoniation, and chlorination.

Rated capacity of treatment plant: 5,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 4,000,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.1	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	112
Manganese (Mn)	.00	Noncarbonate	48
Calcium (Ca)	35		
Magnesium (Mg)	5.8	Color	0
Sodium (Na)	6.0	pH	7.9
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	259
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	77	Temperature (F.)	--
Sulfate (SO_4)	52	Date of collection	Apr. 19, 1951
Chloride (Cl)	7.5		
Fluoride (F)	.1		
Nitrate (NO_3)	3.2		
Dissolved solids	162		

HENDERSON--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.....	--	--	--	7.3	7.6	6.4	--	--	--	150	800	100
Finished water...	63	80	58	7.2	7.4	7.0	121	127	117	5	7	2

HOPKINSVILLE
(Population, 12,526)

Ownership: Municipal; supplies also about 4,000 people outside the city limits. Total population supplied, about 16,500.

Source: Little River. Auxiliary supply is from two artificial lakes on tributaries of Little River.

Treatment: Coagulation with alum, sedimentation, rapid sand filtration, lime, ammoniation, and chlorination.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: 450,000,000 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)	4.2	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	124
Manganese (Mn)	.00	Noncarbonate	38
Calcium (Ca)	42		
Magnesium (Mg)	4.4	Color	0
Sodium (Na)	4.1	pH	7.8
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	257
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	104	Temperature (F.)	67
Sulfate (SO_4)	40	Date of collection	Apr. 30, 1951
Chloride (Cl)	4.5		
Fluoride (F)	.1		
Nitrate (NO_3)	1.5		
Dissolved solids	155		

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.....	76	120	56	7.1	7.8	6.0	77	116	48	177	1500	10
Finished water...	88	124	60	7.7	8.7	6.8	122	144	76	--	--	--

LEXINGTON
(Population, 55,534)

Ownership: Lexington Water Co.; supplies also about 25,600 people outside the city limits. Total population supplied, about 81,100.
Source: East Hickman Creek and West Hickman Creek, impounded in 4 reservoirs. The impounding reservoirs and treatment plant are 1 mile southeast of Lexington on U. S. Highway 25.
Treatment: Copper sulfate for algae control in impounding reservoirs, aeration, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 18,000,000 gpd.
Raw-water storage: 1,750,000,000 gal.
Finished-water storage: 2,500,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	0.8	Hardness as $CaCO_3$:	
Iron (Fe)	.26	Total	110
Manganese (Mn)	.00	Noncarbonate	24
Calcium (Ca)	36		
Magnesium (Mg)	4.6	Color	4
Sodium (Na)	1.4	pH	7.3
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	224
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	104	Temperature (F.)	--
Sulfate (SO_4)	21	Date of collection	May 1, 1951
Chloride (Cl)	3.2		
Fluoride (F)	.0		
Nitrate (NO_3)	4.1		
Dissolved solids	128		

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	84	114	52	7.5	8.4	7.2	80	101	64	49	240	10
Finished water	76	110	42	7.4	8.0	7.2	84	108	63	.24	2.4	1

LOUISVILLE
(Population, 369,129)

Ownership: Municipal; supplies also St. Matthews, Shively, Middletown, Jeffersontown, Anchorage, and Jefferson County (which supplies other places). Total population supplied, about 450,000.
Source: Ohio River.
Treatment: Plain sedimentation, prechlorination, coagulation with alum (sometimes with sodium aluminate, activated carbon) softening with lime and soda ash, clarification, recarbonation, rapid sand filtration, postchlorination, ammoniation, and adjustment of pH (when not softening) with lime. When it is necessary, for taste and odor control, activated carbon and chlorine dioxide are used. Fluoridation (with sodium silicofluoride) is planned in the near future.
Rated capacity of treatment plant: 80,000,000 gpd capacity of softening plant; 120,000,000 gpd, capacity of filters.
Raw-water storage: 131,000,000 gal (only in connection with treatment processes).
Finished-water storage: 57,750,000 gal.

LOUISVILLE--Continued

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	6.4	6.4	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.24	Total	101	90
Manganese (Mn)	.00	.00	Noncarbonate	51	54
Calcium (Ca)	26	21			
Magnesium (Mg)	8.5	9.2	Color	0	3
Sodium (Na)	8.0	15	pH	7.2	7.7
Potassium (K)	1.6	1.7	Specific conductance (micromhos at 25 C.)	246	251
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	60	44	Turbidity	--	--
Sulfate (SO_4)	48	60	Temperature (F.)	--	--
Chloride (Cl)	9.0	13	Date of collection	May 9, 1951	May 10, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	3.0	2.1			
Dissolved solids	142	146			

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	57	99	27	7.4	8.2	6.7	115	165	62	155	875	5
Finished water	40	88	26	9.0	10.0	7.0	97	140	70	0	3	0

LYNCH-BENHAM
(Population, 7,952)
LYNCH

Ownership: United States Steel Company. Total population supplied, 5,800.
Source: Watershed of Big Looney Creek, southeast of Lynch.
Treatment: Coagulation with iron salts and lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: 150,000,000 gal.
Finished-water storage: 50,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	5.3	Hardness as $CaCO_3$:	
Iron (Fe)	.24	Total	48
Manganese (Mn)	.00	Noncarbonate	0
Calcium (Ca)	14		
Magnesium (Mg)	3.4	Color	3
Sodium (Na)	24	pH	7.6
Potassium (K)	1.6	Specific conductance (micromhos at 25 C.)	200
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	100	Turbidity	--
Sulfate (SO_4)	21	Temperature (F.)	--
Chloride (Cl)	2.2	Date of collection	May 10, 1951
Fluoride (F)	.1		
Nitrate (NO_3)	1.5		
Dissolved solids	118		

LYNCH-BENHAM--Continued
BENHAM

Ownership: International Harvester Company. Total population supplied, 2,200.
Source: Maggard's Branch, impounded near No. 1 mine at Benham. Auxiliary supply, No. 1 coal mine in Machine Shop Hollow, and Scott's Branch impounded.
Treatment: Aeration, coagulation with alum and lime, chlorination, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 500,000 gpd.
Raw-water storage: 2,400,000 gal.
Finished-water storage: 600,000 gal.

Maggard's Branch is used about 9 months during the year. No. 1 coal mine is used during the other 3 months, usually September, October, and November, or in times of drought. Scott's Branch is used only, and rarely, when the other supplies fail.

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)	5.6	4.1	Hardness as $CaCO_3$:		
Iron (Fe)	.26	.17	Total	198	60
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	43	15			
Magnesium (Mg)	22	5.3	Color	3	4
Sodium (Na)	60	19	pH	6.9	7.8
Potassium (K)	3.9	1.6	Specific conductance (micromhos at 25 C.)	605	205
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	284	76	Temperature (F.)	--	--
Sulfate (SO_4)	88	31	Date of collection	May 9, 1951	May 9, 1951
Chloride (Cl)	2.0	5.0			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	2.4	.9			
Dissolved solids	356	113			

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	92	270	32	7.5	7.7	7.1	--	--	--	29	800	20
Finished water	95	244	40	7.6	7.8	7.5	--	--	--	0	0	0

[a] No. 1 mine. [b] Maggard's Branch.

MADISONVILLE
(Population, 11,132)

Ownership: Municipal; supplies also about 3,000 people outside the city limits. Total population supplied, about 14,000.
Source: 2 lakes (impounded streams). Auxiliary supply from lakes (impounded streams) near Earlington.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and addition of polyphosphate (Calgon).
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: --
Finished-water storage: 550,000 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)	.17	Total	56
Manganese (Mn)	.00	Noncarbonate	38
Calcium (Ca)	15		
Magnesium (Mg)	4.4	Color	4
Sodium (Na)	5.1	pH	6.9
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	147
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	22	Temperature (F.)	55
Sulfate (SO_4)	41	Date of collection	Apr. 18, 1951
Chloride (Cl)	4.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.0		
Dissolved solids	87		

Regular determinations at treatment plant, 1950

	Alkalinity as $CaCO_3$ (ppm)			pH			Hardness as $CaCO_3$ (ppm)			Temperature		
	Av	Max	Min	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	16	20	8	7.1	7.3	6.8	--	--	--	--	91	34
Finished water	20	25	12	8.0	8.1	7.9	--	--	--	--	--	--

MAYFIELD
(Population, 8,990)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 9,500.
Source: 3 wells (8835-3640-1, 8835-3640-2, 8835-3640-3) 254, 258, and 246 ft deep; yield reported to be 1,400, 1,300, and 1,200 gpm.
Treatment: Aeration, chlorination, and addition of lime.
Rated capacity of treatment plant: --
Raw-water storage: None.
Finished-water storage: 180,000 gal.

MAYFIELD--Continued

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	16	Hardness as $CaCO_3$:	
Iron (Fe)	.30	Total	69
Manganese (Mn)	.00	Noncarbonate	40
Calcium (Ca)	14		
Magnesium (Mg)	8.0	Color	2
Sodium (Na)	22	pH	6.8
Potassium (K)	1.3	Specific conductance (micromhos at 25° C.)	254
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	34	Temperature (F.)	--
Sulfate (SO_4)	31	Date of collection	May 14, 1951
Chloride (Cl)	22		
Fluoride (F)	.1		
Nitrate (NO_3)	24		
Dissolved solids	155		
Depth (feet)			246
Diameter (inches)			18
Date drilled			1945
Percent of supply			--

[a] Well 8835-3640-3

MAYSVILLE

(Population, 8,632)

Ownership: Maysville Water Company; supplies also about 5,900 people outside the city limits. Total population supplied, about 14,500.

Source: Ohio River.

Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, lime, fluoridation, and postchlorination during summer months.

Rated capacity of treatment plant: 3,500,000 gpd.

Raw-water storage: None.

Finished-water storage: 2,500,000 gal.

The pumping station and the treatment plant are about 1 mile upstream from the center of Maysville. The finished-water storage basin is on a bluff above the city and the water is delivered by gravity at a pressure of 145 pounds throughout the distribution system.

MAYSVILLE--Continued
ANALYSIS
(Analysis, in parts per million, by U. S. Geological Survey)

	Finished water		Finished water
Silica (SiO_2)	6.7	Hardness as $CaCO_3$:	
Iron (Fe)	.24	Total	124
Manganese (Mn)	.00	Noncarbonate	87
Calcium (Ca)	34		
Magnesium (Mg)	9.2	Color	4
Sodium (Na)	6.0	pH	7.7
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	296
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	44	Temperature (F.)	--
Sulfate (SO_4)	78	Date of collection	May 15, 1951
Chloride (Cl)	14		
Fluoride (F)	a.0		
Nitrate (NO_3)	1.6		
Dissolved solids	181		

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	47	61	31	7.4	8.1	6.3	107	140	80	173	850	20
Finished water	54	69	40	8.3	9.1	7.0	99	120	80	--	--	--

[a] The supply was not being fluoridated at the time of the collection of sample for analysis.

MIDDLESBORO
(Population, 14,482)

Ownership: Kentucky Water Service Co., Inc.; supplies also about 100 people outside the city limits. Total population supplied, about 14,600.
Source: Little Yellow Creek impounded in Fern Lake, 1 mile south of Middlesboro.
Treatment: Chlorination.
Raw-water storage: (Impounding reservoir).
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)	5.3	Hardness as $CaCO_3$:	
Iron (Fe)	.73	Total	12
Manganese (Mn)	.17	Noncarbonate	2
Calcium (Ca)	1.6		
Magnesium (Mg)	1.0	Color	2
Sodium (Na)	.9	pH	7.2
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	20.5
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	8	Temperature (F.)	--
Sulfate (SO_4)	4.0	Date of collection	May 11, 1951
Chloride (Cl)	.9		
Fluoride (F)	.0		
Nitrate (NO_3)	.1		
Dissolved solids	19		

NEWPORT
(Population, 31,044)

Ownership: Municipal; supplies also Bellevue and Dayton. Total population supplied, about 49,100.
Source: Ohio River. The pumping station is about 5 miles upstream from Newport. The treatment plant is half a mile west of the pumping station.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, ammoniation, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 40,000,000 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)	.42	Total	110
Manganese (Mn)	.00	Noncarbonate	68
Calcium (Ca)	33		
Magnesium (Mg)	6.8	Color	5
Sodium (Na)	10	pH	7.0
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	281
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	52	Temperature (F.)	--
Sulfate (SO_4)	69	Date of collection	May 16, 1951
Chloride (Cl)	13		
Fluoride (F)	.1		
Nitrate (NO_3)	2.5		
Dissolved solids	172		

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	39	44	36	7.8	8.0	7.5	--	132	126	286	600	120
Finished water	38	40	36	7.7	8.0	7.5	--	--	--	--	--	--

OWENSBORO
(Population, 33,651)

Ownership: Municipal; supplies also about 3,000 people outside the city limits. Total population supplied, about 36,700.
Source: 18 wells (1 and 5 to 21), 110 to 132 ft deep; yield reported to be 100 to 500 gpm.
Treatment: Aeration, softening with lime, sedimentation, recarbonation, coagulation with alum, sedimentation, rapid sand filtration, and chlorination.
Raw-water storage: None.
Finished-water storage: 5,000,000 gal.

The treatment plant is being enlarged (1951) to a capacity of 10,000,000 gpd.

OWENSBORO--Continued

ANALYSES

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

	Well 1 (raw water)	All wells composite a		Well 1 (raw water)	All wells composite a
Silica (SiO_2)	4.3	12	Hardness as $CaCO_3$:		
Iron (Fe)	.50	.15	Total	126	108
Manganese (Mn)	.00	.00	Noncarbonate	41	61
Calcium (Ca)	41	18			
Magnesium (Mg)	5.8	15	Color	0	0
Sodium (Na)	8.0	8.9	pH	7.7	8.1
Potassium (K)	1.3	.9	Specific conductance (micromhos at 25 C.)	289	263
Carbonate (CO_3)	0	6			
Bicarbonate (HCO_3)	104	44	Turbidity	--	--
Sulfate (SO_4)	49	63	Temperature (F.)	72	61
Chloride (Cl)	9.0	13	Date of collection	Apr. 18, 1951	Apr. 18, 1951
Fluoride (F)	.1	.2			
Nitrate (NO_3)	.1	2.4			
Dissolved solids	174	169			

Depth (feet)	124
Diameter (inches)	8
Date drilled	1931
Percent of supply	--

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	--	--	--	7.4	7.5	7.2	350	385	166	0	--	--
Finished water	--	--	--	8.8	9.2	8.6	116	122	108	0	--	--

a Finished water.

PADUCAH
(Population, 32,828)

Ownership: Municipal; supplies also about 4,520 people outside the city limits. Total population supplied, about 37,300.
Source: Ohio River.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, postchlorination, ammoniation, and final adjustment of pH to about 8.3.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 1,800,000 gal.
Finished-water storage: 5,740,000 gal.

PADUCAH--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.3	Hardness as $CaCO_3$:	
Iron (Fe)	.26	Total	102
Manganese (Mn)	.00	Noncarbonate	47
Calcium (Ca)	34		
Magnesium (Mg)	4.4	Color	3
Sodium (Na)	4.4	pH	7.5
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	226
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	68	Temperature (F.)	--
Sulfate (SO_4)	41	Date of collection	May 14, 1951
Chloride (Cl)	6.5		
Fluoride (F)	.0		
Nitrate (NO_3)	1.6		
Dissolved solids	134		

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	65	88	50	7.4	7.8	6.8	66	90	54	150	700	30
Finished water	68	90	58	8.3	8.6	7.8	72	101	62	5	8	0

RICHMOND

(Population, 10,268)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 10,800.

Source: Otter Creek, impounded. Emergency supply from Blue Grass Ordnance Depot, 4 miles southwest of Richmond. The treatment plant and impounding reservoirs are 2 miles east of Richmond on State Highway 52.

Treatment: Copper sulfate for algae control in reservoirs, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, ammoniation, and postchlorination.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: 325,000,000 gal.

Finished-water storage: 1,300,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	1.4	Hardness as $CaCO_3$:	
Iron (Fe)	.43	Total	132
Manganese (Mn)	.00	Noncarbonate	35
Calcium (Ca)	34		
Magnesium (Mg)	11	Color	4
Sodium (Na)	1.8	pH	7.3
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	269
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	116	Temperature (F.)	--
Sulfate (SO_4)	28	Date of collection	May 1, 1951
Chloride (Cl)	5.2		
Fluoride (F)	.1		
Nitrate (NO_3)	.5		
Dissolved solids	154		

RICHMOND--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	119	157	70	8.1	8.4	7.5	77	92	62	21	165	10
Finished water	108	138	60	7.6	8.1	7.5	80	94	68	0	0	0

WINCHESTER
(Population, 9,226)

Ownership: Municipal; supplies also about 2,000 people outside the city limits. Total population supplied, about 11,200.
Source: Lower Howards Creek, impounded in two reservoirs. The impounding reservoirs and treatment plant are 4.5 miles southwest of Winchester on U. S. Highway 227. Emergency supply from Kentucky River.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 1,250,000 gpd.
Raw-water storage: 150,000,000 gal.
Finished-water storage: 775,000 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)	.57	Total	148
Manganese (Mn)	.00	Noncarbonate	45
Calcium (Ca)	45		
Magnesium (Mg)	8.7	Color	5
Sodium (Na)	4.7	pH	7.1
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	287
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	126	Temperature (F.)	--
Sulfate (SO_4)	38	Date of collection	May 1, 1951
Chloride (Cl)	7.0		
Fluoride (F)	.1		
Nitrate (NO_3)	1.0		
Dissolved solids	166		

Regular determinations at treatment plant, 1947

	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	192	--	--	8.2	8.4	7.6	--	--	--	25	--	--
Finished water	185	--	--	7.4	8.0	7.0	--	--	--	2	--	--

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 and adjustment of pH with lime to 7.6 to 7.8.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 700,000,000 gal.
Finished-water storage: 16,600,000 gal.

AUGUSTA--Continued

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	Turbidity	0.6
Sulfate (SO_4)	9.2	Temperature (F.)	44
Chloride (Cl)	3.4	Date of collection	Apr. 18, 1951
Fluoride (F)	.0		
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		
Bicarbonate (HCO_3)	10	Turbidity	2.1
Sulfate (SO_4)	20	Temperature (F.)	42
Chloride (Cl)	6.9	Date of collection	Apr. 18, 1951
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	Turbidity	1.7
Bicarbonate (HCO_3)	5	Temperature (F.)	--
Sulfate (SO_4)	4.0	Date of collection	Apr. 18, 1951
Chloride (Cl)	5.8		
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	0.2
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		

BIDDEFORD--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.....	4	5	3	6.6	6.7	6.5	17	--	--	5	--	--
Finished water...	14	15	13	8.1	--	--	30	--	--	0	--	--

BRUNSWICK
(Population, 7,342)

Ownership: Brunswick and Topsham Water District. Total population supplied, about 12,800.
Source: 70 driven wells 28 ft deep; yield reported to be 700 gpm.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 3,500,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.38	Total	18
Manganese (Mn)	.22	Noncarbonate	3
Calcium (Ca)	4.8		
Magnesium (Mg)	1.4	Color	3
Sodium (Na)	5.6	pH	6.0
Potassium (K)	.7	Specific conductance (micromhos at 25 C.).....	74.5
Carbonate (CO_3)	0	Turbidity	0.9
Bicarbonate (HCO_3)	18	Temperature (F.).....	--
Sulfate (SO_4)	4.5	Date of collection	Apr. 14, 1951
Chloride (Cl)	8.0		
Fluoride (F)	.0		
Nitrate (NO_3)	1.1		
Dissolved solids	50		

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.

OLD TOWN
(Population, 8,261)

Ownership: Old Town Water District; also supplies Bradley and Milford. Total population supplied, about 10,650.
Source: Penobscot River.
Treatment: Prechlorination, rapid sand filtration, and addition of soda ash.
Rated capacity of treatment plant: 2,500,000 gpd.
Raw-water storage: --
Finished-water storage: 600,000 gal.

OLD TOWN--Continued

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)	.05	Total	16
Manganese (Mn)	.04	Noncarbonate	4
Calcium (Ca)	5.0		
Magnesium (Mg)	.9	Color	32
Sodium (Na)	4.9	pH	6.4
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	56.1
Carbonate (CO_3)	0	Turbidity	0.6
Bicarbonate (HCO_3)	15	Temperature (F.)	--
Sulfate (SO_4)	7.0	Date of collection	May 16, 1951
Chloride (Cl)	5.6		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	49		

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	0.7
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

PRESQUE ISLE
(Population, 9,954)

Ownership: Presque Isle Water District.
Source: Presque Isle Stream.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,200,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	4.6	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	47
Manganese (Mn)	.00	Noncarbonate	26
Calcium (Ca)	16		
Magnesium (Mg)	1.7	Color	12
Sodium (Na)	.7	pH	7.7
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	105
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	26	Temperature (F.)	--
Sulfate (SO_4)	23	Date of collection	Apr. 17, 1951
Chloride (Cl)	3.1		
Fluoride (F)	.1		
Nitrate (NO_3)	.6		
Dissolved solids	71		

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	49	74	23	6.6	7.0	6.3	63	88	48	54	125	25
Finished water	47	72	26	7.1	7.1	7.0	82	107	53	0	0	0

ROCKLAND
(Population, 9,234)

Ownership: Camden & Rockland Water Company; also supplies about 7,000 people in Camden, Rockport town, Thomaston, and a small part of Owls Head town. Total population supplied, about 16,200.
Source: Mirror Lake (Oyster River Pond) in Rockport. Emergency supply only, Chickawaukee Lake (not used in the past 25 years).
Treatment: Chlorination.
Raw-water storage: 600,000,000 gal.
Finished-water storage: 2,600,000 gal.

ROCKLAND--Continued

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)	.24	Total	8
Manganese (Mn)	.02	Noncarbonate	5
Calcium (Ca)	2.0		
Magnesium (Mg)	.8	Color	12
Sodium (Na)	3.5	pH	6.4
Potassium (K)	..4	Specific conductance (micromhos at 25 C.)	42.2
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	4	Temperature (F.)	--
Sulfate (SO_4)	5.5	Date of collection	Apr. 17, 1951
Chloride (Cl)	6.9		
Fluoride (F)	.0		
Nitrate (NO_3)	.2		
Dissolved solids	29		

RUMFORD

(Population, 7,888)

Ownership: Rumford Water District.
Source: Mountain stream.
Treatment: Chlorination.
Raw-water storage: 110,000,000 gal.
Finished-water storage: 3,500,000 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)	.15	Total	9
Manganese (Mn)	.02	Noncarbonate	4
Calcium (Ca)	1.6		
Magnesium (Mg)	1.3	Color	27
Sodium (Na)	.8	pH	6.1
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	24.9
Carbonate (CO_3)	0	Turbidity	2.2
Bicarbonate (HCO_3)	6	Temperature (F.)	48
Sulfate (SO_4)	6.8	Date of collection	Apr. 17, 1951
Chloride (Cl)	1.6		
Fluoride (F)	.0		
Nitrate (NO_3)	.2		
Dissolved solids	22		

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	0.9
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: 40,000,000 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	Turbidity	0.5
Bicarbonate (HCO_3)	17	Temperature (F.)	--
Sulfate (SO_4)	12	Date of collection	Apr. 17, 1951
Chloride (Cl)	3.1		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	38		

WESTBROOK
(Population, 12,284)

Ownership: Supplied by Portland. (See Portland.)

ANNAPOLIS, MARYLAND
(Population, 10,047)

Ownership: Municipal; supplies Dreams Landing, Eastport, Forest Hills, Germantown, Homewood, Wardour and West Annapolis. Total population supplied, about 28,000.

Source: Broad Creek and other small streams (impounded), 74 percent of supply; 4 wells (1, 2, 5, and 6) 26 percent of supply. The wells are 270, 250, 248, and 242 ft deep respectively. Well number 1 is used very little. The surface water is used regularly, and the wells are used only to supplement this supply when necessary.

Treatment: Lime, aeration, coagulation with alum, sedimentation, rapid sand filtration, chlorination, and the addition of lime to adjust the pH to about 8.6. When the well water is used it is mixed with the surface water before treatment is begun.

Rated capacity of treatment plant: 5,000,000 gpd.

Raw-water storage: 80,000,000 gal.

Finished-water storage: Basin, 500,000 gal; standpipe, 1,750,000 gal.

The wells are used during the summer and during the peak demand furnish about one half of the supply. Most of this is furnished by wells 5 and 6. During the year 1950 only well 5 was used. It is not possible at the present time to sample the individual well supplies.

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)	10	11	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.0	Total	10	36
Manganese (Mn)	.00	.00	Noncarbonate	5	20
Calcium (Ca)	2.4	12			
Magnesium (Mg)	1.0	1.5	Color	5	2
Sodium (Na)	1.4	2.0	pH	6.3	7.6
Potassium (K)	1.5	1.6	Specific conductance (micromhos at 25 C.)	42.9	95.7
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	6	20			
Sulfate (SO_4)	6.0	16	Turbidity	1.0	0.9
Chloride (Cl)	3.5	6.6	Temperature (F.)	--	--
Fluoride (F)	.0	.0	Date of collection	Mar.20, 1951	Mar.20, 1951
Nitrate (NO_3)	1.1	.3			
Dissolved solids	35	63			

[a]Impounding reservoir.

[b]Surface supplies, only.

BALTIMORE
(Population, 949,708)

Ownership: Municipal; supplies a large population in the Metropolitan District of Baltimore County. Total population supplied, about 1,163,000.

Source: Gunpowder River impounded in Lock Raven Reservoir. North Branch of Patapsco River, (to be tapped about the middle of 1951 adding about 40,000,000 gpd to the present supply), auxiliary supply.

Treatment: Plain sedimentation, prechlorination to 0.5 ppm of free available chlorine through filters, coagulation with alum, sedimentation, rapid sand filtration, and adjustment of pH to 7.8 with lime. Fluoridation with fluosilicic acid to 1.0 ppm of fluoride in the finished water was begun Nov. 26, 1952.

Rated capacity of treatment plant: 240,000,000 gpd.

Raw-water storage: 43,000,000,000 gal.

Finished-water storage: Filtered water reservoirs, elevated tanks, standpipes. Total 773,500,000 gal.

The Metropolitan District of Baltimore County borders Baltimore City on the west, north, and east and the water supply for the District is obtained from the city supply. After the distribution system is installed, it is turned over to the city for maintenance and operation and forms an integral part of the city system.

It is proposed to construct eventually an impounding dam on the North Branch of Patapsco River and another treatment plant.

ANALYSES

(Analyses, in parts per million, by Monte Bello Laboratory, Baltimore, Maryland)

	Raw water[a]	Finished water[b]		Raw water[a]	Finished water[b]
Silica (SiO_2)	12	6.0	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.01	Total	39	50
Manganese (Mn)	.00	.00	Noncarbonate	6	10
Calcium (Ca)	10	14			
Magnesium (Mg)	3.5	4.0	Color	6	--
Sodium (Na)	2.3	4.3	pH	7.0	8.0
Potassium (K)	1.5		Specific conductance (micromhos at 25 C.)	103	--
Carbonate (CO_3)	0	--			
Bicarbonate (HCO_3)	41	49	Turbidity	1.2	0.1
Sulfate (SO_4)	7.0	11	Temperature (F.)	--	--
Chloride (Cl)	3.2	6.2	Date of collection	Apr. 18, 1951	1950
Fluoride (F)	.0	.1			
Nitrate (NO_3)	3.8	.3			
Dissolved solids	63	81			

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	37	44	33	7.2	7.4	6.8	40	46	37	5	30	3
Finished water	40	52	35	8.0	8.4	7.3	52	63	45	.1	.2	.1

[a] Reservoir. Analysis by U. S. Geological Survey.

[b] Averages of analyses of monthly composites of daily samples.

CAMBRIDGE
(Population, 10,351)

Ownership: Dorchester Water Company, Cambridge, Maryland. Supplies about 750 people outside the city limits. Total population supplied, about 11,100.

Source: 11 wells. Station No. 1, Trenton Street wells 1 and 2 each 375 ft deep and each reported to yield 300 gpm (used as an auxiliary supply); Station No. 2, Mill Street well 1 (well 2 abandoned in 1948) 375 ft deep, and reported to yield 375 gpm; Station No. 3, Washington Street wells 1 and 2 each 405 ft deep and each reported to yield 600 gpm; Station No. 4, Fletcher Avenue Well 1, 420 ft deep, reported to yield 700 gpm; Station No. 5, High Street well 1, 460 ft deep, reported to yield 700 gpm (has been out of service for about a year); Station No. 6, Dorchester Avenue wells 1 and 2, 412 ft and 970 ft deep respectively, and reported to yield 700 and 424 gpm; Station No. 7, Nathan Avenue wells 1 and 2, 431 ft and 427 ft deep, respectively. Well 1 is reported to yield 350 gpm.

Treatment: Aeration, chlorination, and settling.

Rated capacity of treatment plant: The individual wells are equipped with aerators, chlorinators and settling basins.

Raw-water storage: None.

Finished-water storage: Elevated tank 500,000 gal; receiving basins at individual wells 1,080,000 gal.

The Fletcher Avenue well is pumped continuously; the Dorchester Avenue wells and the Washington Street wells are usually pumped continuously. The pumps automatically cut off when the receiving basins at the individual wells are full of water.

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

	Fletcher Avenue Well	Dorchester Avenue Well 1	Dorchester Avenue Well 2	Finished water (city tap)
Silica (SiO_2)	22	20	18	25
Iron (Fe)	.10	.11	.13	.04
Manganese (Mn)	.00	--	--	.00
Calcium (Ca)	6.0	5.1	3.2	5.8
Magnesium (Mg)	4.5	3.5	2.4	4.4
Sodium (Na)	180	172	139	172
Potassium (K)	8.4	6.4	5.3	6.8
Carbonate (CO_3)	12	8	9	12
Bicarbonate (HCO_3)	486	455	358	468
Sulfate (SO_4)	9.2	19	14	9.8
Chloride (Cl)	14	7.5	6.8	6.8
Fluoride (F)	1.0	1.2	1.0	.9
Nitrate (NO_3)	.6	.4	.2	.6
Dissolved solids	[a] 505	473	385	[b] 481
Hardness as $CaCO_3$:				
Total	34	27	18	32
Noncarbonate	0	0	0	0
Color	3	4	5	3
pH	8.5	8.0	8.2	8.5
Specific conductance (micromhos at 25 C.)	809	766	615	758
Turbidity	1.2	--	--	1.4
Temperature (F.)	64	64	72	69
Date of collection	Sept. 8,1951	Oct. 8,1948	Oct. 8,1948	Sept. 8,1951
Depth (feet)	420	412	970	
Diameter (inches)	12	12	14-8	
Date drilled	--	1945	1946	
Percent of supply	--	--	--	

[a] Includes 2.1 ppm lithium (Li).

[b] Includes 1.9 ppm lithium (Li).

COLLEGE PARK
(Population, 11,170)

Ownership: Supplied by Washington Suburban Sanitary Commission. (See Hyattsville.)

CUMBERLAND
(Population, 37,679)

Ownership: Municipal; (Evitts Creek Water Company) supplies also Cresaptown and La Vale, Maryland; Ridgeley and Wiley Ford, West Virginia. Total population supplied, about 42,100.
Source: Evitts Creek impounded in two lakes, Koon Lake and Lake Gordon.
Treatment: Coagulation with alum, sedimentation, rapid (anthrafilt) filtration, chlorination, and ammoniation.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: Koon Lake, 2,300,000,000 gal; Lake Gordon 1,330,000,000 gal.
Finished-water storage: Fort Hill reservoir, 3,750,000 gal; Ridgedale reservoir, 7,500,000 gal.

The treatment plant is located at Koon Lake about 8 miles northeast of the city. The finished water flows by gravity through two 36-in. reinforced concrete conduits from the treatment plant to the finished water reservoirs, thence to the distribution system. The analyses represent water of about minimum concentration of dissolved solids and minimum hardness.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	3.9	4.2	Hardness as $CaCO_3$:		
Iron (Fe)	.0	.02	Total	20	36
Manganese (Mn)	--	--	Noncarbonate	0	0
Calcium (Ca)	4.7	9.9			
Magnesium (Mg)	2.1	2.8	Color	6	5
Sodium (Na)	17	20	pH	7.6	7.2
Potassium (K)		1.4	Specific conductance (micromhos at 25 C.)	118	158
Carbonate (CO_3)	0	0	Turbidity	9	4
Bicarbonate (HCO_3)	48	65	Temperature (F.)	38	--
Sulfate (SO_4)	12	20	Date of collection	Mar. 5, 1951	Mar. 5, 1951
Chloride (Cl)	1.9	3.0			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	2.1	2.2			
Dissolved solids	69	93			

FREDERICK
(Population, 18,142)

Ownership: Municipal; a small population is supplied outside the city limits. Total population supplied, about 18,200.

Source: Tuscarora and Fishing Creeks about 84 percent of supply; Linganore Creek, about 16 percent of supply. Fishing Creek (impounded) is the main source of supply. Linganore Creek water is used to supplement the regular supply at times of peak load or when necessary.

Treatment: Main supply: Chlorination and ammoniation. Linganore Creek water: coagulation with alum and lime, carbon, breakpoint chlorination, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 6,000,000 gpd.

Raw-water storage: Fishing creek reservoir, 77,000,000 gal.

Finished-water storage: Clear wells and elevated tanks, 1,000,000 gal.

Fishing Creek reservoir is located about 10 miles northwest of the city, above the village of Mountain Dale. The water from Tuscarora Creek reservoir enters the conduit from Fishing Creek reservoir near Yellow Springs. Thus the water from these two sources is mixed before entering the city. The treatment plant for the Linganore Creek supply is about 3.5 miles east of the city.

ANALYSES

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

	Fishing Creek reservoir (raw water)	Fishing Creek	Linganore Creek Finished water
Silica (SiO_2)	3.0	0.6	5.7
Iron (Fe)	.01	.00	.01
Manganese (Mn)	--	--	--
Calcium (Ca)	.5	.7	11
Magnesium (Mg)	.1	.2	3.4
Sodium (Na)	2.6	2.1	6.8
Potassium (K)	.3		
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	3.5	4	26
Sulfate (SO_4)	2.4	1.5	20
Chloride (Cl)	1.4	1.5	6.2
Fluoride (F)	.0	.0	.1
Nitrate (NO_3)	.1	.2	6.5
Dissolved solids	12	12	78
Hardness as $CaCO_3$:			
Total	2	3	41
Noncarbonate	0	0	20
Color	3	8	3
pH	6.1	5.7	7.0
Specific conductance (micromhos at 25 C.)	14.5	14.5	131
Turbidity	1	--	2
Temperature (F.)	--	60	--
Date of collection	Mar. 6, 1951	Oct. 16, 1951	Mar. 6, 1951

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	46	61	17	7.1	8.6	6.9	52	66	39	15	1000	5
Finished water	34	45	23	6.6	7.0	6.2	53	68	44	5	5	5

[a]Linganore Creek.

HAGERSTOWN
(Population, 32,260)

Ownership: Municipal; supplies also Williamsport, Funkstown, Smithburg, and a number of people outside the city limits. Total population supplied, about 48,000.

Source: Potomac River, 2/3 of supply; mountain supply consisting of Raven Rock and Warner Hollow Creeks, impounded, 1/3 of supply.

Treatment: Potomac River supply: Plain sedimentation, prechlorination, coagulation with alum, occasionally activated carbon, sedimentation, rapid sand filtration, and addition of lime for adjustment of pH. Mountain supply: Chlorination. Occasional use of chlorine dioxide in both supplies.

Rated capacity of treatment plant: 10,000,000 gpd.

Raw-water storage: Potomac River supply: 2 settling basins, 5,000,000 gal each. Mountain supply: reservoir, 120,000,000 gal.

Finished-water storage: Equalizing reservoirs and elevated tanks, 11,500,000 gal.

The two sources of supply are interconnected so that the consumers may be furnished with river, mountain streams, or the mixed water. There is considerable variation in composition of the water from both supplies throughout the year, but the water of the mountain supply is low in mineral content and hardness at all times.

Fluoridation with sodium silicofluoride was begun Nov. 20, 1951, of the mountain supply and Dec. 4, 1951, of the Potomac River supply. An average content of about 1.1 ppm of fluoride is maintained in the supplies.

ANALYSES

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

	Potomac River		Mountain Supply (city tap)
	Raw water	Finished water	
Silica (SiO_2)	4.8	5.4	10
Iron (Fe)	.03	.01	.07
Manganese (Mn)	--	--	--
Calcium (Ca)	11	17	3.8
Magnesium (Mg)	5.0	3.8	1.9
Sodium (Na)	13	15	4.8
Potassium (K)		1.1	
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	42	45	13
Sulfate (SO_4)	35	44	9.2
Chloride (Cl)	2.9	4.8	4.0
Fluoride (F)	.0	.0	.2
Nitrate (NO_3)	1.5	1.6	1.6
Dissolved solids	97	116	45
Hardness as $CaCO_3$:			
Total	48	58	17
Noncarbonate	14	21	7
Color	6	3	4
pH	7.3	7.8	7.0
Specific conductance (micromhos at 25 C.)	161	193	59.5
Turbidity	9	2	5
Temperature (F.)	--	--	--
Date of collection	Mar. 6, 1951	Mar. 6, 1951	Mar. 6, 1951

HAGERSTOWN--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[a]	65	100	20	7.3	7.6	6.6	80	130	25	20	1600	6
Finished water[a]	65	100	10	7.7	8.2	7.2	85	140	30	5	10	.2
Raw water[b]	15	25	10	6.5	6.9	6.3	20	25	5	8	15	5

[a] Potomac River. [b] Mt. Supply.

HYATTSVILLE
(Population, 12,300)

Ownership: The Washington Suburban Sanitary Commission, a public body incorporated by the Maryland General Assembly in 1918, serves a metropolitan area of 213 square miles in Montgomery and Prince Georges Counties. It supplies water to Beltsville, Berwyn Heights, Bethesda, Bladensburg, Bowie, Brentwood, Cabin John, Capitol Heights, Cheverly, Chevy Chase, College Park, Colmar Manor, Cottage City, District Heights, Edmonston, Fairmount Heights, Forest Heights, Forestville, Gaithersburg, Garrett Park, Glenarden, Glen Echo, Glenmont, Hyattsville, Kensington, Lanham, Mt. Rainier, North Brentwood, Riverdale, Seat Pleasant, Silver Spring, Somerset, Takoma Park, University Park, Washington Grove, Wheaton, and other communities. It also supplies two communities, Laurel and Greenbelt, which are outside the boundary of the District. Total population supplied, about 385,000.

Source: The Patuxent River and the Northwest Branch of the Anacostia River furnish the surface water supply. A deep well system in the southern portion of the District furnishes the supply for that area. Water from the Patuxent River can be pumped into the Northwest Branch of the Anacostia River during low flows of the latter branch.

Treatment: At each of the two plants, prechlorination, coagulation with alum (and lime or sodium aluminate as necessary), sedimentation, rapid sand filtration, postchlorination (or dechlorination as necessary), fluoridation with sodium silicofluoride, and addition of lime for adjustment of pH. The well water, chlorination.

Rated capacity of treatment plants: The Patuxent treatment plant on the Laurel-Burtonsville road at Willis School, 31,700,000 gpd; the Robert B. Morse treatment plant on the Northwest Branch at Burnt Mills, 10,000,000 gpd.

Raw-water storage: Triadelphia Reservoir at Brighton on the Patuxent River, 6,118,000,000 gal; Rocky Gorge Reservoir (under construction) on the Patuxent River near Laurel, 6,000,000,000 gal.

Finished-water storage: Reservoirs, standpipes, elevated tanks, 45,295,000 gal.

The main source of water supply of the Sanitary District is the Patuxent River, impounded by a dam near Brighton in Montgomery County. Another dam is under construction on the same river at Rocky Gorge near Laurel. When this dam is completed the Washington Suburban Sanitary District will have an assured supply from the Patuxent River of slightly over 40 mgd. The Commission also obtains a portion of its supply from the Northwest Branch of the Anacostia River, which water is treated in the Robert B. Morse plant at Burnt Mills. The flow of the Northwest Branch can be supplemented by raw water pumped from the Patuxent River at Mink Hollow near Ashton. The deep wells at Forest Heights in the southern portion of the District will yield 1.4 mgd.

The water from the Patuxent River is lifted by the Rocky Gorge pumping station to the Patuxent treatment plant. The treated water flows by gravity from the plant to Prince Georges County or is pumped to the higher service area at Wheaton in Montgomery County.

HYATTSVILLE--Continued

At Capitol Heights in Prince Georges County a pumping station lifts the water to the higher service area at Suitland and a pumping station at Wheaton in Montgomery County lifts the water to a higher service zone at Glenmont.

Connections with the water supply systems of the District of Columbia exist at a number of points. Water may be interchanged between the two systems in the event of emergency.

Fluoridation of the treated water at both treatment plants was initiated on Dec. 27, 1951. Sodium silicofluoride is utilized and the fluoride content in the finished water averaged 0.96 ppm in 1952.

ANALYSES

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

	Patuxent River		Finished water [c]
	Raw water [a]	Finished water [b]	
Silica (SiO_2)	9.7	8.9	14
Iron (Fe)	.02	.09	.01
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	4.0	8.8	10
Magnesium (Mg)	1.1	1.6	1.7
Sodium (Na)	2.6	2.9	4.6
Potassium (K)	1.2	1.1	.9
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	15	18	26
Sulfate (SO_4)	4.0	8.5	10
Chloride (Cl)	3.2	7.2	7.8
Fluoride (F)	.0	.0	.0
Nitrate (NO_3)	1.9	2.4	1.2
Dissolved solids	37	56	68
Hardness as $CaCO_3$:			
Total	14	29	32
Noncarbonate	2	14	11
Color	2	4	2
pH	6.8	7.4	7.4
Specific conductance (micromhos at 25 C.)	54.6	84.9	102
Turbidity	0.9	1.0	0.5
Temperature (F.)	--	--	--
Date of collection	Apr. 9, 1951	Apr. 9, 1951	Apr. 9, 1951

Regular determinations at treatment plants, 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 [a]	14	21	10	6.9	7.2	6.5	18	22	14	55	5000	5
Finished water [a]	18	30	12	8.7	9.4	6.6	33	47	27	.24	.8	.1
Raw water [c]	19	26	11	6.8	7.0	6.3	20	24	15	78	3000	8
Finished water [c]	24	35	14	8.7	9.3	7.2	38	51	29	.27	.9	.1

[a] Patuxent treatment plant. [b] City tap, Hyattsville.
[c] N. W. Branch Anacostia River, at Robert B. Morse Plant.

MOUNT RAINIER
(Population, 10,989)

Ownership: Supplied by Washington Suburban Sanitary Commission. (See Hyattsville.)

SALISBURY
(Population, 15,141)

Ownership: Municipal.
Source: 11 wells (2, 4 to 13) averaging 60 ft in depth. Emergency supply, Schumaker Pond. The 11 wells are capable of yielding 7,000 gpm.
Treatment: Aeration by means of a forced air degasifier, addition of lime for uniform pH control, chlorination, and ammoniation.
Rated capacity of treatment plant: 10,000 gpd.
Low service storage (aeration and lime treatment only): Underground reservoir at plant, 500,000 gal.
Finished-water storage: 3 elevated tanks, 200,000, 300,000, and 500,000 gal; 1 standpipe, 85,000 gal.

The wells are located within the Municipal Park area and pump to the treatment plant and reservoir. All wells are equipped with turbine pumps with automatic draw-down cutoffs, and all wells, and blowers for the degasifier, are operated by remote control from the main pumping station. A rotation system is used in operating the various wells so that none of the wells is operated continuously. The system is flexible enough to take care of varying daily requirements.

ANALYSES

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

	Well 2 (raw water)	Well 10 (raw water)	Wells 2, 4, 5, 7, 8 (finished water)
Silica (SiO_2)	19	18	19
Iron (Fe)	1.0	.02	.35
Manganese (Mn)	.05	.00	.01
Calcium (Ca)	4.6	2.9	7.0
Magnesium (Mg)	1.4	.5	.6
Sodium (Na)	7.8	9.7	10
Potassium (K)	1.9		1.7
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	12	13	22
Sulfate (SO_4)	3.2	3.5	2.0
Chloride (Cl)	7.5	6.8	9.0
Fluoride (F)	.1	.0	.0
Nitrate (NO_3)	13	8.0	12
Dissolved solids	70	60	81
Hardness as $CaCO_3$:			
Total	17	9	20
Noncarbonate	7	0	2
Color	0	2	3
pH	5.9	6.3	7.1
Specific conductance (micromhos at 25 C.)	83.4	73.0	104
Turbidity	--	2	11
Temperature (F.)	--	--	--
Date of collection	Mar. 3, 1948	Mar. 19, 1951	Mar. 19, 1951
Depth (feet)	57	60	--
Diameter (inches)	24	18	--
Date drilled	1925	1949	--
Percent of supply	--	--	--

TAKOMA PARK
(Population, 13,341)

Ownership: Supplied by Washington Suburban Sanitary Commission. (See Hyattsville.)

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	0.7
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.

BOSTON--Continued

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.

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	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_2)	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: 5,250,000,000 gal.
Finished-water storage: 8,000,000 gal.

BROCKTON--Continued

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. 5, 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	Av	Max	Min	Av	Max	Min	Av	Max	Min
Raw water	7.4	13	2.9	5.7	6.9	4.9	14	30	6	0	0	0
Finished water	9.3	18	2.9	5.9	7.0	4.9	13	26	6	0	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.

CAMBRIDGE--Continued

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.

DANVERS town

(Population, 15,720)

Ownership: Municipal; also supplies Middleton town. Total population supplied, about 18,600.
Source: Middleton Pond, Swan Pond, and Emerson Brook.
Treatment: Chlorination and fluoridation.
Raw-water storage: 951,000,000 gal.
Finished-water storage: 5,000,000 gal.

DANVERS town--Continued
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)	.34	Total	23
Manganese (Mn)	.02	Noncarbonate	15
Calcium (Ca)	8.1		
Magnesium (Mg)	.6	Color	45
Sodium (Na)	3.8	pH	6.2
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	74.4
Carbonate (CO_3)	0	Turbidity	1.2
Bicarbonate (HCO_3)	9	Temperature (F.)	--
Sulfate (SO_4)	12	Date of collection	Mar. 6, 1953
Chloride (Cl)	6.8		
Fluoride (F)	1.2		
Nitrate (NO_3)	.8		
Dissolved solids	52		

DEDHAM town
(Population, 18,487)

Ownership: Dedham Water Co.; supplies also Westwood town. Total population supplied, about 24,300.
Source: 4 tubular wells 45 to 120 ft deep; 1 dug well 18 ft deep.
Treatment: Chlorination.
Finished-water storage: 800,000 gal.

ANALYSIS

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

	Finished water (composite)		Finished water (composite)
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.33	Total	48
Manganese (Mn)	.51	Noncarbonate	24
Calcium (Ca)	13		
Magnesium (Mg)	3.8	Color	7
Sodium (Na)	6.8	pH	6.5
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	156
Carbonate (CO_3)	0	Turbidity	1.0
Bicarbonate (HCO_3)	29	Temperature (F.)	51
Sulfate (SO_4)	23	Date of collection	Mar. 4, 1951
Chloride (Cl)	13		
Fluoride (F)	.0		
Nitrate (NO_3)	2.6		
Dissolved solids	87		

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.
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		
Bicarbonate (HCO_3)	10	Turbidity	--
Sulfate (SO_4)	15	Temperature (F.)	--
Chloride (Cl)	8.4	Date of collection	Feb. 18, 1952
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		
Bicarbonate (HCO_3)	3	Turbidity	1.0
Sulfate (SO_4)	4.4	Temperature (F.)	--
Chloride (Cl)	2.6	Date of collection	Mar. 10, 1953
Fluoride (F)	.6		
Nitrate (NO_3)	.2		
Dissolved solids	23		

[a] Low service system.

FITCHBURG--Continued

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

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	Turbidity	--
Bicarbonate (HCO_3)	15	Temperature (F.)	--
Sulfate (SO_4)	9.7	Date of collection	--
Chloride (Cl)	3.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	40		

GARDNER

(Population, 19,581)

Ownership: Municipal.

Source: Crystal Lake. Auxiliary or emergency supply, Perley Brook.

Treatment: Chlorination.

Raw-water storage: 761,000,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	4.2	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	17
Manganese (Mn)	.06	Noncarbonate	8
Calcium (Ca)	6.3		
Magnesium (Mg)	.3	Color	13
Sodium (Na)	2.4	pH	6.6
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	59.0
Carbonate (CO_3)	0	Turbidity	1.1
Bicarbonate (HCO_3)	11	Temperature (F.)	--
Sulfate (SO_4)	8.2	Date of collection	Mar. 10, 1953
Chloride (Cl)	4.4		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	35		

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.

GREENFIELD
(Population, 15,075)

Ownership: Municipal. Total population supplied, about 17,300.
Source: Glen Brook Reservoirs 74 percent of supply; 2 wells (1 and 2) 123 and 84 ft deep, 26 percent of supply.
Treatment: Coagulation with alum, sedimentation, slow sand filtration, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 70,000,000 gal.
Finished-water storage: 2,500,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	4.9	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	31
Manganese (Mn)	.01	Noncarbonate	9
Calcium (Ca)	11		
Magnesium (Mg)	.9	Color	3
Sodium (Na)	1.3	pH	7.1
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	75.6
Carbonate (CO_3)	0	Turbidity	0.6
Bicarbonate (HCO_3)	27	Temperature (F.)	--
Sulfate (SO_4)	12	Date of collection	Feb. 26, 1953
Chloride (Cl)	2.4		
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	47		

GREENFIELD--Continued

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.....	36	44	30	7.1	7.1	7.1	38	46	29	1.7	2	1
Finished water...	34	35	31	7.1	7.1	7.1	39	47	30	0	0	0

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		
Bicarbonate (HCO_3)	21	Turbidity	--
Sulfate (SO_4)	13	Temperature (F.).....	--
Chloride (Cl)	7.6	Date of collection	Feb. 15, 1952
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: --

HOLYOKE--Continued

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.

ANALYSES

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

	Finished water	Finished water [a]		Finished water	Finished water [a]
Silica (SiO_2)	4.7	4.1	Hardness as $CaCO_3$:		
Iron (Fe)	.45	.20	Total	22	44
Manganese (Mn)	--	--	Noncarbonate	0	18
Calcium (Ca)	7.0	16			
Magnesium (Mg)	1.2	.9	Color	--	8
Sodium (Na), Potassium (K)	13	23	pH	6.8	6.7
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	--	190
Bicarbonate (HCO_3)	32	32	Turbidity	--	--
Sulfate (SO_4)	12	42	Temperature (F.)	--	--
Chloride (Cl)	7.2	16	Date of collection	Apr. 30, 1952	Oct. 15, 1953
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.7	.5			
Dissolved solids	65	119			

[a] Analysis by U. S. Geological Survey.

LAWRENCE--Continued
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		
Bicarbonate (HCO_3)	11	Turbidity	1.0
Sulfate (SO_4)	16	Temperature (F.).....	--
Chloride (Cl)	2.8	Date of collection	Mar. 10, 1953
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	55		

LEXINGTON town
(Population, 17,335)

Ownership: Municipal. Supplied by Metropolitan District Commission. (See Boston.)
Finished-water storage: 550,000 gal.

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.

LOWELL--Continued
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	Turbidity	--
Bicarbonate (HCO_3)	24	Temperature (F.)	--
Sulfate (SO_4)	18	Date of collection	Jan. 24, 1952
Chloride (Cl)	13		
Fluoride (F)	.1		
Nitrate (NO_3)	.4		
Dissolved solids	86		

MALDEN
(Population, 59,804)

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

MARLBOROUGH
(Population, 15,756)

Ownership: Municipal.
Source: Milham and Williams Lakes.
Treatment: Chlorination and addition of Calgon.
Raw-water storage: 720,000,000 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)	1.9	Hardness as $CaCO_3$:	
Iron (Fe)	.59	Total	33
Manganese (Mn)	.01	Noncarbonate	17
Calcium (Ca)	10		
Magnesium (Mg)	2.0	Color	8
Sodium (Na)	12	pH	7.0
Potassium (K)	2.0	Specific conductance (micromhos at 25 C.)	145
Carbonate (CO_3)	0	Turbidity	1.2
Bicarbonate (HCO_3)	20	Temperature (F.)	--
Sulfate (SO_4)	15	Date of collection	Mar. 9, 1953
Chloride (Cl)	22		
Fluoride (F)	.0		
Nitrate (NO_3)	.4		
Dissolved solids	66		

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.)

MILFORD
(Population, 14,396)

Ownership: Milford Water Co.; also sells water wholesale to supply about 300 people in Hopedale. Total population supplied, about 15,000.
Source: Echo Lake (Charles River impounded) 95 percent of supply; 3 dug wells (1 to 3) 26, 25, and 28 ft deep and 24 driven wells 19 to 30 ft deep, 5 percent of supply. The dug wells are reported to yield 50 gpm each, and the driven wells, a total of 200 gpm.
Treatment: Surface sources: slow sand filtration, corrective treatment with Calgon and lime, and chlorination.
Rated capacity of treatment plant: 2,400,000 gpd.
Raw-water storage: 384,000,000 gal.
Finished-water storage: Standpipes, 2,400,000 gal.

MILFORD--Continued

ANALYSES

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

	Driven wells[a]	Finished water[b]		Driven wells[a]	Finished water[b]
Silica (SiO_2)	--	7.0	Hardness as $CaCO_3$:		
Iron (Fe)	2.4	.18	Total	36	30
Manganese (Mn)	--	.01	Noncarbonate	--	11
Calcium (Ca)	--	11			
Magnesium (Mg)	--	.7	Color	21	18
Sodium (Na)	--	2.2	pH	5.9	8.3
Potassium (K)	--	.5	Specific conductance (micromhos at 25 C.)	--	82.0
Carbonate (CO_3)	--	0			
Bicarbonate (HCO_3)	32	24	Turbidity	4	0.6
Sulfate (SO_4)	--	9.4	Temperature (F.)	--	--
Chloride (Cl)	5.8	5.8	Date of collection	Feb. 3, 1953	Mar. 9, 1953
Fluoride (F)	--	.0			
Nitrate (NO_3)	--	.7			
Dissolved solids	--	60			

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[b]	--	--	--	5.5	--	--	20	--	--	3	--	--
Finished water[b]	23	--	--	6.7	--	--	38	--	--	1	--	--

[a] Analyses by State Department of Health. [b] Surface supply.

MILTON town
(Population, 22,395)

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

NATICK town
(Population, 19,838)

Ownership: Municipal. Total population supplied, about 23,000.
Source: Drilled well 65 ft deep, reported to yield 1,000 gpm, 67 percent of supply; dug well 15 ft deep, 34 ft in diam., reported to yield 2,000 gpm, 33 percent of supply. Emergency supply, connections with the towns of Framingham and Wellesley.
Treatment: None.
Storage: 4,600,000 gal.

NATICK town--Continued

ANALYSIS

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

	Storage basin		Storage basin
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	80
Manganese (Mn)	.01	Noncarbonate	23
Calcium (Ca)	25		
Magnesium (Mg)	4.3	Color	10
Sodium (Na)	9.8	pH	7.3
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	208
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	70	Turbidity	1.0
Sulfate (SO_4)	21	Temperature (F.)	--
Chloride (Cl)	16	Date of collection	Mar. 3, 1953
Fluoride (F)	.1		
Nitrate (NO_3)	1.7		
Dissolved solids	127		

NEEDHAM town

(Population, 16,313)

Ownership: Municipal. Total population supplied, about 19,000.
Source: 2 gravel-packed wells (1 and 2) each 90 ft deep, reported to yield 1,500 and 1,100 gpm; 2 dug wells (1 and 2) 24 and 28 ft deep, each reported to yeild 200 gpm.
Treatment: Chlorination.
Raw-water storage: --
Finished-water storage: 2,300,000 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)	17	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	64
Manganese (Mn)	.00	Noncarbonate	6
Calcium (Ca)	18		
Magnesium (Mg)	4.6	Color	5
Sodium (Na)	7.8	pH	7.1
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	164
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	70	Turbidity	1.2
Sulfate (SO_4)	12	Temperature (F.)	--
Chloride (Cl)	9.5	Date of collection	Mar. 4, 1953
Fluoride (F)	.1		
Nitrate (NO_3)	1.6		
Dissolved solids	110		

[a] Composite, gravel-packed wells.

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.

NEW BEDFORD--Continued

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: 4 dug wells and collecting gallery (1 to 4) 38, 42, 41, and 32 ft deep, and 28, 33, 20, and 20 ft in diameter, respectively, 68 percent of supply; Boston Metropolitan District Commission, 32 percent of supply. The Metropolitan District Commission will furnish the entire supply at a future date (in 1954).

Treatment: Well supply, chlorination, addition of soda ash, and ammoniation.

Raw-water storage: --

Finished-water storage: 10,500,000 gal.

ANALYSES

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

	Raw water[a]	Finished water		Raw water[a]	Finished water
Silica (SiO_2)	12	2.0	Hardness as $CaCO_3$:		
Iron (Fe)	.20	.25	Total	46	45
Manganese (Mn)	.00	--	Noncarbonate	9	0
Calcium (Ca)	13	13			
Magnesium (Mg)	3.2	3.0	Color	12	--
Sodium (Na)	9.6	32	pH	6.4	6.3
Potassium (K)	1.6	2.4	Specific conductance (micromhos at 25 C.)	147	--
Carbonate (CO_3)	0	0	Turbidity	1.0	--
Bicarbonate (HCO_3)	45	111	Temperature (F.)	55	--
Sulfate (SO_4)	17	17	Date of collection	Oct. 8, 1953	Jan. 29, 1952
Chloride (Cl)	11	11			
Fluoride (F)	.1	.2			
Nitrate (NO_3)	1.0	1.1			
Dissolved solids	94	148			

[a] Wells and collecting gallery. Analysis by U. S. Geological Survey.

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.

NORTH ADAMS--Continued

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_2)	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_2)	0	Turbidity	0.5
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		

NORWOOD town
(Population, 16,636)

Ownership: Municipal.
Source: Deep well (1), Westwood 60 ft deep and reported to yield 1,050 gpm, 36.7 percent of supply; Ellis Station wells: 2 gravel-packed wells each 50 ft deep and reported to yield 210 and 285 gpm; 4 gravel walled wells 35 to 40 ft deep and reported to yield a total of 400 gpm; 40 driven wells 20 ft deep (average) and reported to yield a total of 700 gpm. The Ellis Station wells furnish 63.3 percent of supply. Emergency supply, Buckmaster Pond (used only when unable to pump from Buckmaster well).
Treatment: Ellis Station well water: iron removal by aeration, coke contact filtration and slow sand filtration. (Buckmaster deep well water: dry lime; Buckmaster Pond: slow sand filtration and chlorination).
Rated capacity of treatment plants: 3,000,000 gpd.
Raw-water storage: 62,000,000 gal.
Finished-water storage: 1,600,000 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)	15	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	63
Manganese (Mn)	.01	Noncarbonate	31
Calcium (Ca)	16		
Magnesium (Mg)	5.6	Color	2
Sodium (Na)	6.8	pH	7.0
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	181
Carbonate (CO_3)	0	Turbidity	0.6
Bicarbonate (HCO_3)	39	Temperature (F.)	--
Sulfate (SO_4)	28	Date of collection	Mar. 5, 1953
Chloride (Cl)	13		
Fluoride (F)	.2		
Nitrate (NO_3)	2.8		
Dissolved solids	112		

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[b]	33	--	--	6.9	--	--	65	--	--	1	--	--
Finished water[b]	32	--	--	6.9	--	--	62	--	--	0	--	--

[a] Composite of wells.
[b] Ellis Station.

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.

PEABODY--Continued

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	Turbidity	--
Bicarbonate (HCO_3)	42	Temperature (F.)	--
Sulfate (SO_4)	10	Date of collection	Feb. 18, 1952
Chloride (Cl)	2.2		
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	--

SAUGUS town
(Population, 17,162)

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

SOMERVILLE
(Population, 102,351)

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

SOUTHBRIDGE
(Population, 16,748)

Ownership: Southbridge Water Supply Company.
Source: Hatchet Brook Reservoirs 3, 4, and 5.
Treatment: Slow sand filtration (for Reservoir 4 only) and chlorination of all supplies. Reservoir 4 is used only during months when there is no danger of freezing.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 560,000,000 gal.
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)	4.1	Hardness as $CaCO_3$:	
Iron (Fe)	.33	Total	8
Manganese (Mn)	.02	Noncarbonate	5
Calcium (Ca)	2.0		
Magnesium (Mg)	.8	Color	16
Sodium (Na)	1.1	pH	6.1
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	31.0
Carbonate (CO_3)	0	Turbidity	1.3
Bicarbonate (HCO_3)	4	Temperature (F.)	--
Sulfate (SO_4)	5.2	Date of collection	Mar. 3, 1953
Chloride (Cl)	2.9		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	25		

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	4	8	3	6.1	6.6	5.5	8	10	6	1	2	1
Finished water	--	--	--	--	--	--	--	--	--	--	--	--

SPRINGFIELD
(Population, 162,399)

Ownership: Municipal; also supplies the towns of Agawam, East Longmeadow, Longmeadow, Ludlow, and Southwick; other communities, and Westover Air Base. Total population supplied, about 250,000.
Source: Cobble Mountain Reservoir (Little River) 91 percent of supply; Ludlow Reservoir (Jabish Brook) 9 percent of supply.
Treatment: Cobble Mountain Reservoir water: aeration, slow sand filtration, aeration, and marble contact filtration. Ludlow Reservoir water: slow sand filtration, and chlorination.
Rated capacity of treatment plants: Little River system, 45,000;000 gpd: Ludlow Reservoir, 8,000,000 gpd.
Raw-water storage: Little River system, 25,000,000,000 gal; Ludlow Reservoir, 1,500,000 gal.
Finished-water storage: Little River system, 29,000,000 gal; Ludlow Reservoir basin, 11,000,000 gal.

SPRINGFIELD--Continued

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_2)	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_2)	0	Turbidity	--
Bicarbonate (HCO_3)	5	Temperature (F.)	--
Sulfate (SO_4)	12	Date of collection	Feb. 18, 1952
Chloride (Cl)	9.2		
Fluoride (F)	.1		
Nitrate (NO_3)	.0		
Dissolved solids	42		

WAKEFIELD town
(Population, 19,633)

Ownership: Municipal.
Source: Crystal Lake and wells. Auxiliary or emergency supply, Metropolitan District Commission. (See Boston.)
Treatment: Surface supply: aeration, slow sand filtration, and chlorination. Well supply: none.
Rated capacity of treatment plant: 2,500,000 gpd.
Raw-water storage: 350,000,000 gal.
Finished-water storage: 1,200,000 gal.

ANALYSIS

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

	Finished water (composite)		Finished water (composite)
Silica (SiO_2)	5.4	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	42
Manganese (Mn)	.00	Noncarbonate	22
Calcium (Ca)	13		
Magnesium (Mg)	2.3	Color	10
Sodium (Na)	7.2	pH	6.8
Potassium (K)	2.0	Specific conductance (micromhos at 25 C.)	132
Carbonate (CO_3)	0	Turbidity	1.2
Bicarbonate (HCO_3)	24	Temperature (F.)	--
Sulfate (SO_4)	20	Date of collection	Mar. 9, 1953
Chloride (Cl)	13		
Fluoride (F)	.1		
Nitrate (NO_3)	2.1		
Dissolved solids	83		

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.

WELLESLEY town--Continued
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	0.6
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	0.6
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		

WEST SPRINGFIELD town
(Population, 20,438)

Ownership: Municipal.
Source: Bear Hole Brook Reservoir and wells. In 1951 the wells furnished 47 percent of the supply.
Treatment: Surface supply: aeration, slow sand filtration, and chlorination. Well supply: none.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 69,000,000 gal.
Finished-water storage: 1,200,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	9.8	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	53
Manganese (Mn)	--	Noncarbonate	13
Calcium (Ca)	17		
Magnesium (Mg)	2.5	Color	--
Sodium (Na)	3.6	pH	7.2
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	49	Temperature (F.)	--
Sulfate (SO_4)	14	Date of collection	--
Chloride (Cl)	3.6		
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	83		

WEYMOUTH town
(Population, 32,690)

Ownership: Municipal.
Source: Great Pond and 2 gravel-packed wells 66 and 52 ft deep, on Circuit Avenue and Main Street, respectively. The wells are used during the summer months and furnished 12 percent of the supply in 1952.
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: 4,070,000 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		

WEYMOUTH town--Continued

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

WINCHESTER town
(Population, 15,509)

Ownership: Municipal.
Source: North, Middle, and South Reservoirs, and wells.
Treatment: Chlorination; softening of ground water supply.
Rated capacity of treatment plant: --
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)	0.7	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	23
Manganese (Mn)	--	Noncarbonate	8
Calcium (Ca)	7.5		
Magnesium (Mg)	1.1	Color	--
Sodium (Na)	3.9	pH	6.4
Potassium (K)	1.6	Specific conductance (micromhos at 25 C.).....	--
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	18	Turbidity	--
Sulfate (SO_4)	13	Temperature (F.).....	--
Chloride (Cl)	6.6	Date of collection	Jan. 24, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	.8		
Dissolved solids	48		

WINTHROP town
(Population, 19,496)

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

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).

WOBURN--Continued

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	0.3
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, Kendal Reservoir, Pine Hill Reservoir, Quinapoxet Reservoir, Lynde Brook Reservoir, and Kettle Brook Reservoirs 1, 2, 3, and 4.
Treatment: 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		

ADRIAN
(Population, 18,393)

Ownership: Municipal; supplies also about 3,000 people outside the city limits. Total population supplied, about 21,400.
Source: Wolf Creek. Auxiliary supply from one well, 89 ft deep.
Treatment: Coagulation with alum, softening with lime and soda ash, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 300,000,000 gal.
Finished-water storage: 1,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	14	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.19	Total	280	96
Manganese (Mn)	.00	.00	Noncarbonate	44	47
Calcium (Ca)	80	22			
Magnesium (Mg)	19	9.7	Color	25	4
Sodium (Na)	5.9	9.5	pH	7.4	8.9
Potassium (K)	4.6	4.7	Specific conductance (micromhos at 25 C.)	523	254
Carbonate (CO_3)	0	26			
Bicarbonate (HCO_3)	285	6	Turbidity	--	--
Sulfate (SO_4)	49	54	Temperature (F.)	--	--
Chloride (Cl)	4.8	9.0	Date of collection	June 27, 1951	June 27, 1951
Fluoride (F)	.1	.3			
Nitrate (NO_3)	5.3	1.0			
Dissolved solids	364	153			

Regular determinations at treatment plant Jan. 1 to May 24, 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	162	239	71	--	--	--	210	333	109	64	319	12
Finished water	56	172	20	9.9	10.6	9.6	115	270	88	0	3	0

ANN ARBOR
(Population, 48,251)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 48,600.
Source: Huron River, 32 percent of supply; 10 wells, 30 to 170 ft deep, 68 percent of supply. Eight of the ten wells are flowing wells.
Treatment: Prechlorination, activated carbon, coagulation with lime, softening with lime and soda ash, sedimentation, and rapid sand filtration. The water is softened to a hardness of about 85 ppm.
Rated capacity of treatment plant: 18,000,000 gpd.
Raw-water storage: 600,000,000 gal.
Finished-water storage: 6,000,000 gal.

ANN ARBOR--Continued

ANALYSES

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

	Huron River (raw water)	Well[a] (raw water)	Huron River and wells (finished water)
Silica (SiO_2)	6.8	13	9.4
Iron (Fe)	.05	.05	.11
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	61	104	17
Magnesium (Mg)	19	35	9.2
Sodium (Na)	4.8	7.1	12
Potassium (K)	1.7	2.3	2.2
Carbonate (CO_3)	0	0	5
Bicarbonate (HCO_3)	240	335	16
Sulfate (SO_4)	33	132	71
Chloride (Cl)	6.2	7.8	10
Fluoride (F)	.2	.2	.2
Nitrate (NO_3)	.7	.5	.4
Dissolved solids	271	491	153
Hardness as $CaCO_3$:			
Total	232	404	80
Noncarbonate	34	129	59
Color	10	2	2
pH	8.2	7.5	9.4
Specific conductance (micromhos at 25 C.)	430	718	246
Turbidity	--	--	--
Temperature (F.)	--	48	--
Date of collection	Nov. 2, 1951	Nov. 2, 1951	Nov. 2, 1951

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	252	280	227	--	--	--	356	404	335	--	--	--
Finished water	36	48	23	--	--	--	97	121	85	55	63	44

[a] Steere Farm, flowing well.

BATTLE CREEK
(Population, 48,666)

Ownership: Municipal.
Source: 18 wells (18 to 35), 110 to 151 ft deep. The yield of well 18 is reported to be 500 gpm; of wells 19 to 30, 300 gpm each; and of wells 31 to 35, 1,000 gpm each.
Treatment: Chlorination and fluoridation.
Raw-water storage: 2,700,000 gal.
Finished-water storage: 4,000,000 gal.

BATTLE CREEK--Continued

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)	.26	Total	254
Manganese (Mn)	.09	Noncarbonate	28
Calcium (Ca)	70		
Magnesium (Mg)	19	Color	2
Sodium (Na)	5.1	pH	7.8
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	504
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	274	Temperature (F.)	--
Sulfate (SO_4)	46	Date of collection	July 3, 1951
Chloride (Cl)	5.8		
Fluoride (F)	1.1		
Nitrate (NO_3)	.3		
Dissolved solids	316		

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	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	222	242	203	7.0	7.1	6.8	201	207	195	50	50	50

BAY CITY

(Population, 52,523)

Ownership: Municipal; supplies also Essexville, and about 2,900 people outside the city limits. Total population supplied, about 58,600.

Source: Lake Huron (Saginaw Bay).

Treatment: Prechlorination, coagulation with alum, softening with lime and soda ash, activated carbon, sedimentation, rapid sand filtration, postchlorination, and chlorine dioxide.

Rated capacity of treatment plant: 20,000,000 gpd.

Raw-water storage: 30,000,000 gal.

Finished-water storage: 5,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	3.1	2.6	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.13	Total	226	71
Manganese (Mn)	.00	.00	Noncarbonate	94	43
Calcium (Ca)	65	16			
Magnesium (Mg)	15	7.5	Color	9	3
Sodium (Na)	35	50	pH	7.9	9.6
Potassium (K)	6.5	5.8	Specific conductance (micromhos at 25 C.)	623	414
Carbonate (CO_3)	0	11	Turbidity	--	--
Bicarbonate (HCO_3)	158	12	Temperature (F.)	--	--
Sulfate (SO_4)	42	43	Date of collection	June 28, 1951	June 28, 1951
Chloride (Cl)	94	76			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	2.3	.2			
Dissolved solids	396	224			

BAY CITY--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.....	100	166	83	8.0	8.2	7.3	159	382	126	28	600	5
Finished water...	36	59	28	9.2	9.6	8.9	79	100	68	0	0	0

BENTON HARBOR
(Population, 18,769)

Ownership: Municipal; supplies about 2,000 people outside the city limits. Total population supplied, about 20,800.
Source: Lake Michigan. Emergency supply can be obtained from the city of St. Joseph.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,600,000 gal.

Prior to March 5, 1951, wells were the source of supply.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	1.8	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	142
Manganese (Mn)	.00	Noncarbonate	31
Calcium (Ca)	39		
Magnesium (Mg)	11	Color	3
Sodium (Na)	4.1	pH	8.1
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	299
Carbonate (CO_3)	8	Turbidity	--
Bicarbonate (HCO_3)	120	Temperature (F.)	--
Sulfate (SO_4)	29	Date of collection	Aug. 24, 1951
Chloride (Cl)	7.0		
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	177		

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.....	114	120	103	8.0	8.3	7.9	154	175	135	6	100	2.5
Finished water...	115	117	105	8.4	8.6	7.8	156	180	140	.25	.25	0

BERKLEY
(Population, 17,931)

Ownership: Municipal.
Source: 3 wells (1 to 3), 205, 214, and 205 ft deep; yield reported to be 1,100, 900, and 650 gpm. Auxiliary supply from the city of Detroit.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 150,000 gal.

ANALYSIS
(Analysis, in parts per million, by Michigan Department of Health)

	Finished water		Finished water
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.50	Total	224
Manganese (Mn)	--	Noncarbonate	0
Calcium (Ca)	45		
Magnesium (Mg)	27	Color	--
Sodium (Na)	65	pH	--
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	--	Turbidity	--
Bicarbonate (HCO_3)	342	Temperature (F.)	--
Sulfate (SO_4)	5.2	Date of collection	March, 1944
Chloride (Cl)	55		
Fluoride (F)	.8		
Nitrate (NO_3)	--		
Dissolved solids	378		

BIRMINGHAM
(Population, 15,467)

Ownership: Municipal.
Source: Wells, 137 to 250 ft deep, in sand and gravel.
Treatment: None.
Storage: 300,000 gal.

ANALYSES
(Analyses, in parts per million, by Michigan Department of Health)

	Well (Lincoln and Westchester)	Well (Redding and Lakeside)	Well (Derby and Eaton)
Silica (SiO_2)	8.8	20	11
Iron (Fe)	1.2	1.3	1.1
Manganese (Mn)	--	--	--
Calcium (Ca)	65	77	72
Magnesium (Mg)	24	27	27
Sodium (Na)	20	37	54
Potassium (K)			
Carbonate (CO_3)	--	--	--
Bicarbonate (HCO_3)	332	392	394
Sulfate (SO_4)	2.8	7.6	4.6
Chloride (Cl)	20	38	56
Fluoride (F)	.5	.4	.5
Nitrate (NO_3)	--	--	--
Dissolved solids	319	418	430
Hardness as $CaCO_3$:			
Total	258	305	288
Noncarbonate	--	--	--
Date of collection	January, 1947	January, 1947	January, 1947

DEARBORN
(Population, 94,994)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

DETROIT
(Population, 1,849,568)

Ownership: Municipal; supplies also cities of Dearborn, East Detroit, Ecorse, Ferndale, Garden City, Hamtramck, Huntington Woods, Lincoln Park, Melvindale, Livonia, Oak Park, Pleasant Ridge, River Rouge, Royal Oak (part); villages of Allen Park, Grosse Pointe Park, Grosse Pointe Shores, Grosse Pointe Woods, Inkster, Riverview, Roseville, St. Clair Shores, Trenton, Wayne; townships of Brownstown, Dearborn, Ecorse, Erin, Farmington, Gratiot, Grosse Ile, Nankin, Redford, Romulus, Royal Oak, Southfield, Lathrup Townsite, Taylor, Warren and Wayne; County General Hospital (Eloise); Detroit House of Correction; and Wayne County Training School. Total population supplied, about 2,508,000.
Source: Detroit River.
Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plants: Water Works Park Plant, 320,000,000 gpd; Springwells Plant, 272,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 136,000,000 gal (at both filter plants and in all elevated tanks).

ANALYSES

(Analyses, in parts per million, by Department of Water Supply, City of Detroit)

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	.4	.2	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.02	Total	98	98
Manganese (Mn)	--	--	Noncarbonate	16	22
Calcium (Ca)	27	27			
Magnesium (Mg)	7	7	Color	--	--
Sodium (Na)	3	3	pH	8.1	7.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	1	0	Turbidity	8	0.1
Bicarbonate (HCO_3)	99	93	Temperature (F.)	--	--
Sulfate (SO_4)	13	19	Date of collection	June, 1951	June, 1950
Chloride (Cl)	7	7			
Fluoride (F)	--	--			
Nitrate (NO_3)	.2	.2			
Dissolved solids	130	132			

Regular determinations at treatment plant, 7-1-49 to 6-30-50

	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	82	86	80	8.1	8.3	7.9	98	100	95	20	130	3
Finished water	76	80	64	7.6	7.8	7.1	98	100	95	.1	.8	0

[a] Composite sample.

EAST DETROIT
(Population, 21,461)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

EAST LANSING
(Population, 20,325)

Ownership: Municipal; supplies also about 2,000 people outside the city limits. Total population supplied, about 22,300.
Source: 5 wells (1, and 3 to 6), 460, 407, 385, 380, and 385 ft deep; yield reported to be 750, 450, 750, 600, and 600 gpm. Auxiliary supply from Michigan State College. Well 1 furnishes 24 percent of supply; wells 3 and 4, 38 percent; and wells 5 and 6, 38 percent.
Treatment: Iron removal, softening by cation exchange, and addition of Calgon.
Rated capacity of treatment plant: 3,750,000 gpd.
Raw-water storage: None.
Finished-water storage: 550,000 gal.

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

	Well 4 (finished water)		Well 4 (finished water)
Silica (SiO_2)	16	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	73
Manganese (Mn)	.00	Noncarbonate	0
Calcium (Ca)	18		
Magnesium (Mg)	7.0	Color	8
Sodium (Na)	179	pH	7.5
Potassium (K)	2.1	Specific conductance (micromhos at 25 C.)	857
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	413	Temperature (F.)	45
Sulfate (SO_4)	114	Date of collection	Nov. 9, 1951
Chloride (Cl)	8.0		
Fluoride (F)	.3		
Nitrate (NO_3)	.2		
Dissolved solids	549		

Depth (feet)	385
Diameter (inches)	14
Date drilled	May, 1942
Percent of supply	--

ECORSE
(Population, 17,948)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

ESCANABA
(Population, 15,170)

Ownership: Municipal.
Source: Lake Michigan; 4 wells (1, 2, 3, 5), 753, 844, 775, and 813 ft deep; yield reported to be 210, 320, 200, and 225 gpm. About 50 percent of the supply was furnished by the wells during 1950.
Treatment: Surface water: Prechlorination to breakpoint, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, and postchlorination when necessary. Ground water: Chlorination for hydrogen sulfide control, and addition of Calgon.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 750,000 gal.

ESCANABA--Continued

ANALYSES

(Analyses, in parts per million, by Michigan Department of Health)

	Wells (finished water)	Finished water [a]		Wells (finished water)	Finished water [a]
Silica (SiO_2)	9.2	3.8	Hardness as $CaCO_3$:		
Iron (Fe)	.25	.10	Total	185	132
Manganese (Mn)	--	.00	Noncarbonate	18	29
Calcium (Ca)	40	35			
Magnesium (Mg)	20	11	Color	--	3
Sodium (Na)	20	3.6	pH	--	7.2
Potassium (K)		2.0	Specific conductance (micromhos at 25 C.)	--	282
Carbonate (CO_3)	--	0	Turbidity	--	--
Bicarbonate (HCO_3)	200	127	Temperature (F.)	--	--
Sulfate (SO_4)	37	23	Date of collection	April, 1941	Sept.29, 1952
Chloride (Cl)	16	9.0			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	--	.4			
Dissolved solids	245	156			

[a] Lake Michigan. Analysis by U. S. Geological Survey.

FERNDALE

(Population, 29,675)

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

FLINT

(Population, 163,143)

Ownership: Municipal; supplies also about 1,000 people outside the city limits. Total population supplied, about 164,100.

Source: Flint River.

Treatment: Prechlorination, activated carbon, chlorine dioxide, coagulation with alum, softening with lime and soda ash, sedimentation, recarbonation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 35,000,000 gpd.

Raw-water storage: 650,000,000 gal.

Finished-water storage: 23,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	8.9	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.17	Total	278	86
Manganese (Mn)	.00	.00	Noncarbonate	43	55
Calcium (Ca)	70	23			
Magnesium (Mg)	25	6.8	Color	22	0
Sodium (Na)	13	13	pH	8.1	10.2
Potassium (K)	4.3	3.8	Specific conductance (micromhos at 25 C.)	555	270
Carbonate (CO_3)	0	18	Turbidity	--	--
Bicarbonate (HCO_3)	286	[a] 0	Temperature (F.)	--	--
Sulfate (SO_4)	42	47	Date of collection	June 28, 1951	June 28, 1951
Chloride (Cl)	18	24			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	2.6	1.6			
Dissolved solids	344	160			

[a] Hydroxide (OH) 1 ppm.

GRAND RAPIDS
(Population, 176,515)

Ownership: Municipal; supplies also about 3,000 people outside the city limits. Total population supplied, about 179,500.
Source: Lake Michigan. Auxiliary supply, Grand River (less than 1 percent of total supply).
Treatment: Prechlorination, coagulation with alum, activated carbon, sodium fluoride, sedimentation, and rapid sand filtration. Auxiliary supply softened with lime.
Rated capacity of treatment plant: 52,000,000 gpd.
Raw-water storage: 8,000,000 gal.
Finished-water storage: 43,800,000 gal.

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	2.1	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	130
Manganese (Mn)	.00	Noncarbonate	17
Calcium (Ca)	35		
Magnesium (Mg)	10	Color	3
Sodium (Na)	5.3	pH	8.0
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	280
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	136	Temperature (F.)	--
Sulfate (SO_4)	18	Date of collection	Aug. 27, 1951
Chloride (Cl)	6.2		
Fluoride (F)	1.0		
Nitrate (NO_3)	.5		
Dissolved solids	155		

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	116	168	105	8.2	8.7	7.9	134	267	124	7.4	61	.5
Finished water	109	122	47	7.8	8.5	7.5	136	163	124	.1	1.8	0

[a] Lake Michigan

HAMTRAMCK
(Population, 43,355)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

HAZEL PARK
(Population, 17,770)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

HIGHLAND PARK
(Population, 46,393)

Ownership: Municipal.
Source: Lake St. Clair. The intake is located at the termination of Seven Mile Road.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and chlorine dioxide.
Rated capacity of treatment plant: 16,000,000 gpd.
Raw-water storage: 45,000,000 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)	3.5	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	98
Manganese (Mn)	.00	Noncarbonate	22
Calcium (Ca)	26		
Magnesium (Mg)	8.0	Color	0
Sodium (Na)	4.2	pH	7.6
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	215
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	92	Temperature (F.)	--
Sulfate (SO_4)	20	Date of collection	Nov. 5, 1951
Chloride (Cl)	8.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.9		
Dissolved solids	126		

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	84	99	77	8.2	8.7	7.9	107	128	97	15	190	2
Finished water	77	84	64	7.3	7.5	6.8	105	114	98	0	0	0

HOLLAND
(Population, 15,858)

Ownership: Municipal; supplies also about 700 people outside the city limits. Total population supplied, about 16,600.
Source: 19 wells (1, 3, 4, 5, and group of 15), 131, 110, 160, 178, and 32 ft deep; yield reported to be 1,800, 1,800, 1,400, 800, and 1,000 gpm.
Treatment: Chlorination.
Raw-water storage: 1,747,000 gal.
Finished-water storage: None.

HOLLAND--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	9.7	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	270
Manganese (Mn)	.00	Noncarbonate	78
Calcium (Ca)	72		
Magnesium (Mg)	22	Color	2
Sodium (Na)	7.0	pH	7.5
Potassium (K)	3.4	Specific conductance (micromhos at 25 C.)	535
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	235	Temperature (F.)	--
Sulfate (SO_4)	58	Date of collection	Nov. 2, 1951
Chloride (Cl)	19		
Fluoride (F)	.1		
Nitrate (NO_3)	11		
Dissolved solids	334		

INKSTER

(Population, 16,728)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

JACKSON

(Population, 51,088)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 51,600.
Source: 13 wells (1 to 10, Water Street, Hamburg Street, and Goodyear), 380 to 451 ft deep; yield reported to be 1,400 to 1,800 gpm for each well. All of the wells are under 400 ft in depth except Goodyear.
Treatment: Chlorination.
Raw-water storage: 3,000,000 gal.
Finished-water storage: None.

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)	.25	Total	331
Manganese (Mn)	.00	Noncarbonate	58
Calcium (Ca)	90		
Magnesium (Mg)	26	Color	2
Sodium (Na)	50	pH	7.3
Potassium (K)	3.3	Specific conductance (micromhos at 25 C.)	791
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	334	Temperature (F.)	--
Sulfate (SO_4)	93	Date of collection	Aug. 21, 1951
Chloride (Cl)	48		
Fluoride (F)	.3		
Nitrate (NO_3)	.2		
Dissolved solids	498		

KALAMAZOO
(Population, 57,704)

Ownership: Municipal; supplies also about 13,022 people outside the city limits. Total population supplied, about 70,700.
Source: 33 wells, 127 to 189 ft deep; yield reported to be from 180 to 1,044 gpm, and to average 401 gpm.
Treatment: Chlorination and fluoridation.
Raw-water storage: None.
Finished-water storage: 8,600,000 gal.

ANALYSES

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

	Finished water[a]	Finished water[b]	Finished water[c]
Silica (SiO_2)	14	14	13
Iron (Fe)	.81	1.4	.49
Manganese (Mn)	.11	.09	.05
Calcium (Ca)	81	97	80
Magnesium (Mg)	30	34	28
Sodium (Na)	8.7	11	6.4
Potassium (K)	1.2	2.0	1.2
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	326	344	321
Sulfate (SO_4)	58	95	50
Chloride (Cl)	12	18	10
Fluoride (F)	.1	.8	.0
Nitrate (NO_3)	.9	3.6	4.0
Dissolved solids	373	460	357
Hardness as $CaCO_3$:			
Total	326	381	314
Noncarbonate	58	100	52
Color	7	2	3
pH	7.4	7.6	7.7
Specific conductance (micromhos at 25 C.)	607	711	581
Turbidity	--	--	--
Temperature (F.)	51	51	51
Date of collection	Nov. 20, 1951	Nov. 20, 1951	Nov. 20, 1951

[a] No. 7 pumping station.
[b] Central pumping station.
[c] Balch Street pumping station.

LANSING
(Population, 92,129)

Ownership: Municipal.
Source: 92 wells, 189 to 572 ft deep; yield reported to be 50 to 800 gpm. The average depth of the wells is 425 ft, and the average yield 225 gpm.
Treatment: Prechlorination, coagulation, softening with lime and soda ash, sedimentation, recarbonation, rapid sand filtration, Calgon, and postchlorination. The water is softened to a hardness of about 85 ppm.
Rated capacity of treatment plant: 60,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 17,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by Water Conditioning Plant, Lansing, Michigan)

	Finished water		Finished water
Silica (SiO_2)	9.9	Hardness as $CaCO_3$:	
Iron (Fe)	--	Total	86
Manganese (Mn)	--	Noncarbonate	57
Calcium (Ca)	19		
Magnesium (Mg)	9.3	Color	--
Sodium (Na)	24	pH	10.3
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	15	Turbidity	0
Bicarbonate (HCO_3)	4	Temperature (F.)	--
Sulfate (SO_4)	75	Date of collection	May, 1951
Chloride (Cl)	22		
Fluoride (F)	.2		
Nitrate (NO_3)	--		
Dissolved solids	177		

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	315	320	312	7.0	7.1	6.9	387	406	367	0.69	1.50	0.23
Finished water	83	106	75	10.4	10.5	10.2	85	91	81	0	0	0

LINCOLN PARK
(Population, 29,310)

Ownership: Municipal; supplies also about 100 people outside the city limits. Total population supplied, about 29,400.
Source: Supplied by Detroit. (See Detroit.) Emergency supply from Wyandotte.

LIVONIA
(Population, 17,534)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

MARQUETTE
(Population, 17,202)

Ownership: Municipal.
Source: Lake Superior.
Treatment: Chlorination, and chlorine dioxide.
Raw-water storage: None.
Finished-water storage: None.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.0	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	46
Manganese (Mn)	.00	Noncarbonate	6
Calcium (Ca)	13		
Magnesium (Mg)	3.4	Color	2
Sodium (Na)	1.1	pH	7.6
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	94.4
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	50	Turbidity	--
Sulfate (SO_4)	2.8	Temperature (F.)	--
Chloride (Cl)	3.2	Date of collection	July 2, 1951
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	51		

MONROE
(Population, 21,467)

Ownership: Municipal.
Source: Lake Erie.
Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH to about 8.0 by addition of lime.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,500,000 gal.

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)	.11	Total	137
Manganese (Mn)	.00	Noncarbonate	44
Calcium (Ca)	40		
Magnesium (Mg)	8.7	Color	5
Sodium (Na)	15	pH	7.9
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	351
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	112	Turbidity	--
Sulfate (SO_4)	32	Temperature (F.)	--
Chloride (Cl)	36	Date of collection	Nov. 2, 1951
Fluoride (F)	.1		
Nitrate (NO_3)	.9		
Dissolved solids	192		

MONROE--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	102	150	81	7.8	8.5	7.2	156	226	112	120	1,250	10
Finished water	97	123	76	7.8	8.5	7.1	169	220	126	--	--	--

MOUNT CLEMENS
(Population, 17,027)

Ownership: Municipal; supplies also about 4,500 people outside the city limits. Total population supplied, about 21,500.
Source: Lake St. Clair. Auxiliary supply, wells.
Treatment: Prechlorination, coagulation with alum, chlorine dioxide, activated carbon, sedimentation, rapid sand filtration, and fluoridation.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,000,000 gal.

ANALYSES

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

	Finished water	Finished water		Finished water	Finished water
Silica (SiO_2)	2.3	3.9	Hardness as $CaCO_3$:		
Iron (Fe)	.17	.13	Total	102	110
Manganese (Mn)	.00	--	Noncarbonate	21	36
Calcium (Ca)	28	31			
Magnesium (Mg)	7.8	7.9	Color	3	--
Sodium (Na)	6.9	7.1	pH	7.6	7.2
Potassium (K)	1.0		Specific conductance (micromhos at 25 C.)	248	253
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	99	90	Temperature (F.)	--	--
Sulfate (SO_4)	16	28	Date of collection	Aug. 27, 1951	Mar. 19, 1952
Chloride (Cl)	13	13			
Fluoride (F)	1.3	1.3			
Nitrate (NO_3)	.3	1.3			
Dissolved solids	135	[a]138			

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	92	116	75	8.0	8.9	7.7	121	152	100	28	400	1
Finished water	81	95	63	7.2	7.7	6.7	121	160	94	0	1	0

[a] Sum of determined constituents.

MUSKEGON
(Population, 48,429)

Ownership: Municipal; supplies also North Muskegon and about 2,000 people outside the city limits. Total population supplied, about 52,900.
Source: Lake Michigan. Emergency supply from Muskegon Heights.
Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, postchlorination at times, and fluoridation.
Rated capacity of treatment plant: 16,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 5,300,000 gal.

MUSKEGON--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	2.6	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	134
Manganese (Mn)	.00	Noncarbonate	25
Calcium (Ca)	34		
Magnesium (Mg)	12	Color	0
Sodium (Na)	3.8	pH	7.9
Potassium (K)	2.3	Specific conductance (micromhos at 25 C.)	270
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	133	Temperature (F.)	55
Sulfate (SO_4)	25	Date of collection	June 28, 1951
Chloride (Cl)	7.0		
Fluoride (F)	.0		
Nitrate (NO_3)	.7		
Dissolved solids	153		

MUSKEGON HEIGHTS

(Population, 18,828)

Ownership: Municipal; supplies also about 2,000 people outside the city limits. Total population supplied, about 20,800.

Source: Lake Michigan. Emergency supply from Muskegon.

Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 7,000,000 gpd.

Raw-water storage: 1,750,000 gal.

Finished-water storage: 3,385,000 gal.

ANALYSIS

(Analysis, in parts per million, by Michigan Department of Health)

	Finished water		Finished water
Silica (SiO_2)	2.8	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	137
Manganese (Mn)	--	Noncarbonate	28
Calcium (Ca)	35		
Magnesium (Mg)	12	Color	--
Sodium (Na)	}	pH	--
Potassium (K)	2.6	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	--	Turbidity	--
Bicarbonate (HCO_3)	133	Temperature (F.)	--
Sulfate (SO_4)	24	Date of collection	October, 1941
Chloride (Cl)	6.0		
Fluoride (F)	.0		
Nitrate (NO_3)	--		
Dissolved solids	156		

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	119	130	114	8.2	8.4	7.9	134	150	126	8	45	1
Finished water	104	110	97	7.1	7.4	6.9	132	138	123	0	0	0

OWOSSO
(Population, 15,948)

Ownership: Municipal; supplies also about 100 people outside the city limits. Total population supplied, about 16,000.
Source: 16 wells, 40 to 200 ft deep; yield reported to be 200 to 720 gpm, and to average 311 gpm.
Treatment: Iron removal by aeration and rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,250,000 gal.

ANALYSIS

(Analysis, in parts per million, by Michigan Department of Health)

	Finished water		Finished water
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	0	Total	405
Manganese (Mn)	--	Noncarbonate	88
Calcium (Ca)	106		
Magnesium (Mg)	35	Color	--
Sodium (Na)	27	pH	--
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	12	Turbidity	--
Bicarbonate (HCO_3)	367	Temperature (F.)	--
Sulfate (SO_4)	124	Date of collection	Mar., 1944
Chloride (Cl)	11		
Fluoride (F)	.4		
Nitrate (NO_3)	--		
Dissolved solids	526		

PONTIAC
(Population, 73,681)

Ownership: Municipal.
Source: 20 wells, 173 to 234 ft deep; yield reported to be from 548 to 1,330 gpm, and to average 855 gpm.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 3,000,000 gal.

There are 9 low-service wells and 11 high-service wells. The low-service wells pump directly into a reservoir and furnish about 67 percent of the supply. The high-service wells pump against a head varying from 30 to 75 pounds and furnish about 33 percent of the supply.

PONTIAC--Continued

ANALYSES

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

	Mechanic well (raw water)	Featherstone well 2 (raw water)	Orchard Lake well 3 (raw water)	Finished water
Silica (SiO_2)	13	20	21	20
Iron (Fe)	1.3	1.4	.56	1.2
Manganese (Mn)	.00	.00	.00	.00
Calcium (Ca)	98	80	62	71
Magnesium (Mg)	32	30	25	28
Sodium (Na)	15	25	30	26
Potassium (K)	2.8	3.0	3.8	3.7
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	347	390	330	340
Sulfate (SO_4)	92	32	7.8	28
Chloride (Cl)	17	22	31	28
Fluoride (F)	.4	.5	.6	.6
Nitrate (NO_3)	1.0	2.5	1.0	1.0
Dissolved solids	472	408	345	375
Hardness as $CaCO_3$:				
Total	374	324	260	292
Noncarbonate	92	3	0	14
Color	3	3	2	0
pH	7.4	7.4	7.6	7.7
Specific conductance (micromhos at 25 C.)	714	676	596	635
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	June 26, 1951	June 26, 1951	June 26, 1951	June 26, 1951
Depth (feet)	200	195	232	--
Diameter (inches)	12	12	12	--
Date drilled	1925	1929	1949	--
Percent of supply	3	4.3	3	--

PORT HURON
(Population, 35,725)

Ownership: Municipal; supplies also about 700 people outside the city limits. Total population supplied, about 36,400.
Source: St. Clair River. Emergency supply from Port Huron Sulphite and Paper Co. water system.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 1,500,000 gal.

PORT HURON--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	1.9	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	94
Manganese (Mn)	.00	Noncarbonate	18
Calcium (Ca)	28		
Magnesium (Mg)	5.8	Color	5
Sodium (Na)	2.9	pH	7.3
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	206
Carbonate (CO_2)	0		
Bicarbonate (HCO_3)	92	Turbidity	--
Sulfate (SO_4)	12	Temperature (F.)	--
Chloride (Cl)	7.0	Date of collection	Sept. 24, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	.4		
Dissolved solids	110		

RIVER ROUGE
(Population, 20,549)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.) Emergency supply from industrial storage tanks.

ROSEVILLE
(Population, 15,816)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

ROYAL OAK
(Population, 46,898)

Ownership: Municipal.
Source: 3 wells, (Baptist Home, Buckingham, Northwood), 186.5, 180, 157.5 ft deep; yield reported to be 150, 800, 350 gpm (about 55 per cent of supply); about 45 per cent of supply from Detroit. Auxiliary supply one well, (Cooper), 200 ft deep; yield reported to be 800 gpm; used during summer months.
Treatment: Addition of Calgon, and chlorination.
Raw-water storage: None.
Finished-water storage: 1,500,000 gal.

ROYAL OAK--Continued

ANALYSES

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

	Baptist Home Well (raw water)	Buckingham Well (finished water)	Finished water [a]
Silica (SiO_2)	14	17	11
Iron (Fe)	.35	.43	.23
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	34	52	36
Magnesium (Mg)	20	20	17
Sodium (Na)	106	66	150
Potassium (K)	3.2	2.0	2.6
Carbonate (CO_3)	8	0	12
Bicarbonate (HCO_3)	339	340	248
Sulfate (SO_4)	1.8	.9	.4
Chloride (Cl)	84	62	182
Fluoride (F)	1.0	.9	1.0
Nitrate (NO_3)	.2	.2	.2
Dissolved solids	440	389	537
Hardness as $CaCO_3$:			
Total	169	214	162
Noncarbonate	0	0	0
Color	3	1	3
pH	--	--	7.7
Specific conductance (micromhos at 25 C.)	789	698	1,000
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	Aug. 23, 1951	Aug. 23, 1951	Aug. 23, 1951
Depth (feet)	186.5	180	--
Diameter (inches)	16-8	30-12	--
Date drilled	May, 1950	July, 1950	--
Percent of supply	10	25	--

[a] Mixed sample: Northwood well 30 percent; supply of City of Detroit 70 percent.

SAGINAW
(Population, 92,918)

Ownership: Municipal; supplies also about 2,000 people outside the city limits. Total population supplied, about 94,900.

Source: Lake Huron. The intake is located at Whitestone Point, about 60 miles north-northeast of Saginaw. Emergency supply, Lake Linton and Saginaw River.

Treatment: Prechlorination, coagulation with alum, softening with lime, sedimentation, rapid sand filtration, fluoridation with sodium silicofluoride, and final adjustment of pH to about 9.4 by addition of soda ash.

Rated capacity of treatment plant: 25,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 9,250,000 gal.

SAGINAW--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.7	2.9	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.14	Total	117	70
Manganese (Mn)	.00	.00	Noncarbonate	28	23
Calcium (Ca)	33	19			
Magnesium (Mg)	8.6	5.3	Color	3	3
Sodium (Na)	6.1	9.0	pH	8.1	9.1
Potassium (K)	3.1	2.2	Specific conductance (micromhos at 25 C.)	259	194
Carbonate (CO_3)	0	8			
Bicarbonate (HCO_3)	109	40	Turbidity	--	--
Sulfate (SO_4)	17	20	Temperature (F.)	--	--
Chloride (Cl)	16	16	Date of collection	June 27, 1951	June 27, 1951
Fluoride (F)	.1	.9			
Nitrate (NO_3)	.5	.6			
Dissolved solids	164	111			

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	77	80	73	8.0	8.3	7.8	93	108	86	3	40	1
Finished water	33	35	29	9.4	9.8	8.7	49	55	46	0	0	0

ST. CLAIR SHORES
(Population, 19,823)

Ownership: Municipal.
Source: Supplied by Detroit. (See Detroit.)

SAULT STE. MARIE
(Population, 17,912)

Ownership: Municipal.
Source: Lake Superior.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 400,000 gal.

SAULT STE. MARIE--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.5	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	43
Manganese (Mn)	.00	Noncarbonate	4
Calcium (Ca)	13		
Magnesium (Mg)	2.8	Color	2
Sodium (Na)	1.4	pH	7.6
Potassium (K)		Specific conductance (micromhos at 25 C.)	93.7
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	49	Temperature (F.)	--
Sulfate (SO_4)	2.1	Date of collection	Nov. 28, 1951
Chloride (Cl)	2.6		
Fluoride (F)	.1		
Nitrate (NO_3)	.8		
Dissolved solids	52		

TRAVERSE CITY
(Population, 16,974)

Ownership: Municipal; supplies also about 200 people outside the city limits. Total population supplied, about 17,200.
Source: Lake Michigan (West Arm of Grand Traverse Bay).
Treatment: Chlorination, and sodium chlorite.
Raw-water storage: None
Finished-water storage: 1,300,000 gal.

ANALYSIS

(Analysis, in parts per million, by Michigan Department of Health)

	Finished water		Finished water
Silica (SiO_2)	6.4	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	130
Manganese (Mn)	--	Noncarbonate	8
Calcium (Ca)	34		
Magnesium (Mg)	11	Color	--
Sodium (Na)	6.4	pH	--
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_2)		Turbidity	--
Bicarbonate (HCO_3)	149	Temperature (F.)	--
Sulfate (SO_4)	14	Date of collection	November, 1942
Chloride (Cl)	5.0		
Fluoride (F)	.1		
Nitrate (NO_3)	--		
Dissolved solids	152		

WYANDOTTE
(Population, 36,846)

Ownership: Municipal.
Source: Detroit River. Emergency supply from Detroit.
Treatment: Prechlorination, coagulation with alum, sedimentation. rapid sand filtration, chlorine dioxide, and fluoridation (silicofluoride).
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,800,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	2.9	2.4	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.10	Total	98	96
Manganese (Mn)	.00	.00	Noncarbonate	15	23
Calcium (Ca)	27	27			
Magnesium (Mg)	7.3	6.8	Color	3	2
Sodium (Na)	6.7	4.9	pH	8.3	7.5
Potassium (K)	2.2	1.1	Specific conductance (micromhos at 25 C.)	218	225
Carbonate (CO_3)	6	0	Turbidity	12	--
Bicarbonate (HCO_3)	88	88	Temperature (F.)	--	--
Sulfate (SO_4)	14	17	Date of collection	Aug. 17, 1951	Aug. 17, 1951
Chloride (Cl)	9.0	10			
Fluoride (F)	.1	1.4			
Nitrate (NO_3)	.6	.4			
Dissolved solids	120	126			

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	86	93	82	7.9	8.2	7.8	115	137	102	29	68	14
Finished water	77	84	72	7.2	7.4	7.0	118	142	105	0	0	0

YPSILANTI
(Population, 18,302)

Ownership: Municipal.
Source: 3 wells, 102, 87, and 94 ft deep.
Treatment: Coagulation and softening with lime and soda ash, sedimentation, rapid sand filtration, Calgon, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by Michigan Department of Health)

	Finished water		Finished water
Silica (SiO_2)	7.2	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	71
Manganese (Mn)	--	Noncarbonate	36
Calcium (Ca)	14		
Magnesium (Mg)	8.8	Color	--
Sodium (Na)	}	pH	--
Potassium (K)	} 40	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	17	Turbidity	--
Bicarbonate (HCO_3)	8	Temperature (F.)	--
Sulfate (SO_4)	102	Date of collection	November, 1943
Chloride (Cl)	12		
Fluoride (F)	.3		
Nitrate (NO_3)	--		
Dissolved solids	212		

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	280	286	272	7.3	7.3	7.3	378	396	359	52	52	52
Finished water	31	45	24	9.4	9.4	9.3	79	92	71	52	52	52

BILOXI
(Population, 37,425)

Ownership: Municipal.
Source: 6 wells. North well, Main St. Station; Main St. Station well; Porter St. well, each 1,200 ft deep; and 3 wells in First St. well field. The yield of North well, Main St. Station well and Porter St. well is reported to be 1,200, 1,100, and 900 gpm, respectively.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 920,000 gal.

ANALYSES

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

	North well [a]	Main St. Station well [a]	Porter St. well [a]	3 wells [b] 1st St. well field	Wells [c]
Silica (SiO_2)	20	18	21	19	17
Iron (Fe)	.09	.03	.08	.04	.06
Manganese (Mn)	.0	.0	.0	.0	.0
Calcium (Ca)	1.5	6.5	2.8	2.6	5.4
Magnesium (Mg)	.8	1.0	1.0	.7	1.5
Sodium (Na)	138	391	212	220	330
Potassium (K)	6.2	14	6.7	1.9	13
Carbonate (CO_3)	8	0	0	0	0
Bicarbonate (HCO_3)	251	335	294	309	306
Sulfate (SO_4)	5.8	.4	1.6	.5	3.7
Chloride (Cl)	56	432	170	166	345
Fluoride (F)	.2	.3	.3	.3	.3
Nitrate (NO_3)	1.8	1.2	2.0	1.3	1.3
Dissolved solids	364	1,030	559	573	880
Hardness as $CaCO_3$:					
Total	7	20	11	10	20
Noncarbonate	0	0	0	0	0
Color	18	40	15	17	80
pH	8.4	8.0	7.2	7.9	7.7
Specific conductance (micromhos at 25 C.)	583	1,850	958	968	1,540
Turbidity	1	0	1	1	2
Temperature (F.)	83	87	85	86	85
Date of collection	June 14, 1951	June 14, 1951	June 14, 1951	June 14, 1951	June 14, 1951
Depth (feet)	1,200	1,200	1,200		
Diameter (inches)	--	--	--		
Date drilled	1951	1942	1945		
Percent of supply	--	--	--		

[a] Raw water. [b] Raw water (composite). [c] Finished water (composite).

BROOKHAVEN
(Population, 7,801)

Ownership: Municipal.
Source: 4 wells (1, 3, 4, and 5) 160, 165, 154, and 160 ft deep; yield reported to be 418, 600, 500, and 510 gpm. Well 1 is used only in emergencies.
Treatment: Aeration (spray), lime, and chlorination.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 891,000 gal.

Equal volumes of water are reported to be pumped from wells 3, 4, and 5.

ANALYSES

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

	Wells[a]	Well 3	Well 4	Well 5
Silica (SiO_2)	15	15	12	15
Iron (Fe)	.04	.09	1.2	.16
Manganese (Mn)	.0	.0	.0	.0
Calcium (Ca)	13	6.8	1.9	2.2
Magnesium (Mg)	2.9	2.9	.9	.7
Sodium (Na)	30	31	6.0	5.1
Potassium (K)	1.7	1.8	.8	.6
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	40	21	15	15
Sulfate (SO_4)	11	12	.5	.2
Chloride (Cl)	39	39	6.5	5.5
Fluoride (F)	.1	.0	.1	.0
Nitrate (NO_3)	13	14	.6	.3
Dissolved solids	155	140	41	40
Hardness as $CaCO_3$:				
Total	44	29	8	8
Noncarbonate	12	12	0	0
Color	4	4	12	6
pH	6.8	6.4	5.8	5.7
Specific conductance (micromhos at 25 C.)	256	223	54.2	43.9
Turbidity	1	0	2	2
Temperature (F.)	71	68	68	68
Date of collection	June 15, 1951	June 15, 1951	June 15, 1951	June 15, 1951
Depth (feet)	--	165	154	160
Diameter (inches)	--	10	10	10
Date drilled	--	1941	1947	1951
Percent of supply	--	33⅓	33⅓	33⅓

[a] Finished water, composite.

CANTON
(Population, 7,048)

Ownership: Municipal; also supplies about 2,500 people outside the city limits. Total population supplied, about 9,500.
Source: 2 wells (1 and 2) 980 and 965 ft deep; yield reported to be 600 and 810 gpm, respectively.
Treatment: Chlorination.
Raw-water storage: Reservoir, 225,000 gal.
Finished-water storage: Elevated tank, 210,000 gal.

The water from the wells is pumped to the reservoir, then to the tank and the distribution system.

ANALYSIS

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

	Wells[a]		Wells[a]
Silica (SiO_2)	62	Hardness as $CaCO_3$:	
Iron (Fe)	.55	Total	22
Manganese (Mn)	--	Noncarbonate	0
Calcium (Ca)	5.9		
Magnesium (Mg)	1.9	Color	17
Sodium (Na)	38	pH	7.0
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	198
Carbonate (CO_3)	0	Turbidity	3
Bicarbonate (HCO_3)	101	Temperature (F.)	78
Sulfate (SO_4)	13	Date of collection	May 22, 1951
Chloride (Cl)	6.0		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	185		

[a] Composite, finished water.

CLARKSDALE
(Population, 16,539)

Ownership: Municipal.
Source: 4 wells (1 to 4) 766, 760, and 758 ft deep. Depth of well 4, not reported. The yield of the wells is reported to be 600, 1,000, 1,000, and 1,000 gpm. The water from the wells is pumped directly into the distribution mains.
Treatment: None.
Storage: None.

CLARKSDALE--Continued

ANALYSIS

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

	Wells (composite)		Wells (composite)
Silica (SiO_2)	27	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	4
Manganese (Mn)	.0	Noncarbonate	0
Calcium (Ca)	.6		
Magnesium (Mg)	.7	Color	22
Sodium (Na)	165	pH	7.7
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	683
Carbonate (CO_3)	0	Turbidity	2
Bicarbonate (HCO_3)	350	Temperature (F.)	71
Sulfate (SO_4)	1.2	Date of collection	May 23, 1951
Chloride (Cl)	55		
Fluoride (F)	.4		
Nitrate (NO_3)	1.7		
Dissolved solids	446		

CLEVELAND
(Population, 6,747)

Ownership: Municipal; also supplies about 100 people outside the city limits. Total population supplied, about 6,800.
Source: 3 wells (1, 2, and 3) 1,437, 847, and 840 ft deep; yield reported to 385, 675, and 1,100 gpm. Well 1 is for emergency use; wells 2 and 3 are pumped alternately.
Treatment: Chlorinated as water enters reservoirs.
Raw-water storage: None.
Finished-water storage: Reservoirs, 600,000 gal.

ANALYSIS

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

	Wells (reservoir)		Wells (reservoir)
Silica (SiO_2)	19	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	6
Manganese (Mn)	--	Noncarbonate	0
Calcium (Ca)	1.1		
Magnesium (Mg)	.7	Color	18
Sodium (Na)	139	pH	7.7
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	564
Carbonate (CO_3)	0	Turbidity	4
Bicarbonate (HCO_3)	340	Temperature (F.)	72
Sulfate (SO_4)	.8	Date of collection	May 23, 1951
Chloride (Cl)	21		
Fluoride (F)	.4		
Nitrate (NO_3)	.8		
Dissolved solids	373		

COLUMBUS
(Population, 17,172)

Ownership: Municipal; population supplied outside of the city limits, about 3,000. Total population supplied, about 20,200.
Source: Luxapalila Creek.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, and ammoniation. (Fluoridation to begin July 1, 1951.)
Rated capacity of treatment plant: 4,000,000 to 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,550,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	8.3	8.0	Hardness as $CaCO_3$:		
Iron (Fe)	.38	.08	Total	9	40
Manganese (Mn)	.0	.0	Noncarbonate	0	20
Calcium (Ca)	2.1	14			
Magnesium (Mg)	1.0	1.2	Color	45	8
Sodium (Na)	1.6	1.4	pH	6.5	9.1
Potassium (K)	1.8	1.4	Specific conductance (micromhos at 25 C.)	28.6	95.2
Carbonate (CO_3)	0	--			
Bicarbonate (HCO_3)	11	[a] 24	Turbidity	7	2
Sulfate (SO_4)	1.4	12	Temperature (F.)	--	--
Chloride (Cl)	2.0	7.5	Date of collection	May 21, 1951	May 21, 1951
Fluoride (F)	.1	.0			
Nitrate (NO_3)	4.0	3.6			
Dissolved solids	38	77			

[a] Includes the equivalent of less than 5 ppm of carbonate (CO_3).

CORINTH
(Population, 9,785)

Ownership: Peoples Water Service Co., Baltimore, Md. Population supplied outside of the city limits, about 3,000. Total population supplied, about 12,800.
Source: 4 wells (1 to 4) 320, 320, 320, and 200 ft deep. The yield of the wells is reported to be 750, 750, 400, and 200 gpm. Wells 1 and 2 are pumped alternately.
Treatment: Aeration (overflow trays), lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: 200,000 gal.
Finished-water storage: 400,000 gal.

CORINTH--Continued

ANALYSES

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

	Wells (finished water)	Well 1 (raw water)	Well 4 (raw water)
Silica (SiO_2)	13	19	8.3
Iron (Fe)	.09	.15	.11
Manganese (Mn)	.0	.14	.0
Calcium (Ca)	20	9.4	36
Magnesium (Mg)	4.9	2.5	9.6
Sodium (Na)	22	3.1	77
Potassium (K)	3.4	2.2	8.5
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	79	41	141
Sulfate (SO_4)	7.2	5.8	15
Chloride (Cl)	34	2.5	125
Fluoride (F)	.4	.2	.3
Nitrate (NO_3)	.2	.3	.3
Dissolved solids	146	66	358
Hardness as $CaCO_3$:			
Total	70	34	130
Noncarbonate	5	0	14
Color	4	12	5
pH	8.0	6.2	7.6
Specific conductance (micromhos at 25 C.)	244	87.0	637
Turbidity	2	5	1
Temperature (F.)	65	63	--
Date of collection	May 21, 1951	May 21, 1951	May 21, 1951
Depth (feet)		320	200
Diameter (inches)		12	10
Date drilled		1949	1922
Percent of supply		--	--

GREENVILLE
(Population, 29,936)

Ownership: Municipal; population supplied outside of the city limits, about 5,000. Total population supplied, about 34,900.

Source: 4 wells (Toombs Alley, 1 to 3) 500+, 526, 519, and 500+ ft deep. The yield of the wells is reported to be 1,500, 1,350, 1,050, and 1,500 gpm. The water from the wells is pumped to storage reservoirs where it is chlorinated.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 500,000 gal.

The water from all the wells is reported to be about the same chemical composition.

GREENVILLE--Continued

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

	Wells [a]	Well 2		Wells [a]	Well 2
Silica (SiO_2)	19	17	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.03	Total	6	5
Manganese (Mn)	.0	.02	Noncarbonate	0	0
Calcium (Ca)	.9	1.2			
Magnesium (Mg)	.9	.5	Color	35	55
Sodium (Na)	145	156	pH	7.9	8.5
Potassium (K)	9.5	9.9	Specific conductance (micromhos at 25 C.)	590	654
Carbonate (CO_3)	0	5			
Bicarbonate (HCO_3)	274	293	Turbidity	2	2
Sulfate (SO_4)	3.3	2.3	Temperature (F.)	--	70
Chloride (Cl)	70	68	Date of collection	May 24, 1951	May 24, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.8	.8			
Dissolved solids	387	406			

Depth (feet)	519
Diameter (inches)	12
Date drilled	1931
Percent of supply	--

[a] Finished water.

GREENWOOD
(Population 18,061)

Ownership: Municipal.
Source: 10 wells (1 to 9, and Old Ice Plant well) each 800 ft deep, except wells 5 and 6 which are 1,919 and 640 ft deep, respectively.
Treatment: Chlorinated as pumped from the wells.
Raw-water storage: None.
Finished-water storage: 1,100,000 gal.

Wells 8 and 9 are pumped continuously into the mains. The yield is reported to be 500 and 1,000 gpm, respectively. The other 8 wells are reported as flowing and the combined flow is reported to be 1,400 gpm, but the wells are connected together and are pumped into a 1,000,000 gal storage reservoir.

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

	Finished water (composite)		Finished water (composite)
Silica (SiO_2)	21	Hardness as $CaCO_3$:	
Iron (Fe)	.17	Total	7
Manganese (Mn)	.0	Noncarbonate	0
Calcium (Ca)	2.0		
Magnesium (Mg)	.6	Color	15
Sodium (Na)	83	pH	7.9
Potassium (K)	6.1	Specific conductance (micromhos at 25 C.)	347
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	210	Turbidity	3
Sulfate (SO_4)	5.4	Temperature (F.)	74
Chloride (Cl)	7.5	Date of collection	May 23, 1951
Fluoride (F)	.2		
Nitrate (NO_3)	1.2		
Dissolved solids	243		

GRENADA
(Population, 7,388)

Ownership: Municipal; also supplies about 100 people outside the city limits. Total population supplied, about 7,500.
Source: 3 wells (1, 2, and 3) each 170 ft deep; yield reported to be 650, 600, and 800 gpm, respectively.
Treatment: Chlorination.
Raw-water storage: 85,000 gal.
Finished-water storage: 650,000 gal.

ANALYSES

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

	Well 1 (raw water)	Well 2 (raw water)	Well 3 (raw water)	Wells (finished water)
Silica (SiO_2)	28	26	20	25
Iron (Fe)	.24	.09	.14	.20
Manganese (Mn)	.01	.01	.0	.01
Calcium (Ca)	10	11	9.2	12
Magnesium (Mg)	4.3	4.0	4.0	5.4
Sodium (Na)	64	71	72	68
Potassium (K)	7.0	4.0	2.2	2.9
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	204	210	216	206
Sulfate (SO_4)	7.4	4.9	7.4	6.9
Chloride (Cl)	11	17	12	14
Fluoride (F)	.0	.1	.0	.2
Nitrate (NO_3)	1.8	1.8	1.8	.5
Dissolved solids	252	266	245	255
Hardness as $CaCO_3$:				
Total	43	44	39	52
Noncarbonate	0	0	0	0
Color	8	8	5	7
pH	7.4	7.5	7.5	7.6
Specific conductance (micromhos at 25 C.)	361	383	366	371
Turbidity	2	2	3	2
Temperature (F.)	67	67	67	71
Date of collection	May 23, 1951	May 23, 1951	May 23, 1951	May 23, 1951
Depth (feet)	170	170	170	--
Diameter (inches)	12	12	12	--
Date drilled	1933	1931	1944	--
Percent of supply	--	--	--	--

GULFPORT
(Population, 22,659)

Ownership: Municipal.
Source: 9 wells. Three wells (1, 2, and 3) located on U. S. Naval Base, 854, 1,196, and 761 ft deep. Three wells (2W, 3W, and 4W) located on Gulfport Airfield Base, 600 and 645 ft deep (depth not reported for well 4W). Three wells (West 2nd St., Gravelene, and Schoolyard) located in the city, 1,360, 900, and 1,200 ft deep.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: (Capacity not available).

The water from the wells is pumped into storage reservoirs and tanks before distribution in the city mains.

ANALYSES

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

	Well 1 U. S. Navy	Well 2W Airfield	Well West 2nd Street	Wells Finished water (composite)
Silica (SiO_2)	20	42	34	21
Iron (Fe)	.07	.30	.08	.12
Manganese (Mn)	.0	.05	.0	.0
Calcium (Ca)	.5	.4	.2	.6
Magnesium (Mg)	.4	.5	.7	.1
Sodium (Na)	135	51	64	93
Potassium (K)	5.8	3.0	5.6	6.2
Carbonate (CO_3)	18	0	0	16
Bicarbonate (HCO_3)	300	120	154	193
Sulfate (SO_4)	7.7	10	8.8	9.0
Chloride (Cl)	6.0	7.2	5.5	5.0
Fluoride (F)	.5	.0	.1	.3
Nitrate (NO_3)	1.7	2.4	.6	3.1
Dissolved solids	349	177	197	251
Hardness as $CaCO_3$:				
Total	2	3	3	2
Noncarbonate	0	0	0	0
Color	30	5	7	15
pH	8.8	7.9	8.2	8.8
Specific conductance (micromhos at 25 C.)	539	214	265	382
Turbidity	2	2	2	2
Temperature (F.)	84	78	85	88
Date of collection	June 14, 1951	June 14, 1951	June 14, 1951	June 14, 1951
Depth (feet)	854	600	1,360	--
Diameter (inches)	12	--	--	--
Date drilled	1942	--	--	--
Percent of supply	--	--	--	--

HATTIESBURG
(Population, 29,474)

Ownership: Municipal.
Source: 12 wells (data available for only 9 wells, namely, 2, 3, 4, and 9 to 14) 622, 610, 621, 353, 456, 635, 422, 400, and 610 ft deep. The yield of the wells is reported to be as follows: (2, not reported), 619, 137, 320 (flowing) and 950 (pumping), 306, 155 (flowing), 328 (flowing) and 950 (pumping), 240, and 135 (flowing) gpm.
Treatment: Aeration (contact trays), rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 4,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 5,000,000 gal.

ANALYSES

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

	Wells [a]	Wells [b]		Wells [a]	Wells [b]
Silica (SiO_2)	20	21	Hardness as $CaCO_3$:		
Iron (Fe)	.66	.18	Total	28	29
Manganese (Mn)	.0	.0	Noncarbonate	0	0
Calcium (Ca)	6.6	8.0			
Magnesium (Mg)	2.8	2.1	Color	10	8
Sodium (Na)	16	17	pH	6.5	7.3
Potassium (K)	1.2	2.7	Specific conductance (micromhos at 25 C.)	130	134
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	64	67			
Sulfate (SO_4)	8.9	9.2	Turbidity	1	2
Chloride (Cl)	3.5	3.0	Temperature (F.)	70	71
Fluoride (F)	.0	.1	Date of collection	June 13, 1951	June 13, 1951
Nitrate (NO_3)	.4	.4			
Dissolved solids	103	102			

[a] Raw water.
[b] Finished water.

JACKSON
(Population, 98,271)

Ownership: Municipal; supplies also about 5,000 people outside of city limits. Total population supplied, about 103,300.
Source: Pearl River.
Treatment: Coagulation, sedimentation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plant: 14,000,000 gal.
Raw-water storage: 8,000,000 gal.
Finished-water storage: 4,000,000 gal.

There is some variation in the chemical character of the water throughout the year, but the dissolved solids is usually low.

JACKSON--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	13	12	Hardness as $CaCO_3$:		
Iron (Fe)	1.2	.01	Total	26	47
Manganese (Mn)	.06	.07	Noncarbonate	1	16
Calcium (Ca)	7.5	15			
Magnesium (Mg)	1.9	2.3	Color	80	8
Sodium (Na)	4.9	4.4	pH	7.0	8.8
Potassium (K)	.8	.6	Specific conductance (micromhos at 25 C.)	81.1	122
Carbonate (CO_3)	0	--	Turbidity	8	2
Bicarbonate (HCO_3)	31	[a]38	Temperature (F.)	--	--
Sulfate (SO_4)	4.0	16	Date of collection	May 22, 1951	May 22, 1951
Chloride (Cl)	6.2	6.5			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.8	.6			
Dissolved solids	75	85			

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	16	24	8	6.6	7.9	6.0	35	48	6	60	1000	8
Finished water	25	40	15	9.0	9.2	8.8	50	60	30	--	--	--

[a] Includes the equivalent of less than 5 ppm of carbonate (CO_3).

KOSCIUSKO

(Population, 6,753)

Ownership: Municipal; also supplies about 100 people outside the city limits. Total population supplied, about 6,900.

Source: 3 wells (East, West, and No. 3) 470, 470, and 750 ft deep; yield reported to be 400 gpm. Water from the wells is pumped directly into the mains and to storage.

Treatment: None.

Storage: Reservoir, 225,000 gal.

ANALYSIS

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

	Wells (composite)		Wells (composite)
Silica (SiO_2)	34	Hardness as $CaCO_3$:	
Iron (Fe)	.43	Total	49
Manganese (Mn)	.01	Noncarbonate	0
Calcium (Ca)	12		
Magnesium (Mg)	4.6	Color	7
Sodium (Na)	5.1	pH	6.8
Potassium (K)	5.2	Specific conductance (micromhos at 25 C.)	131
Carbonate (CO_3)	0	Turbidity	1
Bicarbonate (HCO_3)	64	Temperature (F.)	70
Sulfate (SO_4)	8.9	Date of collection	May 22, 1951
Chloride (Cl)	3.5		
Fluoride (F)	.0		
Nitrate (NO_3)	.8		
Dissolved solids	131		

LAUREL
(Population, 25,038)

Ownership: Municipal.
Source: 7 wells (1, 2, 3A, and 4 to 7), each 400 ft deep (depth of well 2 not reported).
Treatment: Aeration and chlorination.
Rated capacity of treatment plant: --
Raw-water storage: None.
Finished-water storage: 1,120,000 gal.

ANALYSES

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

	Wells [a]	Well 1	Well 3A	Well 4	Well 7
Silica (SiO_2)	41	35	60	49	29
Iron (Fe)	.09	.07	.09	.09	.10
Manganese (Mn)	.0	.0	.0	.0	.0
Calcium (Ca)	2.9	1.8	4.4	4.1	3.4
Magnesium (Mg)	3.8	1.1	2.2	1.2	2.1
Sodium (Na)	44	66	30	26	79
Potassium (K)	5.2	3.2	2.6	1.0	5.3
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	133	164	92	73	212
Sulfate (SO_4)	12	9.4	11	9.6	8.2
Chloride (Cl)	4.2	4.0	3.5	3.8	3.8
Fluoride (F)	.2	.3	.0	.0	.5
Nitrate (NO_3)	2.7	2.5	.5	.6	1.0
Dissolved solids	187	207	165	147	243
Hardness as $CaCO_3$:					
Total	23	9	20	15	17
Noncarbonate	0	0	0	0	0
Color	8	8	12	6	10
pH	7.7	7.6	6.9	7.1	7.9
Specific conductance (micromhos at 25 C.)	235	280	171	144	337
Turbidity	2	2	3	2	2
Temperature (F.)	--	73	80	83	79
Date of collection	June 13, 1951	June 13, 1951	June 13, 1951	June 13, 1951	June 13, 1951
Depth (feet)		400	400	400	400
Diameter (inches)		12	12	12	12
Date drilled		1926	1948	1950	1950
Percent of supply		--	--	--	---

[a] Finished water (composite).

MCCOMB
(Population, 10,401)

Ownership: Municipal.
Source: 3 wells (1 to 3) 100, 500-600, and 600-700 ft deep. The yield of the wells is reported to be 500, 1,000, and 1,200 gpm.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 350,000 gal.

ANALYSES

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

	Finished water (composite)	Well 1	Well 2	Well 3
Silica (SiO_2)	30	11	66	71
Iron (Fe)	.12	.10	.50	.16
Manganese (Mn)	.02	.04	.0	.0
Calcium (Ca)	2.8	9.8	1.4	2.3
Magnesium (Mg)	1.1	4.2	.4	.6
Sodium (Na)	24	13	27	27
Potassium (K)	1.3	1.9	1.6	2.5
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	53	7	67	67
Sulfate (SO_4)	11	31	5.1	5.3
Chloride (Cl)	7.0	16	4.0	4.8
Fluoride (F)	.1	.1	.1	.1
Nitrate (NO_3)	1.8	11	.8	.5
Dissolved solids	133	111	147	150
Hardness as $CaCO_3$:				
Total	12	42	5	8
Noncarbonate	0	36	0	0
Color	7	3	7	6
pH	6.6	5.3	6.7	6.8
Specific conductance (micromhos at 25 C.)	135	168	127	127
Turbidity	1	0	0	0
Temperature (F.)	72	69	72	72
Date of collection	June 15, 1951	June 15, 1951	June 15, 1951	June 15, 1951
Depth (feet)		100	500-600	600-700
Diameter (inches)		8	12	12
Date drilled		--	--	--
Percent of supply		--	--	--

MERIDIAN
(Population, 41,893)

Ownership: Municipal; population supplied outside of the city limits, about 10,000. Total population supplied, about 51,900.
Source: 3 lakes, fed by springs. Equal distribution of water from each lake to city. Emergency supply: one lake.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 1,200,000,000 gal.
Finished-water stroage: 6,500,000 gal.

MERIDIAN--Continued

ANALYSES

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

	Lake 3 (raw water)	Finished water		Lake 3 (raw water)	Finished water
Silica (SiO_2)	5.2	4.5	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.06	Total	8	18
Manganese (Mn)	.0	.07	Noncarbonate	1	8
Calcium (Ca)	1.6	5.4			
Magnesium (Mg)	1.1	1.2	Color	25	10
Sodium (Na)	1.6	1.6	pH	6.2	6.8
Potassium (K)	.6	.5	Specific conductance (micromhos at 25 C.)	25.8	49.5
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	9	13			
Sulfate (SO_4)	1.9	8.4	Turbidity	3	2
Chloride (Cl)	2.8	3.2	Temperature (F.)	--	--
Fluoride (F)	.0	.0	Date of collection	June 12, 1951	June 12, 1951
Nitrate (NO_3)	.8	.4			
Dissolved solids	27	38			

NATCHEZ

(Population, 22,740)

Ownership: Municipal; population supplied outside of the city limits, 100. Total population supplied, 22,840.

Source: 6 wells (1 to 6) 457, 612, 449, 612, 425, and 660 ft deep. The yield from each well is reported to be 500 gpm.

Treatment: Split treatment: Aeration, softening with lime, recarbonation, rapid (anthrafilt) filtration, and chlorination.

Rated capacity of treatment plant: 2,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 1,250,000 gal.

The entire supply is not softened; only a part. Then the softened water and the raw water are mixed in such proportions as to give a water of the desired hardness prior to filtration.

ANALYSES

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

	4 wells [a]	Wells [b]		4 wells [a]	Wells [b]
Silica (SiO_2)	45	38	Hardness as $CaCO_3$:		
Iron (Fe)	.74	.08	Total	226	59
Manganese (Mn)	.02	.0	Noncarbonate	0	0
Calcium (Ca)	56	7.4			
Magnesium (Mg)	21	9.9	Color	4	4
Sodium (Na)	35	34	pH	7.0	9.1
Potassium (K)	4.8	4.1	Specific conductance (micromhos at 25 C.)	531	270
Carbonate (CO_3)	0	19			
Bicarbonate (HCO_3)	338	88			
Sulfate (SO_4)	14	23	Turbidity	1	0
Chloride (Cl)	5.2	6.5	Temperature (F.)	71	78
Fluoride (F)	.0	.0	Date of collection	June 15, 1951	June 14, 1951
Nitrate (NO_3)	1.8	1.1			
Dissolved solids	350	187			

[a] Raw water (composite).

[b] Finished water (composite).

PASCAGOULA
(Population, 10,805)

Ownership: Municipal; population supplied outside of city limits, about 200. Total population supplied, about 11,000.
Source: 5 wells (1 and 2, Common St.; 1, 2, and 3, Beach St.), each 800 ft deep. The yield of each well is reported to be 2,300 gpm.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 1,200,000 gal.

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

	Finished water (composite)		Finished water (composite)
Silica (SiO_2)	34	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	10
Manganese (Mn)	.0	Noncarbonate	0
Calcium (Ca)	2.7		
Magnesium (Mg)	.7	Color	32
Sodium (Na)	244	pH	8.0
Potassium (K)	11	Specific conductance (micromhos at 25 C.)	1,120
Carbonate (CO_3)	0	Turbidity	0
Bicarbonate (HCO_3)	330	Temperature (F.)	87
Sulfate (SO_4)	.6	Date of collection	June 14, 1951
Chloride (Cl)	196		
Fluoride (F)	.3		
Nitrate (NO_3)	1.2		
Dissolved solids	654		

STARKVILLE
(Population, 7,107)

Ownership: Municipal; also supplies about 500 people outside the city limits. Total population supplied, about 7,600.
Source: 2 wells (1 and 2) each 1,450 ft deep, and reported to yield 635 and 840 gpm, respectively. Emergency supply, 300,000 gallon surface reservoir. The Borden Company can also supply water (ground water).
Treatment: None.
Storage: 350,000 gal.

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

	Wells (composite)		Wells (composite)
Silica (SiO_2)	24	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	25
Manganese (Mn)	.0	Noncarbonate	0
Calcium (Ca)	6.6		
Magnesium (Mg)	2.0	Color	6
Sodium (Na)	33	pH	7.6
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	194
Carbonate (CO_3)	0	Turbidity	3
Bicarbonate (HCO_3)	106	Temperature (F.)	80
Sulfate (SO_4)	1.6	Date of collection	May 21, 1951
Chloride (Cl)	9.8		
Fluoride (F)	.1		
Nitrate (NO_3)	.8		
Dissolved solids	124		

TUPELO
(Population, 11,527)

Ownership: Municipal; population supplied outside of the city limits, 50. Total population supplied, 11,577.
Source: 7 wells (1 to 6, and East Tupelo) 460, 460, 460, 468, 470, 501, and 380 ft deep. The yield of the wells is reported to be 300, 310, 310, 450, 300, 780, and 80 gpm. Emergency supply: a surface reservoir of 262,000 gal supplied by these 7 wells.
Treatment: Chlorination. A chlorine residual of 0.2 to 0.3 ppm is maintained in the reservoir.
Storage: For emergency, 262,000 gal.
Finished-water storage: 332,000 gal.

ANALYSES

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

	Well 2	Wells[a]		Well 2	Wells[a]
Silica (SiO_2)	17	16	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.66	Total	95	104
Manganese (Mn)	.01	.01	Noncarbonate	0	19
Calcium (Ca)	29	33			
Magnesium (Mg)	5.6	5.2	Color	5	5
Sodium (Na)	46	45	pH	7.6	7.7
Potassium (K)	4.6	7.0	Specific conductance (micromhos at 25 C.)	405	429
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	122	104			
Sulfate (SO_4)	8.1	16	Turbidity	1	1
Chloride (Cl)	65	71	Temperature (F.)	66	--
Fluoride (F)	.0	.0	Date of collection	May 21, 1951	May 21, 1951
Nitrate (NO_3)	1.2	.5			
Dissolved solids	238	246			
Depth (feet)				460	
Diameter (inches)				12	
Date drilled				1931	
Percent of supply				--	

[a] Finished water (composite).

VICKSBURG
(Population, 27,948)

Ownership: Municipal; population supplied outside of the city limits, about 10,000. Total population supplied, about 37,900.
Source: Mississippi River.
Treatment: Copper sulfate, coagulation with lime and ferric sulfate, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 5,500,000 gal.
Raw-water storage: None.
Finished-water storage: 630,000 gal.

There is some variation in the chemical character of the water throughout the year.

VICKSBURG--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	8.3	7.2	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.04	Total	172	202
Manganese (Mn)	.0	.0	Noncarbonate	46	80
Calcium (Ca)	46	58			
Magnesium (Mg)	14	14	Color	15	6
Sodium (Na)	32	31	pH	7.5	7.8
Potassium (K)	2.7	4.6	Specific conductance (micromhos at 25 C.)	483	524
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	154	149	Turbidity	2	1
Sulfate (SO_4)	67	93	Temperature (F.)	76	77
Chloride (Cl)	34	35	Date of collection	June 16, 1951	June 16, 1951
Fluoride (F)	.3	.1			
Nitrate (NO_3)	3.6	2.5			
Dissolved solids	304	356			

Regular determinations at treatment plant, 1951 [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	100	120	85	7.8	8.0	7.7	100	120	80	1000	1500	800
Finished water	90	120	90	8.4	8.4	8.4	110	120	100	0	0	0

[a] Fiscal year.

YAZOO CITY

(Population, 9,746)

Ownership: Municipal; population supplied outside of the city limits, 100. Total population supplied, 9,846.

Source: 3 wells (1 to 3), each 900 ft deep. The yield of the wells is reported to be 1,100, 1,000, and 2,000 gpm.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 300,000 gal.

ANALYSIS

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

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	22	Hardness as $CaCO_3$:	
Iron (Fe)	.09	Total	5
Manganese (Mn)	.0	Noncarbonate	0
Calcium (Ca)	1.3		
Magnesium (Mg)	.5	Color	7
Sodium (Na)	77	pH	8.2
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	317
Carbonate (CO_2)	0		
Bicarbonate (HCO_3)	194	Turbidity	2
Sulfate (SO_4)	8.2	Temperature (F.)	82
Chloride (Cl)	3.5	Date of collection	May 22, 1951
Fluoride (F)	.2		
Nitrate (NO_3)	.9		
Dissolved solids	212		

BERLIN, NEW HAMPSHIRE
(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		
Bicarbonate (HCO_3)	8	Turbidity	0.3
Sulfate (SO_4)	6.5	Temperature (F.)	47
Chloride (Cl)	.8	Date of collection	May 25, 1951
Fluoride (F)	.2		
Nitrate (NO_3)	.6		
Dissolved solids	29		

[a] Sample collected at filter plant before chlorination.

CLAREMONT
(Population, 12,811)

Ownership: Municipal. Supplies also about 1,000 people outside the city limits. Total population supplied, about 13,800.
Source: Spring-fed brooks.
Treatment: Chlorination. Copper sulfate for control of algae in summer months.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 205,000,000 gal.
Finished-water storage: 41,000,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.1	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	21
Manganese (Mn)	.00	Noncarbonate	8
Calcium (Ca)	6.6		
Magnesium (Mg)	1.1	Color	2
Sodium (Na)	1.0	pH	6.9
Potassium (K)	.2	Specific conductance (micromhos at 25 C.)	48.7
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	16	Turbidity	1.8
Sulfate (SO_4)	8.0	Temperature (F.)	50
Chloride (Cl)	1.8	Date of collection	June 5, 1951
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	32		

CLAREMONT--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.....	--	--	--	6.8	--	--	26	--	--	0	--	--
Finished water...	--	--	--	--	--	--	--	--	--	--	--	--

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	0.4
Bicarbonate (HCO_3)	8	Temperature (F.).....	--
Sulfate (SO_4)	6.5	Date of collection	May 15, 1951
Chloride (Cl)	2.8		
Fluoride (F)	[a].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

[a] Fluoridation with sodium silicofluoride to a concentration of 1 ppm of fluoride in the finished water was begun May 12, 1952.

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.

KEENE--Continued

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		
Bicarbonate (HCO_3)	3	Turbidity	0.3
Sulfate (SO_4)	6.0	Temperature (F.)	52
Chloride (Cl)	1.2	Date of collection	May 22, 1951
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: 3,250,000 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		
Bicarbonate (HCO_3)	9	Turbidity	0.1
Sulfate (SO_4)	5.2	Temperature (F.)	45
Chloride (Cl)	2.4	Date of collection	May 15, 1951
Fluoride (F)	.2		
Nitrate (NO_3)	.3		
Dissolved solids	23		

LACONIA--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	--	--	--	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_2)	0	Turbidity	0.9
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; 42 flowing wells ranging in depth from 16 to 50 ft with an average of 30 ft. Auxiliary or emergency supply, Pennichuck Brook. The combined yield of the springs and wells is reported to be a little over 4,000,000 gpd.
Treatment: Chlorination.
Raw-water storage: Spring water, 56,000,000 gal.
Finished-water storage: --

NASHUA--Continued

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	0.3
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: 250,000,000 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	Turbidity	0.7
Bicarbonate (HCO_3)	4	Temperature (F.)	--
Sulfate (SO_4)	4.8	Date of collection	May 14, 1951
Chloride (Cl)	5.0		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	24		

SOMERSWORTH
(Population, 6,927)

Ownership: Municipal; also supplies about 500 people outside the city limits.
Total population supplied, about 7,400.
Source: 2 wells (1 and 2) 69 and 65 ft deep: yield reported to be 612 and 700 gpm.
Treatment: Adjustment of pH with lime.
Raw-water storage: --
Finished-water storage: 1,000,000 gal.

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

	Well (raw water)		Well (raw water)
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.37	Total	20
Manganese (Mn)	.04	Noncarbonate	14
Calcium (Ca)	6.2		
Magnesium (Mg)	1.2	Color	1
Sodium (Na)	3.3	pH	6.1
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	67.2
Carbonate (CO_3)	0	Turbidity	0.2
Bicarbonate (HCO_3)	8	Temperature (F.)	--
Sulfate (SO_4)	14	Date of collection	May 14, 1951
Chloride (Cl)	5.5		
Fluoride (F)	.1		
Nitrate (NO_3)	.6		
Dissolved solids	47		
Depth (feet)			69
Diameter (inches)			36
Date drilled			1934
Percent of supply			--

ASBURY PARK
(Population, 17,094)

Ownership: Municipal about 50 percent of supply; Monmouth Consolidated Water Co. about 50 percent. (See Long Branch.) Population supplied during summer months, about 50,000.
Source: 3 wells (Layne 1, American 1 and 2) 630, 1,130, and 1,130 ft deep; yield reported to be 200, 750, and 1,000 gpm.
Treatment: Aeration, sedimentation, rapid sand (pressure) filtration, and addition of Calgon.
Rated capacity of treatment plant: --
Raw-water storage: 210,000 gal.
Finished-water storage: --

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

	Layne well 1 (raw water)	American well 2 (raw water)	Finished water[a]
Silica (SiO_2)	--	--	8.4
Iron (Fe)	1.6	10	.57
Manganese (Mn)	--	--	.08
Calcium (Ca)	24	11	11
Magnesium (Mg)	4.3	1.0	1.4
Sodium (Na)	9.3	4.6	1.7
Potassium (K)			3.0
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	96	34	34
Sulfate (SO_4)	19	13	13
Chloride (Cl)	.2	.2	1.2
Fluoride (F)	--	--	.1
Nitrate (NO_3)	.8	.5	.2
Dissolved solids	--	--	59
Hardness as $CaCO_3$:			
Total	78	32	33
Noncarbonate	0	4	5
Color	20	0	1
pH	7.4	7.2	6.6
Specific conductance (micromhos at 25 C.)	190	88.2	89.6
Turbidity	--	--	3.5
Temperature (F.)	--	--	--
Date of collection	Mar. 24, 1953	Mar. 24, 1953	Mar. 24, 1953
Depth (feet)	630	1,130	--
Diameter (inches)	10-6	12-6	--
Date drilled	1939	1943	--
Percent of supply	--	--	--

[a] Composite sample. Collected at pumping station.

ATLANTIC CITY
(Population, 61,657)

Ownership: Municipal.
Source: 12 wells (1 to 4, 6 to 13) 675, 102, 213, 105, 91, 200, 97, 200, 199, 199, 200, and 95 ft deep, 54 percent of supply; 2 ponds (Absecon Creek impounded) 46 percent of supply. The wells are reported to yield from 695 to 1,390 gpm.
Treatment: Aeration, sedimentation, ammoniation, and chlorination.
Rated capacity of treatment plant: 40,000,000 gpd.
Raw-water storage: 7,000,000 gal.
Finished-water storage: 500,000 gal.

ATLANTIC CITY--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	9.9	Hardness as $CaCO_3$:	
Iron (Fe)	.47	Total	10
Manganese (Mn)	.03	Noncarbonate	6
Calcium (Ca)	2.2		
Magnesium (Mg)	1.0	Color	25
Sodium (Na)	4.8	pH	5.9
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	52.0
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	4	Temperature (F.)	54
Sulfate (SO_4)	7.5	Date of collection	Feb. 5, 1952
Chloride (Cl)	8.2		
Fluoride (F)	.2		
Nitrate (NO_3)	.5		
Dissolved solids	41		

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	2.4	2.5	2.3	5.0	5.2	5.0	5.3	5.4	4.9	0	1	0
Finished water	2.4	2.6	2.3	5.0	5.2	5.0	5.3	5.4	4.9	0	1	0

BAYONNE
(Population, 77,203)

Ownership: Municipal. Supplied by North Jersey District Water Supply Commis sion. (See Newark, Wanaque supply.)

BELLEVILLE
(Population 32,019)

Ownership: Supplied by Newark, Pequannock supply. (See Newark.)

BERGENFIELD
(Population, 17,647)

Ownership: Private water utility supplied by Hackensack Water Company. (See Hackensack.)

BLOOMFIELD
(Population, 49,307)

Ownership: Municipal. Supplied by Newark, Pequannock supply, Cedar Grove Reservoir. (See Newark.)

BRIDGETON
(Population, 18,378)

Ownership: Municipal. Total population supplied, about 19,500.
Source: 10 wells (1 to 10) 75, 97, 110, 95, 87, 105, 84, 93, 104, and 103 ft deep; yield reported to be 260, 620, 400, 250, 370, 460, 500, 460, 500, and 450 gpm. Emergency supply, Sunset Lake.
Treatment: None.
Storage: 2,500,000 gal.

ANALYSIS

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

	Wells (city tap)		Wells (city tap)
Silica (SiO_2)	8.9	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	14
Manganese (Mn)	.02	Noncarbonate	10
Calcium (Ca)	3.9		
Magnesium (Mg)	1.0	Color	0
Sodium (Na)	4.5	pH	5.7
Potassium (K)	1.5	Specific conductance (micromhos at 25 C.)	74.0
Carbonate (CO_2)	0		
Bicarbonate (HCO_3)	5	Turbidity	2.3
Sulfate (SO_4)	4.4	Temperature (F.)	--
Chloride (Cl)	8.0	Date of collection	Mar. 23, 1953
Fluoride (F)	.0		
Nitrate (NO_3)	9.5		
Dissolved solids	53		

CAMDEN
(Population, 124,555)

Ownership: Municipal; supplies about 100,000 people; New Jersey Water Company supplies the 11th and 12th wards; Merchantville-Pennsauken Water Commission supplies a small part.
Source: Municipal wells as follows: Camden, 12 wells (1 to 12) at different points in the city, about 116 to 195 ft deep; Morris field, 9 wells about 115 to 182 ft deep located between the Pennsylvania railroad tracks on the east, Pennsauken Creek on the north, and Delaware River on the west; Puchack field, 5 wells (1 to 5) 162 to 186 ft deep at School Lane and River Road Delair; Delair field, 3 wells (1 to 3) 135 to 144 ft deep, just west of Delair station on Pennsylvania railroad. New Jersey Water Company, Stockton field, 6 wells.
Treatment: Morris station wells, aeration; other wells, none.
Raw-water storage: Morris station reservoir, 500,000 gal.

The city wells are equipped with high-duty turbine pumps that pump directly into the distribution mains. The Morris wells are equipped with individual low-duty turbine pumps which pump into a concrete reservoir, from which the water is pumped into the city by centrifugal pumps. The Delair wells pump directly into the mains. The Puchack wells are equipped with individual high-duty turbine pumps which force the water into a large main leading to the city. The New Jersey Water Company wells are tied into a common line for distribution into the 11th and 12th wards.

The water from the wells in the different well fields differs considerably in chemical composition. The water from some of the wells contains objectionable quantities of iron and manganese. The analyses selected show the approximate range in dissolved solids and hardness of the water furnished by the wells in the different well fields.

CAMDEN--Continued

ANALYSES

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

	Camden well 1	Camden well 6	Camden well 7	Morris well 2	Morris well 3
Silica (SiO_2)	13	7.0	6.1	7.3	6.2
Iron (Fe)	1.2	.75	.02	.37	5.5
Manganese (Mn)	.28	.77	.03	.05	2.7
Calcium (Ca)	24	39	7.0	6.6	13
Magnesium (Mg)	9.4	35	4.7	3.6	6.2
Sodium (Na)	18	46	9.7	4.4	4.4
Potassium (K)	3.6	18	3.6	1.5	1.8
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	63	116	1	14	54
Sulfate (SO_4)	37	137	41	13	15
Chloride (Cl)	36	48	13	6.0	5.2
Fluoride (F)	.2	.1	.0	.1	.1
Nitrate (NO_3)	1.0	52	4.0	9.4	4.6
Dissolved solids	181	460	103	59	86
Hardness as $CaCO_3$:					
Total	99	241	37	31	63
Noncarbonate	47	146	36	20	19
Color	3	3	2	3	4
pH	6.0	6.0	4.6	5.6	6.4
Specific conductance (micromhos at 25 C.)	306	735	166	99.1	158
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	--	--
Date of collection	Nov. 28, 1949	Nov. 28, 1949	Feb. 16, 1951	Nov. 7, 1949	Nov. 7, 1949
Depth (feet)	176	137	164	116	117
Diameter (inches)	24	--	26	26	26
Date drilled	--	--	--	--	--
Percent of supply	--	--	--	--	--

	Morris well 9N	Puchack well 1	Puchack well 4	Delair well 3	Well 44 [a]
Silica (SiO_2)	3.9	4.0	7.9	4.7	10
Iron (Fe)	[b] 21	.00	.00	[b] 17	.02
Manganese (Mn)	5.6	.14	.41	8.1	.30
Calcium (Ca)	17	14	5.2	17	12
Magnesium (Mg)	10	7.8	1.8	9.6	4.7
Sodium (Na)	5.2	10	3.5	6.1	59
Potassium (K)	2.2	3.0	2.1	2.0	2.7
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	110	39	4	102	2
Sulfate (SO_4)	12	40	10	18	140
Chloride (Cl)	7.0	10	7.2	8.6	18
Fluoride (F)	.0	.0	.0	.0	.0
Nitrate (NO_3)	.5	7.5	12	.5	11
Dissolved solids	118	128	62	124	290
Hardness as $CaCO_3$:					
Total	94	67	20	94	49
Noncarbonate	3	35	17	10	48

[a] New Jersey Water Company. [b] Total iron. Sample turbid when collected.

CAMDEN, Analyses--Continued

	Morris well 9N	Puchack well 1	Puchack well 4	Delair well 3	Well 44 [a]
Color	3	3	3	12	4
pH	6.8	6.5	5.8	6.9	5.4
Specific conductance (micromhos at 25 C.)	219	198	79.7	218	444
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	--	56
Date of collection	July 3, 1953	July 3, 1953	July 3, 1953	July 3, 1953	Feb. 16, 1951
Depth (feet)	148	162	186	135	169
Diameter (inches)	38-26	26	36-26	38-26	--
Date drilled	1932	1924	1924	1930	--
Percent of supply	----	--	--	--	--

[a] New Jersey Water Company.

CLIFFSIDE PARK
(Population, 17,116)

Ownership: Supplied by Hackensack Water Company. (See Hackensack.)

CLIFTON
(Population, 64,511)

Ownership: The distribution system is owned by the city and the Passaic Valley Water Commission. Supplied by the Passaic Valley Water Commission, Wanaque supply. (See Passaic.)

COLLINGSWOOD
(Population, 15,800)

Ownership: Municipal.
Source: 4 wells (1 to 4) 305, 298, 326, and 305 ft deep; reported to yield 1,000, 750, 600, and 760 gpm, respectively.
Treatment: Aeration, and sedimentation.
Raw-water storage: 330,000 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)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.31	Total	68
Manganese (Mn)	.04	Noncarbonate	14
Calcium (Ca)	20		
Magnesium (Mg)	4.5	Color	5
Sodium (Na)	3.7	pH	7.3
Potassium (K)	3.9	Specific conductance (micromhos at 25 C.)	162
Carbonate (CO_3)	0	Turbidity	0.5
Bicarbonate (HCO_3)	66	Temperature (F.)	--
Sulfate (SO_4)	21	Date of collection	Feb. 7, 1952
Chloride (Cl)	3.4		
Fluoride (F)	.2		
Nitrate (NO_3)	.4		
Dissolved solids	98		

EAST ORANGE
(Population, 79,340)

Ownership: East Orange Water Department.
Source: 12 wells: North, Middle, South Braidburn wells 123, 126, and 122 ft deep, and reported to yield 1,220, 1,050, and 800 gpm; North, Middle, South Canoe Brook wells 108, 111, and 121 ft deep, and reported to yield 1,400, 1,400, and 450 gpm; North, Middle, South Dickinson wells 133, 129, and 126 ft deep, and reported to yield 1,000, 1,000, and 500 gpm; North, Middle, South Slough Brook wells each 280 ft deep, and each reported to yield 225 gpm.
Treatment: Chlorination.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: --
Finished-water storage: 10,000,000 gal.

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	23	Hardness as $CaCO_3$:	
Iron (Fe)	.00	Total	139
Manganese (Mn)	.00	Noncarbonate	37
Calcium (Ca)	36		
Magnesium (Mg)	12	Color	4
Sodium (Na)	10	pH	7.8
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	304
Carbonate (CO_3)	0	Turbidity	1.2
Bicarbonate (HCO_3)	125	Temperature (F.)	--
Sulfate (SO_4)	40	Date of collection	Feb. 21, 1952
Chloride (Cl)	6.4		
Fluoride (F)	.0		
Nitrate (NO_3)	5.0		
Dissolved solids	194		

EAST PATERSON
(Population, 15,386)

Ownership: Municipal. Supplied by Garfield Water Company. (See Garfield.) Emergency tie-in connection with the Passaic Valley Water Commission.

ELIZABETH
(Population, 112,817)

Ownership: Elizabethtown Water Company; North Jersey District Water Supply Commission (see Newark, Wanaque supply). The Elizabethtown Water Company supplies about 1/3 of the population of Elizabeth, also Dunellen, Linden, Middlesex, and South Plainfield (part); and Clark, Hillside, and Union (90 percent) townships. Total population supplied, about 148,000.
Source: Raritan River, Millstone River, Delaware Canal, and 141 wells in the following well fields: Conant Field, 5 wells 400 to 600 ft deep, total yield 1,500,000 gpd; Hummock Field, 46 wells 70 to 600 ft deep, total yield 3,500,000 gpd; Springfield Field, 50 wells 70 to 600 ft deep, total yield 3,500,000 gpd; Greenbrook Field, 20 wells 20 to 30 ft deep, total yield 775,000 gpd; and Piscataway Field, 20 wells 20 to 30 ft deep, total yield 2,000,000 gpd.
Treatment: Surface water: Aeration, coagulation with alum, lime, sedimentation, rapid sand filtration and chlorination. Well water: Chlorination.
Rated capacity of treatment plant: 25,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Hancock reservoir, 1,000,000 gal; Springfield reservoir, 1,000,000 gal; clear well, 1,000,000 gal.

ELIZABETH--Continued

ANALYSES

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

	Raw water[a]	Finished water[a]	Finished water[b]	Well water (composite)
Silica (SiO_2)	--	14	8.5	22
Iron (Fe)	--	.03	.14	.06
Manganese (Mn)	--	.00	.00	.00
Calcium (Ca)	--	19	15	85
Magnesium (Mg)	--	6.1	3.1	9.5
Sodium (Na)	4.4	6.4	3.3	12
Potassium (K)		1.6	.8	.9
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	32	29	38	216
Sulfate (SO_4)	30	42	18	71
Chloride (Cl)	5	10	4.8	15
Fluoride (F)	--	.0	.1	.0
Nitrate (NO_3)	5.1	5.4	1.5	10
Dissolved solids	--	117	80	338
Hardness as $CaCO_3$:				
Total	59	72	50	251
Noncarbonate	33	49	19	74
Color	12	5	5	5
pH	7.0	7.3	7.6	8.1
Specific conductance (micromhos at 25 C.)	156	188	125	511
Turbidity	--	2.1	4.0	2.1
Temperature (F.)	--	--	--	--
Date of collection	Feb. 1, 1952	Feb. 1, 1952	Feb. 1, 1952	Feb. 1, 1952

[a] Surface supplies, composite (60 percent Raritan and Millstone rivers, 40 percent Delaware Canal).

[b] Mixed surface supplies, City Hall tap.

ENGLEWOOD

(Population, 23,145)

Ownership: Supplied by the Hackensack Water Company. (See Hackensack.)

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	7.3	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	78
Manganese (Mn)	.02	Noncarbonate	45
Calcium (Ca)	25		
Magnesium (Mg)	3.8	Color	5
Sodium (Na)	12	pH	7.4
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	225
Carbonate (CO_3)	0	Turbidity	5.1
Bicarbonate (HCO_3)	40	Temperature (F.)	--
Sulfate (SO_4)	41	Date of collection	Jan. 29, 1952
Chloride (Cl)	18		
Fluoride (F)	.1		
Nitrate (NO_3)	2.9		
Dissolved solids	131		

FAIR LAWN
(Population, 23,885)

Ownership: Municipal.
Source: 13 wells (1 to 12, 14) 300 to 500 ft deep. The yield of the wells is reported to range from 100 to 400 gpm.
Treatment: Chlorination.
Raw-water storage: Collecting basin, 200,000 gal.
Finished-water storage: 1,300,000 gal.

Wells (1 to 7) are located in one field (Cadmus Place) and pump into a collecting basin; well 8 is on Willow Street; well 9, on George Street; and wells 10, 11, 12, and 14, are in one field (Westmoreland). Wells 8, 9, and those in Westmoreland field pump directly into the distribution system being automatically chlorinated.
Cadmus Place wells furnish about 40 percent of the supply; Westmoreland wells, about 30 percent; and the other two, about 15 percent each.

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	18	Hardness as $CaCO_3$:	
Iron (Fe)	.30	Total	195
Manganese (Mn)	.00	Noncarbonate	98
Calcium (Ca)	50		
Magnesium (Mg)	17	Color	4
Sodium (Na)	10	pH	7.3
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	428
Carbonate (CO_3)	0	Turbidity	0.6
Bicarbonate (HCO_3)	118	Temperature (F.)	53
Sulfate (SO_4)	81	Date of collection	Feb. 6, 1952
Chloride (Cl)	11		
Fluoride (F)	.0		
Nitrate (NO_3)	26		
Dissolved solids	282		

[a] Composited according to percentage furnished from each source.

GARFIELD
(Population, 27,550)

Ownership: Municipal; also supplies East Paterson and Saddle River township. Total population supplied, about 54,000.
Source: 5 wells. Auxiliary or emergency supply, tie-in with the Passaic Valley Water Commission.
Treatment: Chlorination. Copper sulfate is used in the receiving basin for control of algae.
Raw-water storage: Receiving basin, 500,000 gal.
Finished-water storage: 3 standpipes, 814,000 gal.

GARFIELD--Continued

ANALYSES

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

	Well 4 (raw water)	Finished water [a]		Well 4 (raw water)	Finished water [a]
Silica (SiO_2)	23	20	Hardness as $CaCO_3$:		
Iron (Fe)	--	.88	Total	272	206
Manganese (Mn)	--	.02	Noncarbonate	77	69
Calcium (Ca)	--	58			
Magnesium (Mg)	--	15	Color	4	10
Sodium (Na)	15	12	pH	7.4	7.5
Potassium (K)		1.5	Specific conductance (micromhos at 25 C.)	558	434
Carbonate (CO_3)	0	0	Turbidity	--	0.6
Bicarbonate (HCO_3)	238	168	Temperature (F.)	--	--
Sulfate (SO_4)	74	62	Date of collection	Jan. 29, 1952	Jan. 29, 1952
Chloride (Cl)	16	12			
Fluoride (F)	--	.0			
Nitrate (NO_3)	12	11			
Dissolved solids	--	277			

[a] Wells, composite sample.

HACKENSACK
(Population, 29,219)

Ownership: Hackensack Water Company. Also supplies Bergenfield, Cliffside Park, Dumont, Englewood, Fort Lee, Lyndhurst township (part), North Bergen township, Ridgefield Park township, Rutherford, Teaneck township (part), Union City, Weehawken township, West New York, and numerous boroughs, towns, and townships in whole or in part. Total population supplied, about 500,000.

Source: Hackensack River and tributaries impounded in Oradell Lake and Woodcliff Lake.

Treatment: Prechlorination, ammoniation, coagulation with alum, addition of activated carbon, sedimentation, rapid sand filtration, adjustment of pH, ammoniation, and postchlorination.

Rated capacity of treatment plant: (At New Milford) 72,000,000 gpd.

Raw-water storage: Oradell Lake, 2,850,000,000 gal; Woodcliff Lake, 889,000,000 gal.

Finished-water storage: Weehawken reservoirs 1 and 2, 16,000,000 and 69,200,000 gal, respectively; Fairview reservoir, 18,900,000 gal; Western reservoir (Woodcliff), 5,000,000 gal; Carlstadt tank, 1,300,000 gal; clear wells and suction wells (New Milford Plant-Oradell), 2,100,000 gal.

HACKENSACK--Continued

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

	Raw water	Finished water	Finished water [a]
Silica (SiO_2)	9.0	8.3	5.9
Iron (Fe)	--	.00	.03
Manganese (Mn)	--	.04	.04
Calcium (Ca)	--	21	31
Magnesium (Mg)	--	4.0	5.9
Sodium (Na)	10	12	10
Potassium (K)		1.3	
Carbonate (CO_3)	0	0	--
Bicarbonate (HCO_3)	38	38	64
Sulfate (SO_4)	28	36	43
Chloride (Cl)	16	17	26
Fluoride (F)	--	.0	--
Nitrate (NO_3)	3.6	2.3	.8
Dissolved solids	--	125	176
Hardness as $CaCO_3$:			
Total	64	69	102
Noncarbonate	33	38	48
Color	11	8	9
pH	6.9	7.5	7.2
Specific conductance (micromhos at 25 C.)	193	212	--
Turbidity	--	0.9	0
Temperature (F.)	--	--	56
Date of collection	Jan. 28, 1952	Jan. 28, 1952	1951

[a] Average of monthly analyses for year 1951. Analyses by the Hackensack Water Company.

HILLSIDE township
(Population, 21,007)

Ownership: Supplied by Elizabethtown Water Company. (See Elizabeth.)

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.56	Total	246
Manganese (Mn)	--	Noncarbonate	84
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	3
Sodium (Na)	11	pH	7.7
Potassium (K)		Specific conductance (micromhos at 25 C.)	501
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	198	Temperature (F.)	--
Sulfate (SO_4)	78	Date of collection	Jan. 29, 1952
Chloride (Cl)	13		
Fluoride (F)	--		
Nitrate (NO_3)	9.2		
Dissolved solids	--		

[a] Tap, Hillside, N. J.

HOBOKEN
(Population, 50,676)

Ownership: Municipal. Supplied by Jersey City. (See Jersey City.)

IRVINGTON
(Population, 59,201)

Ownership: Supplied by the Commonwealth Water Company. (See Summit.)

JERSEY CITY
(Population, 299,017)

Ownership: Municipal; also supplies Hoboken, part of Lyndhurst township, and North Arlington. Total population supplied, about 391,000.
Source: Rockaway River impounded in Boonton Reservoir. The supply system is interconnected with 7 other major water supply systems in metropolitan area of New Jersey.
Treatment: Plain sedimentation (in storage reservoir) and chlorination.
Rated capacity of treatment plant: 100,000,000 gpd.
Raw-water storage: Boonton Reservoir, 7,500,000,000 gal.
Finished-water storage: 2 distribution system reservoirs, 100,000,000 gal.

ANALYSES

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

	Finished water	Finished water [a]		Finished water	Finished water [a]
Silica (SiO_2)	9.8	7.4	Hardness as $CaCO_3$:		
Iron (Fe)	.18	.50	Total	36	49
Manganese (Mn)	.00	.00	Noncarbonate	19	14
Calcium (Ca)	9.0	11			
Magnesium (Mg)	3.3	5.2	Color	10	15
Sodium (Na)	3.1	6.3	pH	7.3	7.7
Potassium (K)	.8		Specific conductance (micromhos at 25 C.)	98.0	--
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	21	42	Turbidity	2.0	3
Sulfate (SO_4)	17	16	Temperature (F.)	--	--
Chloride (Cl)	6.5	7.7	Date of collection	Jan. 30, 1952	Sept. 19, 1951
Fluoride (F)	.1	--			
Nitrate (NO_3)	1.0	.8			
Dissolved solids	65	92			

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	39	15	7.1	7.6	6.7	44	64	30	4	20	3
Finished water	24	35	15	6.8	7.2	6.5	44	62	30	4	10	3

[a] Analysis by Jersey City Water Department.

KEARNEY
(Population, 39,952)

Ownership: Supplied by North Jersey District Water Supply Commission. (See Newark, Wanaque supply.)

LINDEN
(Population, 30,644)

Ownership: Supplied by Elizabethtown Water Company. (See Elizabeth.)

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	66
Manganese (Mn)	--	Noncarbonate	44
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	5
Sodium (Na)	5.8	pH	7.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	178
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	27	Temperature (F.)	--
Sulfate (SO_4)	41	Date of collection	Feb. 1, 1952
Chloride (Cl)	7		
Fluoride (F)	--		
Nitrate (NO_3)	5.0		
Dissolved solids	--		

[a] City tap, Linden.

LODI
(Population, 15,392)

Ownership: Municipal. Total population supplied, about 18,000.
Source: 7 wells (1, 4, 5, 6, 7, Columbia Ave., and Lawrence Ave.) 300, 319, 302, 308, 332, 409, and 373 ft deep; yield reported to be 160, 295, 130, 110, 150, 475, and 500 gpm. Well 1 furnishes 1 percent of supply; wells 4, 5, 6, and 7, 60 percent; Columbia Ave. well, 14 percent; Lawrence Ave. well, 25 percent.
Treatment: Chlorination.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Underground tank, 475,000 gal; steel standpipe, 55,000 gal.

LODI--Continued

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	18	Hardness as $CaCO_3$:	
Iron (Fe)	.00	Total	217
Manganese (Mn)	.00	Noncarbonate	83
Calcium (Ca)	59		
Magnesium (Mg)	17	Color	7
Sodium (Na)	10	pH	7.8
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	456
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	164	Temperature (F.)	--
Sulfate (SO_4)	64	Date of collection	Jan. 29, 1952
Chloride (Cl)	15		
Fluoride (F)	.0		
Nitrate (NO_3)	18		
Dissolved solids	289		

[a] Pumping station No. 2, wells 4, 5, 6, and 7.

LONG BRANCH
(Population, 23,090)

Ownership: Monmouth Consolidated Water Company (controlled by American Water Works Co., Inc.); also supplies Asbury Park (part), Bradley Beach, Fair Haven, Middletown township (part), Neptune township, Oceanport, Ocean township, Rumson, Shrewsbury township, and a number of other boroughs. Total population supplied, about 111,000: in summer about 229,000.

Source: Swimming River impounded, Whalepond Brook impounded, Jumping Brook, and Shark River (97 percent of supply); 2 wells, Whitesville Station, 610 and 981 ft deep, 5 wells, Ocean Grove Station, 450 to 605 ft deep, and 1 well, Jumping Brook Station, 1,065 ft deep (3 percent of supply).

Treatment: Prechlorination, coagulation with alum, lime, sedimentation, rapid sand filtration, fluoridation with sodium fluoride and sodium silicofluoride, and postchlorination.

Rated capacity of treatment plant: 21,700,000 gpd.

Raw-water storage: 175,000,000 gal.

Finished-water storage: 2,090,000 gal; 3 standpipes, 2,220,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	9.4	10	Hardness as $CaCO_3$:		
Iron (Fe)	--	.02	Total	52	59
Manganese (Mn)	--	.00	Noncarbonate	31	40
Calcium (Ca)	17	20			
Magnesium (Mg)	2.3	2.3	Color	20	4
Sodium (Na)	4.9	4.8	pH	7.4	7.2
Potassium (K)		1.8	Specific conductance (micromhos at 25 C.)	141	163
Carbonate (CO_3)	0	0	Turbidity	22	0.7
Bicarbonate (HCO_3)	25	24	Temperature (F.)	36	--
Sulfate (SO_4)	23	31	Date of collection	Feb. 18, 1952	Feb. 18, 1952
Chloride (Cl)	10	11			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	4.8	4.6			
Dissolved solids	84	102			

LONG BRANCH--Continued

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.....	34	97	20	6.8	7.1	6.5	65	70	55	47	190	48
Finished water...	36	46	22	7.8	8.2	7.6	70	80	54	1	5	0

LYNDHURST township
(Population, 19,980)

Ownership: Distribution system, Lyndhurst township. Supplied by Jersey City and Hackensack Water Company. (See Jersey City and Hackensack.)

MAPLEWOOD township
(Population, 25,201)

Ownership: Commonwealth Water Company. (See Summit, Canoe Brook and Short Hills Stations.)

ANALYSIS

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

	Finished water (tap sample)		Finished water (tap sample)
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	136
Manganese (Mn)	--	Noncarbonate	48
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	1
Sodium (Na)	6.1	pH	7.8
Potassium (K)		Specific conductance (micromhos at 25 C.)	303
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	108	Temperature (F.)	--
Sulfate (SO_4)	43	Date of collection	Feb. 1, 1952
Chloride (Cl)	9		
Fluoride (F)	--		
Nitrate (NO_3)	4.2		
Dissolved solids	--		

MILLVILLE
(Population, 16,041)

Ownership: Municipal.
Source: Union Lake 75 percent of supply; 5 wells (7, 9, 10, 11, 12) each 110 ft deep, 25 percent of supply.
Treatment: Union Lake water: coagulation with alum and soda ash, sedimentation, rapid sand filtration, and chlorination. Well water: aeration and chlorination.
Rated capacity of treatment plant: --
Raw-water storage: None.
Finished-water storage: Clear well, 50,000 gal.

MILLVILLE--Continued

ANALYSES

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

	Union Lake (raw water)	Union Lake (finished water)	Wells (finished water)
Silica (SiO_2)	--	2.5	9.3
Iron (Fe)	.23	.09	.39
Manganese (Mn)	--	.00	.01
Calcium (Ca)	3.9	3.0	3.5
Magnesium (Mg)	.6	1.1	.8
Sodium (Na)	2.5	16	2.7
Potassium (K)		.8	1.5
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	1	10	1
Sulfate (SO_4)	10	28	18
Chloride (Cl)	3.6	5.8	4.0
Fluoride (F)	--	.0	.0
Nitrate (NO_3)	2.5	2.1	.7
Dissolved solids	--	71	48
Hardness as $CaCO_3$:			
Total	12	12	12
Noncarbonate	11	4	11
Color	55	5	1
pH	5.1	6.4	4.6
Specific conductance (micromhos at 25 C.)	49.4	113	70.6
Turbidity	--	3.5	2.0
Temperature (F.)	--	--	--
Date of collection	Mar. 23, 1953	Mar. 23, 1953	Mar. 23, 1953

MONTCLAIR

(Population, 43,927)

Ownership: Municipal; also supplies about 2,000 people outside the city limits, Glen Ridge, and the township of Cedar Grove. Total population supplied, about 65,000. Supplied by North Jersey District Water Supply Commission. (See Newark, Wanaque supply.)

Finished-water storage: 4,000,000 gal.

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	26
Manganese (Mn)	--	Noncarbonate	12
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	2
Sodium (Na)	3.0	pH	7.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	72.3
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	17	Temperature (F.)	--
Sulfate (SO_4)	12	Date of collection	Jan. 30, 1952
Chloride (Cl)	4		
Fluoride (F)	--		
Nitrate (NO_3)	.5		
Dissolved solids	--		

[a] City tap, Montclair.

MORRISTOWN
(Population, 17,124)

Ownership: Municipal; also supplies about 12,000 people outside the city limits. Total population supplied, about 30,000.
Source: 5 wells 60 to 136 ft deep, 55 percent of supply; impounding reservoir, Brookside, N. J., 45 percent of supply.
Treatment: Chlorination, ammoniation, lime for pH correction, and fluoridation with sodium fluoride.
Rated capacity of treatment plant: 3,000,000 gpd.
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)	10	Hardness as $CaCO_3$:	
Iron (Fe)	.27	Total	37
Manganese (Mn)	.00	Noncarbonate	7
Calcium (Ca)	11		
Magnesium (Mg)	2.4	Color	5
Sodium (Na)	3.6	pH	7.4
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	94.4
Carbonate (CO_3)	0	Turbidity	4.1
Bicarbonate (HCO_3)	37	Temperature (F.)	--
Sulfate (SO_4)	11	Date of collection	Mar. 24, 1953
Chloride (Cl)	2.2		
Fluoride (F)	.6		
Nitrate (NO_3)	1.6		
Dissolved solids	67		

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	9	10	7	6.5	6.9	6.1	24	--	--	5	20	5
Finished water	21	23	20	9.1	9.3	8.9	28	--	--	5	20	5

NEWARK
(Population, 438,776)

Ownership: (Distribution system owned by the city) Municipal (Pequannock supply); also supplies Belleville, Bloomfield, Nutley, and Wayne township. Total population supplied, about 400,000. North Jersey District Water Supply Commission (Wanaque supply); Participants are allotted daily quantities of water as follows: Bloomfield, 4,000,000 gal; Clifton, 6,750,000 gal; Glen Ridge, 750,000 gal; Kearney, 12,000,000 gal; Montclair, 5,000,000 gal; Newark, 40,500,000 gal; Paterson, 20,000,000 gal; Passaic, 11,000,000 gal. Total population supplied, about 640,000.

Source: Municipal: Pequannock River and tributaries impounded in four main reservoirs, Oak Ridge, Clinton, Canistear, and Echo Lake, the flow from which in natural stream beds is controlled through the Macopin Intake Reservoir. North Jersey District Water Supply Commission: Wanaque River impounded, northeast of and adjoining the Pequannock watershed.

Treatment: Pequannock supply: Ammoniation, chlorination at intake into aqueducts at Macopin, aeration and sedimentation in Cedar Grove Reservoir, and rechlorination at distribution outlet of this reservoir. Copper sulfate or chlorine is used to control algae in the reservoirs. Wanaque supply: Ammoniation and chlorination as water leaves Wanaque Reservoir, and addition of lime for pH control. Copper sulfate is used in reservoir when necessary for control of algae.

Raw-water storage: Pequannock supply: Oak Ridge Reservoir, 3,895,000,000 gal; Clinton Reservoir, 3,518,000,000 gal; Canistear Reservoir, 2,407,000,000 gal; Echo Lake Reservoir, 1,678,000,000 gal; and Macopin Intake Reservoir, 32,000,000 gal. Total, 11,530,000,000 gal. Wanaque supply: Wanaque Reservoir, 27,600,000,000 gal.

Finished-water storage: Pequannock supply: Cedar Grove Reservoir, (main distribution reservoir), on mountain above Montclair, 679,000,000 gal; South Orange Avenue Reservoir (equalizing reservoir), 9,000,000 gal; Belleville Reservoir (equalizing reservoir), which also may receive Wanaque water, 14,000,000 gal; Wanaque supply: Balancing reservoir (in Clifton), 15,000,000 gal.

Pequannock water, which is delivered from Cedar Grove Reservoir, can be supplied to all sections of Newark. However it is used principally in the higher sections of the city; Wanaque Aqueduct conveys water from Wanaque Reservoir to Belleville Reservoir from which point the supply is connected with the Newark distribution system. The Wanaque supply is also interconnected with the Pequannock supply at several points. Wanaque water is distributed to the lower lying sections of Newark.

NEWARK--Continued

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

	Pequannock Supply		Wanaque Supply		Mixed Supply
	Finished water [a]	Finished water [b]	Finished water [c]	Finished water [d]	Finished water
Silica (SiO_2)	6.7	2.6	3.5	4.5	5.2
Iron (Fe)	.07	.30	.09	.34	.27
Manganese (Mn)	--	.00	.04	.00	.00
Calcium (Ca)	9.0	6.6	8.7	7.4	7.6
Magnesium (Mg)	2.9	2.1	2.2	1.6	1.7
Sodium (Na)	1.0	1.4	4.5	2.0	1.6
Potassium (K)		.4		.7	.4
Carbonate (CO_3)	--	0	--	0	0
Bicarbonate (HCO_3)	16	14	18	14	13
Sulfate (SO_4)	12	10	13	12	12
Chloride (Cl)	6.0	4.1	8.3	4.2	4.5
Fluoride (F)	--	.1	--	.1	.1
Nitrate (NO_3)	1.2	.6	.2	.3	.4
Dissolved solids	55	39	57	43	44
Hardness as $CaCO_3$:					
Total	35	25	31	25	26
Noncarbonate	21	14	16	14	15
Color	19	15	18	8	5
pH	6.9	6.8	7.7	8.0	7.2
Specific conductance (micromhos at 25 C.)	--	64.9	--	70.6	65.9
Turbidity	2.8	1.6	2	5.1	0.6
Temperature (F.)	--	--	50	--	--
Date of collection	1951	Jan. 28, 1952	1951	Jan. 28, 1952	Jan. 30, 1952

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
Finished water [e]	13	17	9.6	6.9	7.0	6.8	35	38	31	19	25	15
Finished water [f]	15	20	11	7.7	8.2	7.2	31	38	28	2	3	1

[a] Average of analyses of monthly composites of daily samples. Analyses by Newark Water Department.
[b] City tap, Bloomfield, N. J.
[c] Average of analyses of monthly composites of daily samples. Analyses by Passaic Valley Water Commission, at Little Falls treatment plant.
[d] City tap, Bayonne, N. J.
[e] Pequannock supply.
[f] Wanaque supply.

NEW BRUNSWICK
(Population, 38,811)

Ownership: Municipal; also supplies Franklin (part), Highland Park, Milltown, and North Brunswick township. Total population supplied, about 59,000.
Source: Lawrence Brook impounded.
Treatment: Coagulation with alum, activated carbon, lime, sedimentation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: 800,000,000 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)	7.8	Hardness as $CaCO_3$:	
Iron (Fe)	.29	Total	44
Manganese (Mn)	.00	Noncarbonate	29
Calcium (Ca)	12		
Magnesium (Mg)	3.4	Color	10
Sodium (Na)	4.8	pH	9.0
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	131
Carbonate (CO_3)	3	Turbidity	11
Bicarbonate (HCO_3)	12	Temperature (F.)	--
Sulfate (SO_4)	26	Date of collection	Jan. 28, 1952
Chloride (Cl)	7.5		
Fluoride (F)	.4		
Nitrate (NO_3)	3.2		
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	15	12	7	5.7	6.4	5.0	30	35	25	65	90	40
Finished water	16	24	9	7.9	8.4	7.5	51	53	48	6	10	3

NORTH ARLINGTON
(Population, 15,970)

Ownership: Supplied by Jersey City. (See Jersey City.)

NORTH BERGEN township
(Population, 41,560)

Ownership: Supplied by Hackensack Water Company. (See Hackensack.)

NUTLEY
(Population, 26,992)

Ownership: Municipal. Purchases water wholesale from the Passaic Valley Water Commission. (See Passaic.)

ORANGE
(Population, 38,037)

Ownership: Municipal.
Source: 4 wells (1 to 4) 42, 132, 76, and 100 ft deep, 63 percent of supply; West Branch of Rahway River, 37 percent of supply. The yield of the wells is reported to be 740, 1,400, 1,400, and 1,395 gpm. Auxiliary or emergency supply, interconnection with the supply systems of East Orange and the Commonwealth Water Company.
Treatment: Coagulation with alum, filtration, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 275,000,000 gal.
Finished-water storage: 6,000,000 gal.

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	18	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	84
Manganese (Mn)	.00	Noncarbonate	38
Calcium (Ca)	22		
Magnesium (Mg)	7.0	Color	0
Sodium (Na)	7.2	pH	7.6
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	199
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	56	Turbidity	0.4
Sulfate (SO_4)	34	Temperature (F.)	--
Chloride (Cl)	10	Date of collection	January, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	1.8		
Dissolved solids	129		

PASSAIC
(Population, 57,702)

Ownership: Passaic Valley Water Commission. The Water Commission owns and operates the distribution systems in Passaic, Paterson, part of Clifton and Prospect Park; it sells water wholesale to the Clifton Water Department, East Paterson, Garfield, Haledon, Harrison, Little Falls, Nutley, Totowa, West Paterson, and Hackensack Water Company. Total population supplied, about 360,000.
Source: Passaic River; Wanaque Reservoir. (About 50 percent from each source was used for the supply of Passaic in 1951.)
Treatment: Passaic River supply: Prechlorination, coagulation with alum, activated carbon when necessary, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime. Wanaque Reservoir supply: Ammoniation, chlorination, and addition of lime at outlet of Wanaque Reservoir, rechlorination, and pressure filtration at Little Falls plant of the Passaic Valley Water Commission.
Rated capacity of treatment plants: Little Falls: gravity, 55,000,000 gpd; pressure, 40,000,000 gpd.
Raw-water storage: --
Finished-water storage: 3 reservoirs: Great Notch, 178,500,000 gal; New Street, 63,900,000 gal; Grand Street, 20,460,000 gal. 2 clear wells, 3,250,000 gal.

The Passaic Valley Water Commission has water rights to 75 mgd from the Passaic River and 37.75 mgd from the Wanaque Reservoir. Mixed finished water supplied to the various places consists of about 10 percent more Wanaque Reservoir water than Passaic River water. The low pressure system is supplied with water from the Passaic River.

PASSAIC--Continued

ANALYSES

(Analyses, in parts per million, by Passaic Valley Water Commission, Clifton)

	Passaic River		Wanaque Supply		Mixed Supply
	Raw water [a]	Finished water [a]	Raw water [a]	Finished water [a]	Finished water [a b]
Silica (SiO_2)	11	7.3	3.5	3.3	4.7
Iron (Fe)	.58	.04	.09	.05	.05
Manganese (Mn)	.06	.02	.04	.02	.02
Calcium (Ca)	14	20	8.7	8.8	13
Magnesium (Mg)	4.5	4.5	2.2	2.2	3.0
Sodium (Na) / Potassium (K)	8.6	9.0	4.5	5.1	6.6
Carbonate (CO_3)	--	--	--	--	--
Bicarbonate (HCO_3)	41	42	18	19	28
Sulfate (SO_4)	25	33	13	14	21
Chloride (Cl)	8.9	14	8.3	8.7	10
Fluoride (F)	--	--	--	--	--
Nitrate (NO_3)	1.6	1.6	.2	.2	.7
Dissolved solids	112	130	57	56	86
Hardness as $CaCO_3$:					
Total	55	69	31	31	45
Noncarbonate	22	35	16	16	22
Color	48	4	18	9	7
pH	7.0	7.1	7.7	7.6	7.3
Specific conductance (micromhos at 25 C.)	--	--	--	--	--
Turbidity	8	0	2	0.4	0.4
Temperature (F.)	54	54	50	50	52
Date of collection	1951	1951	1951	1951	1951

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 [c]	34	53	19	7.0	7.4	6.8	55	70	37	8	11	4
Finished water [c]	34	50	22	7.1	7.4	7.1	70	90	49	0	0	0
Raw water [d]	15	20	11	7.7	8.2	7.2	31	38	28	2	3	1
Finished water [d]	15	21	12	7.6	8.1	7.2	31	37	28	.4	1	0

[a] Average of analyses of monthly composites of daily samples.
[b] Approximately equal parts of each supply.
[c] Passaic River supply.
[d] Wanaque Reservoir supply.

PATERSON
(Population, 139,336)

Ownership: Supplied by Passaic Valley Water Commision. (See Passaic.)

PENNSAUKEN township
(Population, 22,767)

Ownership: Merchantville-Pennsauken Water Commission. Supplies Merchantville, a large part of the townships of Pennsauken and Delaware, and a small part of Camden. Total population supplied, about 35,000.
Source: Park Avenue Well Field: 5 wells (1, 5, 6, 7, 12) 285, 288, 260, 185, 256, ft deep; yield reported to be 1,005, 1,000, 500, 600, and 1,000 gpm. Emergency connection, Delaware Gardens well and pumping station.
Treatment: Aeration, sedimentation, and pressure filtration.
Rated capacity of treatment plant: 2,500,000 gpd.
Raw-water storage: 85,000 gal; facilities under construction, 500,000 gal.
Finished-water storage: 1,200,000 gal.

ANALYSES

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

	Well 7 (raw water)	Wells (finished water)		Well 7 (raw water)	Wells (finished water)
Silica (SiO_2)	9.6	13	Hardness as $CaCO_3$:		
Iron (Fe)	.17	.02	Total	21	24
Manganese (Mn)	.02	.00	Noncarbonate	16	15
Calcium (Ca)	4.5	6.2			
Magnesium (Mg)	2.3	2.2	Color	2	5
Sodium (Na)	4.7	3.3	pH	5.7	7.0
Potassium (K)	1.8	1.8	Specific conductance (micromhos at 25 C.)	78.2	80.7
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	6	12			
Sulfate (SO_4)	13	15	Turbidity	--	1.0
Chloride (Cl)	6.9	5	Temperature (F.)	55	--
Fluoride (F)	.1	.0	Date of collection	Nov. 28, 1949	Mar. 20, 1952
Nitrate (NO_3)	4.6	2.7			
Dissolved solids	50	57			

PERTH AMBOY
(Population, 41,330)

Ownership: Municipal; also supplies Sayreville, Spotswood, and part of the townships of East Brunswick, Raritan, and Woodbridge. Total population supplied, about 66,300.
Source: 3 Layne wells (1 to 3) 291, 265, and 68 ft deep; 58 suction wells, ranging in depth from 40 to 94 ft. The yield of the Layne wells is reported to be 1,500, 1,529, and 800 gpm, respectively.
Treatment: Addition of lime for iron removal and adjustment of pH, sedimentation, and pressure filtration.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 40,000,000 gal.

PERTH AMBOY--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	4.8	Hardness as $CaCO_3$:	
Iron (Fe)	.28	Total	65
Manganese (Mn)	.01	Noncarbonate	31
Calcium (Ca)	21		
Magnesium (Mg)	3.1	Color	5
Sodium (Na)	3.3	pH	8.0
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	156
Carbonate (CO_3)	0	Turbidity	0.9
Bicarbonate (HCO_3)	42	Temperature (F.)	--
Sulfate (SO_4)	28	Date of collection	Mar. 12, 1952
Chloride (Cl)	6.5		
Fluoride (F)	.0		
Nitrate (NO_3)	.3		
Dissolved solids	93		

Regular determinations at treatment plant, 1951

	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	--	--	--	--	---	--	--	--	--	--	--	--
Finished water	40	44	30	7.6	8.0	7.0	40	50	28	54	56	52

PHILLIPSBURG

(Population, 18,919)

Ownership: The Peoples Water Company; also supplies about 1,000 people outside the city limits. Total population supplied, about 20,000.

Source: Infiltration chamber 8 ft high, 8 ft wide and 225 ft long, about 30 ft below ground. The yield is reported to be 10,000,000 gpd. Auxiliary or emergency supply, Delaware River.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 8,000,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	9.7	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	117
Manganese (Mn)	.00	Noncarbonate	28
Calcium (Ca)	27		
Magnesium (Mg)	12	Color	3
Sodium (Na)	3.0	pH	8.1
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	234
Carbonate (CO_3)	0	Turbidity	0.9
Bicarbonate (HCO_3)	108	Temperature (F.)	--
Sulfate (SO_4)	22	Date of collection	Mar. 12, 1952
Chloride (Cl)	5.7		
Fluoride (F)	.0		
Nitrate (NO_3)	4.3		
Dissolved solids	140		

PLAINFIELD
(Population, 42,366)

Ownership: Plainfield-Union Water Company; also supplies Fanwood, Garwood, Kenilworth, Linden (small part), Mountainside, North Plainfield, Roselle, Roselle Park, South Plainfield, Watchung (part), and Westfield; and the townships of Clark, Cranford, Scotch Plains, Union (part), Winfield, and other consumers. Total population supplied, about 160,000.

Source: 39 wells (32 in use, 5 in reserve, 2 applications filed for use) in several well fields and individual wells: Netherwood Field, Plainfield, 19 wells 78 to 500 ft deep, average yield of 255 gpm; Jerusalem Rd. Field, Scotch Plains, 3 wells (1 to 3) 650, 665, and 708 ft deep, average yield 283 gpm; Greenbrook Field, Greenbrook township, 8 wells (1 to 8) 44 to 550 ft deep, average yield 431 gpm; Clinton Avenue Field, South Plainfield, 3 wells (1 to 3) 300, 300, and 400 ft deep, average yield 317 gpm; Kenilworth, 3 wells (Newark Ave., Richfield Ave., and Quinton Ave.) 275, 401, and 550 ft deep, average yield 228 gpm; Westfield well 523 ft deep, yield 500 gpm; Mountainside, Charles St. well 454 ft deep, yield 500 gpm. Emergency connections with Elizabethtown Water Company.

Treatment: Chlorination.

Finished-water storage: 12,000,000 gal.

ANALYSES

(Analyses, in parts per million, by Plainfield-Union Water Co., Westfield, N. J.)

	Wells	Wells	Wells	Well	Wells Netherwood Station[a]
Silica (SiO_2)	--	--	--	--	21
Iron (Fe)	0	.10	.10	.10	.00
Manganese (Mn)	--	--	--	--	.00
Calcium (Ca)	--	--	--	--	74
Magnesium (Mg)	--	--	--	--	8.9
Sodium (Na)	--	--	--	--	12
Potassium (K)	--	--	--	--	.7
Carbonate (CO_3)	--	--	--	--	0
Bicarbonate (HCO_3)	106	110	122	222	198
Sulfate (SO_4)	--	--	--	--	58
Chloride (Cl)	16	18	10	11	10
Fluoride (F)	.3	.2	--	.0	.0
Nitrate (NO_3)	.8	2.0	2.0	4.0	16
Dissolved solids	1,080	579	205	409	304
Hardness as $CaCO_3$:					
Total	650	250	164	240	221
Noncarbonate	563	489	54	58	59
Color	--	--	--	--	0
pH	7.8	7.5	7.6	7.6	8.1
Specific conductance (micromhos at 25 C.)	--	--	--	--	465
Turbidity	--	--	--	--	0.2
Temperature (F.)	--	--	--	--	--
Date of collection	--	--	--	--	Jan. 31, 1952
Depth (feet)	650-708	44-550	275-550	78	78-500
Diameter (inches)	12	12	8-12	28-16	10-12
Date drilled	1948-1950	1945-1950	1906, 1943-44	1946	1910-1948

[a] Analyzed by U. S. Geological Survey.

RAHWAY
(Population, 21,290)

Ownership: Municipal.
Source: Rahway River. Auxiliary or emergency connection with Elizabethtown Water Company and Middlesex Water Company.
Treatment: Coagulation with alum, activated carbon, copper sulfate, sedimentation, rapid sand filtration, chlorination, sodium chlorite, and soda ash.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 1,250,000 gal.
Finished-water storage: 400,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	17	11	Hardness as $CaCO_3$:		
Iron (Fe)	--	.0	Total	106	97
Manganese (Mn)	--	.01	Noncarbonate	58	66
Calcium (Ca)	--	30			
Magnesium (Mg)	--	5.5	Color	7	2
Sodium (Na)	9.6	22	pH	7.2	7.0
Potassium (K)		1.8	Specific conductance (micromhos at 25 C.)	282	320
Carbonate (CO_3)	0	0	Turbidity	--	0.3
Bicarbonate (HCO_3)	58	39	Temperature (F.)	--	--
Sulfate (SO_4)	48	63	Date of collection	Feb. 1, 1952	Feb. 1, 1952
Chloride (Cl)	18	33			
Fluoride (F)	--	.3			
Nitrate (NO_3)	5.0	4.2			
Dissolved solids	--	197			

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	46	--	--	7.2	7.7	6.7	98	105	94	18	135	1.0
Finished water	34	--	--	6.9	7.4	5.9	--	--	--	.6	1.8	0

RIDGEWOOD
(Population, 17,481)

Ownership: Municipal: also supplies Glen Rock, Hohokus, Midland Park, and Wyckoff township. Total population supplied, about 42,000.
Source: 29 wells as follows: Ames (3, 5, 6, 7) 350 to 455 ft deep; Wortendyke (2, 6, 7) 1,137, 337, and 360 ft deep; Cedar Hill (1 to 6) 315 to 500 ft deep; Ridgewood Avenue 201 ft deep; Lynwood 261 ft deep; Grove St. 298 ft deep; Farview 402 ft deep; East Saddle River 400 ft deep; and 11 suction wells (very old), reported to yield a total of 800 gpm. The average yield from the other wells is reported to be 206 gpm.
Treatment: Chlorination.
Rated capacity of pumping plants: 4,500 gpm.
Raw-water storage: --
Finished-water storage: 4 steel tanks and 1 standpipe. Total, 1,300,000 gal.

RIDGEWOOD--Continued

ANALYSIS

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

	Well 4[a] Cedar Hill		Well 4[a] Cedar Hill
Silica (SiO_2)	15	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	104
Manganese (Mn)	.00	Noncarbonate	21
Calcium (Ca)	25		
Magnesium (Mg)	10	Color	0
Sodium (Na)	4.9	pH	7.8
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	244
Carbonate (CO_3)	0	Turbidity	2.8
Bicarbonate (HCO_3)	101	Temperature (F.)	--
Sulfate (SO_4)	20	Date of collection	Mar. 25, 1953
Chloride (Cl)	4.8		
Fluoride (F)	.1		
Nitrate (NO_3)	9.2		
Dissolved solids	150		
Depth (feet)			315
Diameter (inches)			12
Date drilled			1932
Percent of supply			--

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	--	--	--	--	--	--	--	--	--	--	--	--
Finished water	78	89	69	7.4	7.8	7.3	105	116	84	0	0	0

[a] The water from well 4 represents about the average of the supply.

ROSELLE

(Population, 17,681)

Ownership: Supplied by Plainfield-Union Water Company. (See Plainfield.)
Elizabethtown Water Company supplies a small part of Roselle. (See Elizabeth.)

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	238
Manganese (Mn)	--	Noncarbonate	103
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	2
Sodium (Na)	15	pH	7.9
Potassium (K)		Specific conductance (micromhos at 25 C.)	515
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	165	Temperature (F.)	--
Sulfate (SO_4)	109	Date of collection	Feb. 1, 1952
Chloride (Cl)	12		
Fluoride (F)	--		
Nitrate (NO_3)	11		
Dissolved solids	--		

RUTHERFORD
(Population, 17,411)

Ownership: Supplied by Hackensack Water Company. (See Hackensack.)

SOUTH ORANGE village
(Population, 15,230)

Ownership: Municipal.
Source: 10 wells (1 to 3, 5, 7, 8, 11 to 14) 274, 276, 275, 300, 290, 300, 301, 382, 349, and 355 ft deep; yield reported to be 87, 170, 297, 222, 250, 220, 520, 200, 490, and 235 gpm. Auxiliary or emergency supplies, connection with Commonwealth Water Company and East Orange Water Department.
Treatment: Softening with zeolite.
Rated capacity of treatment plant: 2,750,000 gpd.
Raw-water storage: None.
Finished-water storage: 3 reservoirs, 3,700,000 gal.

ANALYSES

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

	Finished water	Finished water [a]		Finished water	Finished water [a]
Silica (SiO_2)	--	16	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.1	Total	44	40
Manganese (Mn)	--	--	Noncarbonate	0	0
Calcium (Ca)	--	12			
Magnesium (Mg)	--	2.2	Color	2	3
Sodium (Na)	83	84	pH	6.8	7.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	464	--
Carbonate (CO_3)	0	0	Turbidity	--	3
Bicarbonate (HCO_3)	143	140	Temperature (F.)	--	--
Sulfate (SO_4)	59	60	Date of collection	Jan. 30, 1952	Jan. 7, 1952
Chloride (Cl)	26	28			
Fluoride (F)	--	.05			
Nitrate (NO_3)	12	15			
Dissolved solids	--	[b] 286			

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	--	--	--	--	--	--	198	214	186	--	--	--
Finished water	--	--	--	--	--	--	45	48	41	--	--	--

[a] Analysis by Permutit Company, New York, N. Y.
[b] Sum of determined constituents.

SUMMIT
(Population, 17,929)

Ownership: Commonwealth Water Company (controlled by American Water Works Company, Inc.) owns and operates the supply works, the transmission and distribution systems, and serves Irvington, New Providence, Summit, and West Orange; Chatham, Maplewood, Millburn, New Providence, Passaic; and Springfield townships; also a small part of Hillside and Union townships. It sells water for the entire supply to Livingston township. Total population supplied, about 160,000.

Source: Canoe Brook Station (in Millburn township): 9 wells of 18 (9 wells held in reserve) 105 to 309 ft deep, and Canoe Brook pumped into 2 reservoirs (1 and 2); Baltusrol Station (in Summit): 8 wells 200 to 462 ft deep and infiltration galleries; Short Hills Station (in Springfield): 3 wells 77 to 85 ft deep. The aggregate diversion from the Canoe Brook Station is limited to 10,375,000 gpd; from the Baltusrol Station, to 1,570,000 gpd; and from the Short Hills Station, to 3,000,000 gpd. The wells pump directly into the distribution system or into suction basins and storage.

Treatment: Surface Supply: coagulation with alum, activated carbon, sedimentation, rapid sand filtration, pH adjustment, and chlorination. Well supply: none.

Rated capacity of treatment plant: 10,000,000 gpd.

Raw-water storage: Canoe Brook Station: Reservoir 1, 735,000,000 gal and Reservoir 2 (filled by transfer from Reservoir 1) 620,000,000 gal.

Finished-water storage: Druid Hill standpipe (in Summit), 610,000 gal; West Orange standpipes, 1,131,000 gal; Short Hills standpipe (in Millburn), 317,200 gal; Day elevated tank (in Millburn), 100,000 gal; West Orange reservoir (concrete covered), 1,000,000 gal; Wyoming Reservoirs (in Millburn township), 1,000,000 and 1,700,000 gal; Baltusrol Reservoir, 160,000 gal; standpipe (Chatham township), 1,420,000 gal; suction basins, 439,000 gal.

There are 6 services on the supply system, 4 of which are supplied by booster pumps. The greater part of the area served is on the Canoe Brook Station low service. A higher section of Millburn is supplied by the Short Hills Pumping Station high service. Practically all of Summit and all the area north and west of Summit is supplied by the Summit high service from the Baltusrol Pumping Station with an auxiliary supply from the Canoe Brook low service.

SUMMIT--Continued

ANALYSES

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

	Wells [a]	Canoe Brook [b]	Finished water [c]	Finished water [d]	Finished water [e]
Silica (SiO_2)	28	17	15	23	25
Iron (Fe)	--	--	.02	.01	.01
Manganese (Mn)	--	--	.00	.01	.00
Calcium (Ca)	--	--	34	28	50
Magnesium (Mg)	--	--	4.3	3.8	11
Sodium (Na)	3.8	7.5	11	9.0	7.7
Potassium (K)			1.1	1.0	.6
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	150	26	69	70	150
Sulfate (SO_4)	24	39	55	36	44
Chloride (Cl)	8	10	8.0	8.0	8.5
Fluoride (F)	--	--	.1	.1	.0
Nitrate (NO_3)	1.4	3.0	1.6	1.5	7.8
Dissolved solids	--	--	171	145	243
Hardness as $CaCO_3$:					
Total	152	62	103	85	170
Noncarbonate	29	41	46	28	47
Color	3	28	0	0	0
pH	7.7	7.0	7.9	7.1	7.9
Specific conductance (micromhos at 25 C.)	345	171	258	219	355
Turbidity	--	--	0.2	0.4	0.3
Temperature (F.)	--	--	--	--	--
Date of collection	Jan. 31, 1952	Jan. 31, 1952	Jan. 31, 1952	Jan. 31, 1952	Jan. 31, 1952

[a] Canoe Brook Station. [b] Prior to being pumped into Reservoir 1.
[c] Canoe Brook Station; mixture of water from wells and Canoe Brook.
[d] Baltusrol Station. [e] Short Hills Station.

TEANECK township
(Population, 33,772)

Ownership: Supplied by Hackensack Water Company. (See Hackensack.)

TRENTON
(Population, 128,009)

Ownership: Municipal; also supplies parts of Ewing, Hamilton, and Lawrence townships. Total population supplied, about 175,000.
Source: Delaware River.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 30,000,000 gpd.
Raw-water storage: --
Finished-water storage: 120,000,000 gal.

TRENTON--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.6	5.7	Hardness as $CaCO_3$:		
Iron (Fe)	--	.01	Total	48	53
Manganese (Mn)	--	.00	Noncarbonate	25	33
Calcium (Ca)	--	17			
Magnesium (Mg)	--	2.6	Color	11	0
Sodium (Na)	3.2	3.0	pH	6.9	7.5
Potassium (K)		.9	Specific conductance (micromhos at 25 C.)	119	128
Carbonate (CO_3)	0	0	Turbidity	--	0.5
Bicarbonate (HCO_3)	28	24	Temperature (F.)	--	--
Sulfate (SO_4)	21	27	Date of collection	Feb. 1, 1952	Feb. 1, 1952
Chloride (Cl)	5	5.1			
Fluoride (F)	--	.1			
Nitrate (NO_3)	3.7	3.1			
Dissolved solids	--	80			

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	31	61	9	7.3	8.3	6.7	--	--	--	30	500	3
Finished water	33	70	2	7.2	9.8	4.4	59	72	40	0	0	0

UNION CITY

(Population, 55,537)

Ownership: Supplied by Hackensack Water Company. (See Hackensack.)

UNION township

(Population, 38,004)

Ownership: Elizabethtown Water Company (see Elizabeth) supplies about 90 percent of population; Plainfield Union Water Company (see Plainfield) and Commonwealth Water Company (see Summit) supply the remainder of the population.

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	208
Manganese (Mn)	--	Noncarbonate	70
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	1
Sodium (Na)	7.8	pH	7.7
Potassium (K)		Specific conductance (micromhos at 25 C.)	436
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	168	Temperature (F.)	44
Sulfate (SO_4)	61	Date of collection	Jan. 31, 1952
Chloride (Cl)	12		
Fluoride (F)	--		
Nitrate (NO_3)	8.5		
Dissolved solids	--		

[a] Tap sample, Mones Avenue and Brunell St., Union township.

WESTFIELD
(Population, 21,243)

Ownership: Supplied by the Plainfield-Union Water Company. (See Plainfield.)

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	240
Manganese (Mn)	--	Noncarbonate	83
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	1
Sodium (Na)	10	pH	7.9
Potassium (K)		Specific conductance (micromhos at 25 C.)	500
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	192	Temperature (F.)	48
Sulfate (SO_4)	74	Date of collection	Jan. 31, 1952
Chloride (Cl)	12		
Fluoride (F)	--		
Nitrate (NO_3)	14		
Dissolved solids	--		

[a] City tap, Westfield.

WEST NEW YORK
(Population, 37,683)

Ownership: Suppled by Hackensack Water Company. (See Hackensack.)

WEST ORANGE
(Population, 28, 605)

Ownership: Supplied by the Commonwealth Water Company. (See Summit, Canoe Brook Station.)

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	--	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	124
Manganese (Mn)	--	Noncarbonate	42
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	1
Sodium (Na)	8.9	pH	7.5
Potassium (K)		Specific conductance (micromhos at 25 C.)	288
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	100	Temperature (F.)	--
Sulfate (SO_4)	47	Date of collection	Jan. 30, 1952
Chloride (Cl)	7		
Fluoride (F)	--		
Nitrate (NO_3)	3.4		
Dissolved solids	--		

[a] City tap, 5 Northfield Avenue, West Orange.

WOODBRIDGE township
(Population, 35,758)

Ownership: Middlesex Water Company; also supplies boroughs of Carteret, Metuchen, and South Plainfield; and Raritan township. Total population supplied, about 93,500.

Source: Wells (70 percent of supply) as follows: 17 wells 300 ft deep, each reported to yield 300 gpm; 4 wells 100 ft deep, reported to yield a total of 1,000 gpm; 2 wells 400 and 450 ft deep, reported to yield a total of 350 gpm. Reservoir (surface water) 30 percent of supply.

Treatment: Well supply: chlorination. Surface supply: Prechlorination, coagulation with alum, sedimentation, filtration, aeration, postchlorination, and adjustment of pH with lime. Copper sulfate is used to control algae in the reservoir.

Rated capacity of treatment plant: 7,000,000 gpd.

Raw-water storage: Reservoir (surface water supply only).

Finished-water storage: -- (surface water supply only).

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	9.0	Hardness as $CaCO_3$:	
Iron (Fe)	.15	Total	63
Manganese (Mn)	.29	Noncarbonate	54
Calcium (Ca)	19		
Magnesium (Mg)	3.8	Color	5
Sodium (Na)	5.8	pH	6.8
Potassium (K)	2.0	Specific conductance (micromhos at 25 C.)	184
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	11	Temperature (F.)	--
Sulfate (SO_4)	53	Date of collection	Feb. 1, 1952
Chloride (Cl)	8.0		
Fluoride (F)	.1		
Nitrate (NO_3)	2.7		
Dissolved solids	112		

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	32	49	9	6.9	8.0	5.8	--	--	--	13	65	3
Finished water	33	45	14	7.6	8.0	7.0	110	170	80	.66	3.6	0

[a] Mixed sample, well water and surface water supply.

ALBANY
(Population, 134,995)

Ownership: Municipal.
Source: Alcove Creek impounded in Alcove Reservoir, about 92 percent of supply; Basic Creek impounded in Basic Reservoir, about 8 percent of supply. Auxiliary or emergency supply, Hudson River.
Treatment: Aeration, coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 32,000,000 gpd.
Raw-water storage: Alcove Reservoir, 12,000,000,000 gal; Basic Reservoir, 1,000,000,000 gal.
Finished-water storage: 202,000,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	1.8	Hardness as $CaCO_3$:	
Iron (Fe)	.00	Total	54
Manganese (Mn)	.00	Noncarbonate	20
Calcium (Ca)	18		
Magnesium (Mg)	2.2	Color	2
Sodium (Na)	1.7	pH	8.1
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	122
Carbonate (CO_3)	0	Turbidity	4.2
Bicarbonate (HCO_3)	41	Temperature (F.)	41
Sulfate (SO_4)	21	Date of collection	Jan. 16, 1952
Chloride (Cl)	2.4		
Fluoride (F)	.0		
Nitrate (NO_3)	.2		
Dissolved solids	70		

Regular determinations at treatment plant, 1949

	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	30	43	20	8.5	8.9	7.3	47	59	39	0.1	0.3	0.0

AMSTERDAM
(Population, 32,240)

Ownership: Municipal.
Source: Glen Wild Reservoir (impounded supply).
Treatment: Chlorination.
Raw-water storage: 2,600,000,000 gal.
Finished-water storage: ---

AMSTERDAM--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	6.7	Hardness as $CaCO_3$:	
Iron (Fe)	.22	Total	11
Manganese (Mn)	.01	Noncarbonate	9
Calcium (Ca)	2.8		
Magnesium (Mg)	1.0	Color	38
Sodium (Na)	.6	pH	5.5
Potassium (K)	.2	Specific conductance (micromhos at 25 C.)	36.6
Carbonate (CO_3)	0	Turbidity	3.9
Bicarbonate (HCO_3)	2	Temperature (F.)	46
Sulfate (SO_4)	7.8	Date of collection	Jan. 15, 1952
Chloride (Cl)	2.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.7		
Dissolved solids	36		

AUBURN

(Population, 36,722)

Ownership: Municipal; also supplies about 2,000 people outside the city limits. Total population supplied, about 38,700.
Source: Owasco Lake.
Treatment: Slow sand filtration, and chlorination.
Rated capacity of treatment plant: 9,500,000 gpd.
Raw-water storage: Owasco Lake.
Finished-water storage: 12,500,000 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)	.02	Total	127
Manganese (Mn)	.00	Noncarbonate	20
Calcium (Ca)	38		
Magnesium (Mg)	7.8	Color	4
Sodium (Na)	1.7	pH	8.0
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	252
Carbonate (CO_3)	0	Turbidity	1.1
Bicarbonate (HCO_3)	131	Temperature (F.)	42
Sulfate (SO_4)	17	Date of collection	Jan. 31, 1952
Chloride (Cl)	2.6		
Fluoride (F)	.1		
Nitrate (NO_3)	2.4		
Dissolved solids	144		

BATAVIA
(Population, 17,799)

Ownership: Municipal.
Source: Tonawanda Creek.
Treatment: Prechlorination, coagulation with alum, and softening with lime, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: --
Finished-water storage: 2,150,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	7.1	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	82
Manganese (Mn)	.00	Noncarbonate	59
Calcium (Ca)	28		
Magnesium (Mg)	3.0	Color	5
Sodium (Na)	4.0	pH	9.1
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	210
Carbonate (CO_3)	5	Turbidity	0.9
Bicarbonate (HCO_3)	18	Temperature (F.)	--
Sulfate (SO_4)	52	Date of collection	Feb. 3, 1952
Chloride (Cl)	9.0		
Fluoride (F)	.1		
Nitrate (NO_3)	1.9		
Dissolved solids	126		

Regular determinations at treatment plant, 1950-51

	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	195	220	70	7.6	8.0	7.4	210	300	150	10	610	5
Finished water	185	205	60	8.4	8.4	8.4	225	315	165	0	0	0

BINGHAMTON
(Population, 80,674)

Ownership: Municipal; also supplies about 12,000 people outside the city limits. Total population supplied, about 93,000.
Source: Susquehanna River. Auxiliary or emergency supply, wells (2,000,000 gpd).
Treatment: Prechlorination, coagulation with alum and lime, carbon when needed, sedimentation, rapid sand filtration, and postchlorination (chlorine dioxide).
Rated capacity of treatment plant: 21,000,000 gpd.
Raw-water storage: --
Finished-water storage: 5,750,000 gal.

BINGHAMTON--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	3.8	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	70
Manganese (Mn)	.03	Noncarbonate	16
Calcium (Ca)	24		
Magnesium (Mg)	2.5	Color	0
Sodium (Na)	2.2	pH	7.3
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	153
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	66	Temperature (F.)	--
Sulfate (SO_4)	16	Date of collection	Feb. 19, 1952
Chloride (Cl)	3.2		
Fluoride (F)	.1		
Nitrate (NO_3)	1.8		
Dissolved solids	91		

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	--	--	--	7.3	7.7	6.8	62	93	30	60	1400	10
Finished water	--	--	--	7.2	7.4	6.7	57	87	26	0	0	0

BUFFALO

(Population, 580,132)

Ownership: Municipal.
Source: Lake Erie. Emergency supply, Niagara River.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 160,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 30,000,000 gal (clear well).

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	.5	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	124
Manganese (Mn)	.00	Noncarbonate	35
Calcium (Ca)	36		
Magnesium (Mg)	8.3	Color	1
Sodium (Na)	9.3	pH	7.4
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	285
Carbonate (CO_3)	0	Turbidity	0.6
Bicarbonate (HCO_3)	108	Temperature (F.)	--
Sulfate (SO_4)	26	Date of collection	Mar. 19, 1952
Chloride (Cl)	20		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	164		

CHEEKTOWAGA town
(Population, 45,354)

Ownership: Supplied by Western New York Water Company. (See Lackawanna.)

COHOES
(Population, 21,272)

Ownership: Municipal.
Source: Mohawk River.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, incidental pH correction, and chlorination.
Rated capacity of treatment plant: 8,500,000 gpd.
Raw-water storage: --
Finished-water storage: 250,000 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)	.06	Total	104
Manganese (Mn)	.00	Noncarbonate	34
Calcium (Ca)	32		
Magnesium (Mg)	5.9	Color	4
Sodium (Na)	4.0	pH	7.1
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	222
Carbonate (CO_3)	0	Turbidity	6.5
Bicarbonate (HCO_3)	86	Temperature (F.)	39
Sulfate (SO_4)	34	Date of collection	Jan. 16, 1952
Chloride (Cl)	5.1		
Fluoride (F)	.0		
Nitrate (NO_3)	1.4		
Dissolved solids	132		

CORNING
(Population, 17,684)

Ownership: Municipal; also supplies South Corning. Total population supplied, about 18,600.
Source: 3 drilled wells (1 to 3) 77, 64, and 70 ft deep (70 percent of supply); 1 dug well (30 percent of supply). The yield of wells 1, 2, and 3 is reported to be 700, 700, and 750 gpm, respectively.
Treatment: Chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,000,000 gal.

CORNING--Continued

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

	Wells [a]		Wells [a]
Silica (SiO_2)	8.7	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	216
Manganese (Mn)	.00	Noncarbonate	44
Calcium (Ca)	67		
Magnesium (Mg)	12	Color	0
Sodium (Na)	13	pH	7.8
Potassium (K)	1.6	Specific conductance (micromhos at 25 C.)	468
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	212	Temperature (F.)	50
Sulfate (SO_4)	50	Date of collection	June 6, 1952
Chloride (Cl)	14		
Fluoride (F)	.0		
Nitrate (NO_3)	3.9		
Dissolved solids	278		

[a] Wells 1, 2, and 3 (impounding basin).

CORTLAND
(Population, 18,152)

Ownership: Municipal; also supplies about 300 people outside the city limits. Total population supplied, about 18,500.
Source: 3 dug wells (1 to 3) 17, 15, and 76 ft deep; yield reported to be 3,000, 2,000, and 2,500 gpm.
Treatment: Chlorination.
Rated capacity of treatment plant: --
Raw-water storage: --
Finished-water storage: 2,200,000 gal.

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

	Well 1		Well 1
Silica (SiO_2)	7.6	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	168
Manganese (Mn)	.00	Noncarbonate	30
Calcium (Ca)	53		
Magnesium (Mg)	8.8	Color	0
Sodium (Na)	2.2	pH	7.6
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	317
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	169	Temperature (F.)	--
Sulfate (SO_4)	21	Date of collection	Jan. 31, 1952
Chloride (Cl)	3.5		
Fluoride (F)	.1		
Nitrate (NO_3)	11		
Dissolved solids	188		

Depth (feet)	17
Diameter (feet)	20
Date dug	1917
Percent of supply	--

DUNKIRK
(Population, 18,007)

Ownership: Municipal; also supplies about 800 people outside the city limits. Total population supplied, about 18,800.
Source: Lake Erie. Auxiliary supply connection with the city system of Fredonia.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: --
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)	2.6	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	128
Manganese (Mn)	.00	Noncarbonate	47
Calcium (Ca)	38		
Magnesium (Mg)	8.0	Color	0
Sodium (Na)	10	pH	7.4
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	303
Carbonate (CO_3)	0	Turbidity	0.3
Bicarbonate (HCO_3)	98	Temperature (F.)	36
Sulfate (SO_4)	32	Date of collection	Feb. 6, 1952
Chloride (Cl)	26		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	178		

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	91	96	88	7.9	8.3	7.5	--	--	--	21	150	.4
Finished water	86	92	80	7.2	7.5	6.9	121	122	120	.04	.40	.02

ELMIRA
(Population, 49,716)

Ownership: Municipal; also supplies about 20,000 people outside the city limits. Total population supplied, about 70,000.
Source: Chemung River 58 percent of supply; Hoffman Creek impounded 42 percent of supply.
Treatment: Aeration (spray), coagulation with alum, sedimentation, rapid sand filtration, ammoniation, and chlorination. Soda ash or lime is used when necessary. Fluoridation (begun Feb. 10, 1953) with sodium silicofluoride to a content of about 1.0 ppm of fluoride in the finished water.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 150,000,000 gal.
Finished-water storage: 10,500,000 gal.

ELMIRA--Continued

ANALYSES

(Analyses, in parts per million, by Bureau of Environmental Sanitation)

	Chemung River		Hoffman Creek		
	Raw water	Finished water	Raw water	Raw water [a]	Finished water
Silica (SiO_2)	30	0.8	20	5.7	4.5
Iron (Fe)	.20	.05	1.8	.03	.05
Manganese (Mn)	.05	0	.01	.00	--
Calcium (Ca)	42	41	13	18	14
Magnesium (Mg)	5.2	5.3	3.0	3.8	3.4
Sodium (Na)	12	15	4.1	3.5	4.6
Potassium (K)				1.3	
Carbonate (CO_3)	--	--	--	0	--
Bicarbonate (HCO_3)	115	105	32	32	28
Sulfate (SO_4)	31	37	18	32	26
Chloride (Cl)	19	23	5.0	6.2	5.5
Fluoride (F)	--	--	--	.0	--
Nitrate (NO_3)	.1	.3	2.2	2.4	1.6
Dissolved solids	230	185	105	92	85
Hardness as $CaCO_3$:					
Total	126	124	45	60	49
Noncarbonate	32	38	19	34	26
Color	8	0	40	4	0
pH	7.9	7.6	7.1	7.7	7.2
Specific conductance (micromhos at 25 C.)	--	--	--	156	--
Turbidity	5.0	0	50	1.0	0
Temperature (F.)	--	--	--	--	--
Date of analyses	Sept. 10, 1951	Sept. 10, 1951	Sept. 10, 1951	Feb. 11, 1952	Sept. 10, 1951

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	53	95	10	7.5	8.4	6.1	103	144	42	116	--	5
Finished water	44	86	10	7.4	8.4	6.1	103	144	51	0	0	0

[a] Analysis by U. S. Geological Survey.

ENDICOTT
(Population, 20,050)

Ownership: Endicott Water Works Company; also supplies about 31,000 people in other places. Total population supplied, about 51,000.
Source: 5 wells 100, 160, 100, 150, and 150 ft deep; yield reported to be 4,000, 3,000, 2,500, 1,500, and 4,000 gpm.
Treatment: Chlorination.
Raw-water storage: --
Finished-water storage: 5,500,000 gal.

ENDICOTT--Continued

ANALYSIS

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

	Well 1[a]		Well 1[a]
Silica (SiO_2)	10	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	138
Manganese (Mn)	.02	Noncarbonate	15
Calcium (Ca)	41		
Magnesium (Mg)	8.8	Color	5
Sodium (Na)	8.0	pH	8.0
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	296
Carbonate (CO_3)	0	Turbidity	1.8
Bicarbonate (HCO_3)	151	Temperature (F.)	52
Sulfate (SO_4)	16	Date of collection	Feb. 12, 1952
Chloride (Cl)	10		
Fluoride (F)	.1		
Nitrate (NO_3)	1.5		
Dissolved solids	176		
Depth (feet)			100
Diameter (feet)			13
Date drilled			1947
Percent of supply			--

[a] Ranney collector.

FREEPORT

(Population, 24,680)

Ownership: Municipal.
Source: 2 wells (N68, N134) 552 and 557 ft deep; yield reported to be 1,570 and 1,500 gpm.
Treatment: Addition of Calgon and lime.
Rated capacity of treatment plant: 12,000,000 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)	7.1	Hardness as $CaCO_3$:	
Iron (Fe)	.26	Total	7
Manganese (Mn)	--	Noncarbonate	0
Calcium (Ca)	2.1		
Magnesium (Mg)	.5	Color	2
Sodium (Na)	3.1	pH	6.4
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	31.3
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	10	Temperature (F.)	--
Sulfate (SO_4)	3.5	Date of collection	Jan. 16, 1952
Chloride (Cl)	3.2		
Fluoride (F)	.0		
Nitrate (NO_3)	--		
Dissolved solids	25		

GENEVA
(Population, 17,144)

Ownership: Municipal; also supplies about 400 people outside the city limits. Total population supplied, about 17,500.
Source: Seneca Lake.
Treatment: Slow sand filtration and chlorination.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 3,500,000 gal.
Finished-water storage: 500,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	1.9	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	141
Manganese (Mn)	.00	Noncarbonate	44
Calcium (Ca)	40		
Magnesium (Mg)	10	Color	1
Sodium (Na)	61	pH	7.6
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	584
Carbonate (CO_3)	0	Turbidity	0.3
Bicarbonate (HCO_3)	118	Temperature (F.)	--
Sulfate (SO_4)	34	Date of collection	Feb. 5, 1952
Chloride (Cl)	102		
Fluoride (F)	.1		
Nitrate (NO_3)	1.8		
Dissolved solids	323		

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	93	96	91	7.8	8	7.5	112	115	110	--	--	--

GLEN COVE
(Population 15,130)

Ownership: New York Water Service Corp. Total population supplied, about 20,000.
Source: 21 wells 40 to 303 ft deep. Seven of the wells are 40 to 45 ft deep; two, 120 and 128 ft deep; eleven, 146 to 177 ft deep; and one (N835) 303 ft deep. All are flowing wells. All are pumped by common suction except well N835 and the well 177 ft deep.
Treatment: None.
Storage: 530,000 gal.

GLEN COVE--Continued

ANALYSIS

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

	Suction wells		Suction wells
Silica (SiO_2)	14	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	30
Manganese (Mn)	.00	Noncarbonate	16
Calcium (Ca)	7.2		
Magnesium (Mg)	2.9	Color	5
Sodium (Na)	6.2	pH	7.0
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	108
Carbonate (CO_3)	0	Turbidity	1.4
Bicarbonate (HCO_3)	17	Temperature (F.)	52
Sulfate (SO_4)	10	Date of collection	Jan. 17, 1952
Chloride (Cl)	9.2		
Fluoride (F)	.1		
Nitrate (NO_3)	7.5		
Dissolved solids	74		

GLEN FALLS
(Population, 19,610)

Ownership: Municipal; also supplies about 1,500 people outside the city limits. Total population supplied, about 21,100.
Source: Streams impounded in 3 reservoirs: Butler Reservoir 49 percent of supply; Keenan Reservoir 41 percent of supply; Wilkie Reservoir 10 percent of supply. Auxiliary or emergency supply, Halfway Brook impounded.
Treatment: Chlorination.
Raw-water storage: 878,000,000 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_3)	6.4	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	16
Manganese (Mn)	.00	Noncarbonate	6
Calcium (Ca)	4.8		
Magnesium (Mg)	1.0	Color	3
Sodium (Na)	1.0	pH	6.7
Potassium (K)	.5	Specific conductance (micromhos at 25 C.)	41.4
Carbonate (CO_3)	0	Turbidity	4.8
Bicarbonate (HCO_3)	12	Temperature (F.)	50
Sulfate (SO_4)	5.0	Date of collection	Jan. 15, 1952
Chloride (Cl)	1.8		
Fluoride (F)	.2		
Nitrate (NO_3)	.4		
Dissolved solids	29		

GLOVERSVILLE
(Population, 23,634)

Ownership: Municipal; also supplies about 500 people outside the city limits. Total population supplied, about 24,100.
Source: Small streams impounded in 3 reservoirs. Auxiliary or emergency supply, Mountain Lake by pumping from city of Johnstown.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, soda ash for pH control, and Actophos for iron suspension.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 560,000,000 gal.
Finished-water storage: 7,500,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	6.0	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	21
Manganese (Mn)	.01	Noncarbonate	0
Calcium (Ca)	7.0		
Magnesium (Mg)	.9	Color	2
Sodium (Na)	8.4	pH	7.5
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	82.5
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	29	Temperature (F.)	--
Sulfate (SO_4)	14	Date of collection	Feb. 14, 1952
Chloride (Cl)	1.2		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	53		

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	14	7	6.7	6.9	6.5	17	20	15	2	4	1
Finished water	23	25	21	7.5	7.5	7.5	23	25	21	.1	.1	.1

HEMPSTEAD
(Population, 29,135)

Ownership: Municipal.
Source: 6 wells. The depths of wells 2, 5, and 6 are reported to be 426, 525, and 406 ft; and the yields, 1,200, 1,000, and 1,000 gpm, respectively.
Treatment: Aeration (spray), chlorination, sedimentation, and addition of lime and Calgon.
Rated capacity of treatment plant: --
Raw-water storage: Aeration basin, 2,225,000 gal.
Finished-water storage: 3,000,000 gal.

HEMPSTEAD--Continued

ANALYSIS

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

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	7.6	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	10
Manganese (Mn)	.00	Noncarbonate	3
Calcium (Ca)	2.2		
Magnesium (Mg)	1.1	Color	0
Sodium (Na)	4.9	pH	6.4
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	48.7
Carbonate (CO_3)	0	Turbidity	2.2
Bicarbonate (HCO_3)	8	Temperature (F.)	--
Sulfate (SO_4)	4.2	Date of collection	Apr. 8, 1952
Chloride (Cl)	8.6		
Fluoride (F)	.0		
Nitrate (NO_3)	1.8		
Dissolved solids	35		

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	--	--	--	5.5	5.9	5.2	--	--	--	--	--	--
Finished water	--	--	--	7.5	8.5	7.5	--	--	--	--	--	--

HORNELL

(Population, 15,049)

Ownership: Municipal; also supplies North Hornell. Total population supplied, about 17,000.

Source: Small streams impounded in 4 reservoirs. Auxiliary supply, 1 well 56 ft deep (not used in 1950).

Treatment: Aeration, coagulation with alum, sedimentation, pressure filtration, and chlorination.

Rated capacity of treatment plant: 4,000,000 gpd.

Raw-water storage: 395,000,000 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)	3.5	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	76
Manganese (Mn)	.02	Noncarbonate	44
Calcium (Ca)	24		
Magnesium (Mg)	4.0	Color	2
Sodium (Na)	3.2	pH	7.0
Potassium (K)	1.5	Specific conductance (micromhos at 25 C.)	179
Carbonate (CO_3)	0	Turbidity	1.3
Bicarbonate (HCO_3)	40	Temperature (F.)	--
Sulfate (SO_4)	41	Date of collection	Feb. 25, 1953
Chloride (Cl)	7.0		
Fluoride (F)	.1		
Nitrate (NO_3)	1.5		
Dissolved solids	104		

HORNELL--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	70	136	37	7.2	7.4	7.0	--	--	--	10	100	5
Finished water	65	133	34	7.1	7.4	6.8	83	99	59	0	0	0

HUNTINGTON
(Population, 9,324)

Ownership: New York Water Service Corporation; also supplies Centerport, Cold Spring Harbor, Huntington Bay Hills, Huntington Station, and Loyd Harbor. Total population supplied, about 30,000.
Source: Wells: 5 wells 45 ft deep; 2 wells 540 and 600 ft deep, each reported to yield 700 gpm.
Treatment: Chlorination.
Raw-water storage: --
Finished-water storage: 1,335,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	37
Manganese (Mn)	.00	Noncarbonate	8
Calcium (Ca)	9.2		
Magnesium (Mg)	3.5	Color	1
Sodium (Na)	7.1	pH	7.3
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	115
Carbonate (CO_3)	0	Turbidity	0.3
Bicarbonate (HCO_3)	36	Temperature (F.)	--
Sulfate (SO_4)	9.0	Date of collection	Feb. 15, 1952
Chloride (Cl)	7.4		
Fluoride (F)	.0		
Nitrate (NO_3)	5.2		
Dissolved solids	80		

IRONDEQUOIT town
(Population, 34,417)

Ownership: Supplied by Rochester. (See Rochester.)

ITHACA
(Population, 29,257)

Ownership: Municipal; also supplies about 2,000 people outside the city limits. Total population supplied, about 31,300.
Source: Six Mile Creek impounded. Emergency supply, connection with Cornell University supply.
Treatment: Superchlorination, coagulation with alum, sedimentation, rapid sand filtration, and dechlorination with sulfur dioxide.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 316,000,000 gal.
Finished-water storage: 4,924,000 gal.

ITHACA--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	3.5	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	67
Manganese (Mn)	.00	Noncarbonate	29
Calcium (Ca)	22		
Magnesium (Mg)	2.9	Color	1
Sodium (Na)	5.2	pH	7.4
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	163
Carbonate (CO_3)	0	Turbidity	0.5
Bicarbonate (HCO_3)	46	Temperature (F.)	--
Sulfate (SO_4)	29	Date of collection	Feb. 5, 1952
Chloride (Cl)	5.8		
Fluoride (F)	.2		
Nitrate (NO_3)	1.6		
Dissolved solids	96		

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	72	113	44	7.5	7.7	7.3	93	129	63	80	261	11
Finished water	66	98	40	6.7	6.8	6.7	92	132	61	4	13	--

JAMESTOWN
(Population, 43,354)

Ownership: Municipal; also supplies about 6,600 people outside the city limits. Total population supplied, about 50,000.

Source: 16 wells each about 130 ft deep 3 miles east of the city. Nine wells, (total yield reported to be 3,500 gpm) during periods of high ground water level, are siphoned into a receiving well from which the water is pumped into the transmission and distribution system. Seven wells (total yield reported to be 4,900 gpm) are equipped with deep well pumps, and during summer months and dry periods, pump into the receiving well.

Treatment: Chlorination.

Raw-water storage: --

Finished-water storage: English Hill reservoir, 5,000,000 gal; Buffalo Street reservoir, 1,500,000 gal.

JAMESTOWN--Continued

ANALYSIS

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

	Well 4 (raw water)		Well 4 (raw water)
Silica (SiO_2)	6.1	Hardness as $CaCO_3$:	
Iron (Fe)	.13	Total	103
Manganese (Mn)	.01	Noncarbonate	21
Calcium (Ca)	32		
Magnesium (Mg)	5.6	Color	1
Sodium (Na)	3.9	pH	8.0
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	214
Carbonate (CO_3)	0	Turbidity	0.7
Bicarbonate (HCO_3)	100	Temperature (F.)	48
Sulfate (SO_4)	24	Date of collection	Feb. 5, 1952
Chloride (Cl)	2.6		
Fluoride (F)	.1		
Nitrate (NO_3)	.3		
Dissolved solids	127		
Depth (feet)			125
Diameter (inches)			12
Date drilled			1947
Percent of supply			--

JOHNSON CITY

(Population, 19,249)

Ownership: Municipal; also supplies about 4,100 people outside the city limits. Total population supplied, about 23,300.

Source: 3 wells (1 to 3) 100, 101, and 89 ft deep; yield reported to be 2,100, 2,180, and 2,200 gpm. Auxiliary supply, 2 wells.

Treatment: Chlorination.

Finished-water storage: 4,000,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	9.9	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	207
Manganese (Mn)	.00	Noncarbonate	46
Calcium (Ca)	55		
Magnesium (Mg)	17	Color	4
Sodium (Na)	7.8	pH	8.1
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	411
Carbonate (CO_3)	0	Turbidity	1.3
Bicarbonate (HCO_3)	197	Temperature (F.)	50
Sulfate (SO_4)	40	Date of collection	Jan. 15, 1952
Chloride (Cl)	12		
Fluoride (F)	.4		
Nitrate (NO_3)	3.2		
Dissolved solids	247		

KENMORE
(Population, 20,066)

Ownership: Supplied by the Western New York Water Company. (See Lackawanna.)

KINGSTON
(Population, 28,817)

Ownership: Municipal.
Source: Mountain stream impounded. Auxiliary supply, small spring reservoir.
Treatment: Coagulation with alum, sedimentation, pressure filtration, addition of lime for corrosion control, and chlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 1,100,000,000 gal.
Finished-water storage: 12,000,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	2.4	Hardness as $CaCO_3$:	
Iron (Fe)	.27	Total	20
Manganese (Mn)	.00	Noncarbonate	10
Calcium (Ca)	6.6		
Magnesium (Mg)	.9	Color	7
Sodium (Na)	.8	pH	7.1
Potassium (K)	.1	Specific conductance (micromhos at 25 C.)	48.5
Carbonate (CO_3)	0	Turbidity	1.2
Bicarbonate (HCO_3)	13	Temperature (F.)	--
Sulfate (SO_4)	9.0	Date of collection	Feb. 15, 1952
Chloride (Cl)	1.6		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	30		

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	5.2	6.3	4.5	6.8	7.0	6.5	--	--	--	1	2	0
Finished water	9.4	11	7.9	9.0	9.2	8.6	20	34	14	0	0	0

LACKAWANNA
(Population, 27,658)

Ownership: Supplied by the Western New York Water Company; also supplies Alden town, Amherst town (part), Blasdell, Cheektowaga town, Clarence (part), Depew, Hamburg town (part), Kenmore, Lancaster, Lancaster town (part), Orchard Park (part), Sloan, Tonawanda town (part), West Seneca town (part), Williamsville, Woodlawn, and other water districts and places. Total population supplied, about 200,000.
Source: Lake Erie. Emergency supply, interconnection with Buffalo city system.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, addition of sodium chlorite, and chlorine.
Rated capacity of treatment plant: 16,000,000 gpd.
Raw-water storage: --
Finished-water storage: 13,000,000 gal.

LACKAWANNA--Continued

ANALYSIS

(Analysis, in parts per million, by Western New York Water Co.)

	Finished water		Finished water
Silica (SiO_2)	4.1	Hardness as $CaCO_3$:	
Iron (Fe)	0	Total	138
Manganese (Mn)	--	Noncarbonate	48
Calcium (Ca)	44		
Magnesium (Mg)	6.8	Color	0
Sodium (Na)	4.8	pH	8.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	2	Turbidity	0
Bicarbonate (HCO_3)	110	Temperature (F.)	70
Sulfate (SO_4)	24	Date of collection	June 12, 1950
Chloride (Cl)	22		
Fluoride (F)	--		
Nitrate (NO_3)	.2		
Dissolved solids	[a] 161		

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	89	92	83	7.8	8.0	7.7	114	120	110	16	200	--
Finished water	94	99	88	8.1	8.3	7.9	122	128	118	--	5	0

[a] Sum of determined constituents.

LEVITTOWN
(Population, 45,000 approximate)

Ownership: Town of Hempstead Water Company.
Source: 8 wells (1 to 8) 211, 84, 358, 81, 320, depth not reported for well 6, 95, and 307 ft deep; yield reported to be 800, 800, 800, 800, 1,000, not reported for well 6, 800, and 800 gpm.
Treatment: Addition of lime, Calgon, and chlorine.
Rated capacity of treatment plant: --
Raw-water storage: --
Finished-water storage: 1,000,000 gal.

The analyses selected of the raw water show the range in hardness of the water from the wells, and of the finished water, the character of the water furnished in three different sections of the area served.

LEVITTOWN[1]-Continued

ANALYSES

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

	Well 2 (raw water)	Well 3 (raw water)	Finished water (city tap) [a]	Finished water (city tap) [b]	Finished water (city tap) [c]
Silica (SiO_2)	9.9	7.1	9.2	9.2	7.1
Iron (Fe)	.04	.05	.12	.26	.08
Manganese (Mn)	--	--	.01	.03	.01
Calcium (Ca)	--	--	27	36	2.8
Magnesium (Mg)	--	--	4.5	6.8	.5
Sodium (Na)	9.8	3.6	11	13	3.6
Potassium (K)			.9	1.6	.3
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	10	4	37	43	10
Sulfate (SO_4)	90	1	30	54	3.0
Chloride (Cl)	22	4	14	18	3.6
Fluoride (F)	--	--	.0	.0	.0
Nitrate (NO_3)	34	2.3	37	38	3.1
Dissolved solids	--	--	146	208	36
Hardness as $CaCO_3$:					
Total	139	4	86	118	9
Noncarbonate	131	1	56	82	1
Color	5	2	0	0	0
pH	5.8	5.6	7.3	7.9	6.9
Specific conductance (micromhos at 25 C.)	396	29.0	234	311	38.2
Turbidity	--	--	1.7	1.1	1.0
Temperature (F.)	--	--	--	--	--
Date of collection	Jan. 21, 1952	Jan. 21, 1952	Jan. 23, 1952	Jan. 21, 1952	Jan. 21, 1952
Depth (feet)	84	358	--	--	--
Diameter (inches)	12	12	--	--	--
Date drilled	1947	1951	--	--	--
Percent of supply	--	--	--	--	--

[a] 107 Azala.
[b] 34 Center Land.
[c] 101 Shepherd Road.

LOCKPORT
(Population, 25,133)

Ownership: Municipal; also supplies about 400 people outside the city limits. Total population supplied, about 25,500.
Source: Niagara River. Auxiliary or emergency supply, Barge Canal (emergency pumping station).
Treatment: Prechlorination at North Tonawanda pumping station, coagulation with alum, sedimentation, rapid sand filtration, and chlorination (chlorine dioxide).
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 6,600,000 gal.

LOCKPORT--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	.5	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	126
Manganese (Mn)	.00	Noncarbonate	38
Calcium (Ca)	37		
Magnesium (Mg)	8.2	Color	1
Sodium (Na)	9.3	pH	7.4
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	290
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	107	Temperature (F.)	36
Sulfate (SO_4)	27	Date of collection	Feb. 6, 1952
Chloride (Cl)	22		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	169		

Regular determinations at treatment plant, 1950–51

	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	100	110	90	7.8	8.0	7.6	115	--	--	20	150	5
Finished water	95	105	85	7.3	7.4	7.2	105	--	--	0	0	0

LONG BEACH

(Population, 15,586)

Ownership: Municipal; also supplies Lido Beach and a relatively large summer population of about 150,000.

Source: 2 wells (N41 and N3687) 1,135 and 1,266 ft deep. The yield of well N41 is reported to be 1,000 gpm.

Treatment: Addition of lime, filtration, and chlorination.

Rated capacity of treatment plant: 9,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 1,775,000 gal.

ANALYSIS

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

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	2.0	Total	30
Manganese (Mn)	.00	Noncarbonate	9
Calcium (Ca)	9.5		
Magnesium (Mg)	1.5	Color	0
Sodium (Na)	6.0	pH	9.7
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	101
Carbonate (CO_3)	11	Turbidity	1.4
Bicarbonate (HCO_3)	[a]0	Temperature (F.)	--
Sulfate (SO_4)	18	Date of collection	Jan. 16, 1952
Chloride (Cl)	5.0		
Fluoride (F)	.1		
Nitrate (NO_3)	.1		
Dissolved solids	68		

[a] Hydroxide (OH) 1 ppm.

LYNBROOK
(Population, 17,314)

Ownership: Long Island Water Corp., Lynbrook. (See Valley Stream.)

MAMORONECK
(Population, 15,016)

Ownership: Westchester Joint Water Works No. 1; also supplies parts of Harrison and Mamaroneck towns, and Pelham Manor. Total population supplied, about 45,000.
Source: Mamaroneck River. Auxiliary or emergency supply, New York City, Catskill supply.
Treatment: Coagulation with alum, aeration, sedimentation, rapid sand filtration, ammoniation, chlorination, and addition of Calgon.
Rated capacity of treatment plant: 4,500,000 gpd.
Raw-water storage: 35,000,000 gal.
Finished-water storage: 1,650,000 gal.

ANALYSIS

(Analysis, in parts per million, by Port Chester Chemical & Bacteriological Lab.)

	Finished water		Finished water
Silica (SiO_2)	7.5	Hardness as $CaCO_3$:	
Iron (Fe)	.5	Total	85
Manganese (Mn)	.04	Noncarbonate	16
Calcium (Ca)	23		
Magnesium (Mg)	6.8	Color	25
Sodium (Na)	12	pH	7.2
Potassium (K)	3.9	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	85	Temperature (F.)	65
Sulfate (SO_4)	29	Date of collection	Aug. 20, 1951
Chloride (Cl)	10		
Fluoride (F)	.1		
Nitrate (NO_3)	.4		
Dissolved solids	--		

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	42	73	13	8.1	9.3	6.5	81	122	40	--	--	--
Finished water	30	72	3	6.4	6.9	5.9	79	126	34	--	--	--

MIDDLETOWN
(Population, 22,586)

Ownership: Municipal; also supplies about 800 people outside the city limits. Total population supplied, about 23,400.
Source: Lakes.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, pH adjustment, and carbon for taste control.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 1,341,000,000 gal.
Finished-water storage: 350,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	2.5	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	30
Manganese (Mn)	.00	Noncarbonate	12
Calcium (Ca)	9.2		
Magnesium (Mg)	1.7	Color	2
Sodium (Na)	4.2	pH	7.0
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	83.1
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	22	Temperature (F.)	--
Sulfate (SO_4)	18	Date of collection	Feb. 13, 1952
Chloride (Cl)	2.0		
Fluoride (F)	.4		
Nitrate (NO_3)	.3		
Dissolved solids	50		

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	17	--	--	--	--	--	--	45	--	5.0	--	--
Finished water	22	--	--	7.0	7.6	--	--	45	--	0	0	0

MOUNT VERNON
(Population, 71,899)

Ownership: Municipal. Supplied by New York City. (See New York, Croton supply.)

NEWBURGH
(Population, 31,956)

Ownership: Municipal; also supplies about 3,000 people outside the city limits. Total population supplied, about 35,000.
Source: Impounding Reservoir.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, adjustment of pH with lime, chlorination, and fluoridation.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 2,000,000,000 gal.
Finished-water storage: 1,800,000 gal.

NEWBURGH--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	0.5	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	102
Manganese (Mn)	.00	Noncarbonate	36
Calcium (Ca)	35		
Magnesium (Mg)	3.6	Color	4
Sodium (Na)	5.6	pH	8.2
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	230
Carbonate (CO_3)	0	Turbidity	1.6
Bicarbonate (HCO_3)	81	Temperature (F.)	--
Sulfate (SO_4)	36	Date of collection	Feb. 3, 1952
Chloride (Cl)	8.6		
Fluoride (F)	1.1		
Nitrate (NO_3)	.8		
Dissolved solids	137		

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	57	60	52	7.5	7.9	7.2	52	60	48	2	5	1
Finished water	59	63	54	8.1	8.4	7.8	90	100	70	.2	1.0	.05

NEW ROCHELLE
(Population, 79,725)

Ownership: New Rochelle Water Company (New Rochelle Division); also supplies Bronxville, Eastchester town (part), North Pelham, Pelham Manor, Pelham town (part), and Tuckahoe. Total population supplied, about 101,000.

Source: Purchased water, Croton Aqueduct of New York City supply. (See New York.)

Treatment: Purchased water: chlorination, addition of lime, and fluoridation (begun Oct. 8, 1951) with sodium fluoride to a content of between 1.0 and 1.2 ppm of fluoride in the treated water.

Rated capacity of treatment plant: 17,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 3,200,000 gal.

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	37	41	35	7.2	7.3	7.0	50	52	42	--	5	--
Finished water	40	45	30	8.2	8.4	7.8	60	74	53	--	5	--

NEW YORK
(Population, 7,891,957)

Ownership: Municipal; supplies 7,500,000 people in New York and in addition a population of about 300,000 in other communities and cities among which are Mount Kisco, Mount Vernon, New Rochelle, Ossining, White Plains, and Yonkers.

Jamaica Water Supply Company; supplies about 450,000 people in the borough of Queens.

New York Water Service Corporation (Woodhaven Plant); supplies about 50,000 people in the Fourth Ward of Queens. Total population supplied, about 8,300,000.

Systems, Sources, and Storage of Supply

System	Sources	Impounding and Storage Reservoirs	Available Storage (mg), or yield
Croton	Croton River — East Branch, Middle Branch, West Branch	12 reservoirs and six controlled lakes	103,075
Catskill	Esopus Creek	Ashokan	130,478
	Schoharie Creek	Schoharie	19,583
	Bronx River	Kensico	30,573
	Byram River	Byram Lake	948
	Wampus River	Wampus	99
	Rondout Creek [a]	Rondout	48,700
Ridgewood (Long Island watershed)		Hempstead Reservoir	880
		Hempstead Pond	27
	West watershed	Pines Pond	9
		Smith's Pond [b]	42
		Valley Stream Pond [b]	--
	(Driven wells, 10 pumping plants)	--	--
		East Meadow Pond	19
	East watershed	Wantagh Pond	44
		Massapequa Pond	17
	(Driven wells, five plants; 2 infiltration galleries)	--	30-40 mgd
Queens	Wells (7 well stations, 1 pumping station)	--	10 mgd
Richmond	Wells (2 well plants, one of which has five stations)	--	5 mgd
Jamaica Water Supply Co.	Drilled wells	--	29.1 mgd
N. Y. Water Service Corp.	Drilled wells	--	9.1 mgd

[a] Delaware System.
[b] Emergency only.

NEW YORK--Continued

Treatment: Surface waters: plain sedimentation in large storage reservoirs (Catskill supply, aeration, chlorination, coagulation with alum when necessary at Pleasantville plant, addition of lime near Kensico Reservoir, sedimentation in Kensico Reservoir, and rechlorination), chlorination, and rechlorination at points in the distribution system. Well waters: iron removal by rapid sand filtration at Springfield and Jameco Pumping Stations, and pressure filtration at Flushing Station. The private companies operate two gravity and three pressure filters for iron removal. Many of the wells are pumped directly into the distribution system.

Distribution Reservoirs and Standpipes

Source of Supply	Name	Storage (mg)	Borough
Croton	Central Park Reservoir	1,021	Manhattan
Catskill	Hillview Reservoir	929	Bronx
Croton	Jerome Park Reservoir	773	
Catskill and Long Island	Ridgewood Reservoir (3 basins)	302	Brooklyn (municipal)
Catskill	Far Rockaway Standpipe	0.3	Queens (municipal)
Catskill	Silver Lake Reservoir	438	Richmond
Catskill	Grimes Hill Standpipe	0.2	

The water from the Catskill, Bronx and Byram, Rondout, and Croton West Branch sources intermingles in Kensico Reservoir. From this reservoir the water flows through the Catskill and Delaware Aqueducts to Hillview Reservoir from which it is delivered to the five boroughs by the two City Tunnels. The Catskill supply because of its greater pressure is usually used to the full capacity of the Catskill Aqueduct.

Croton water flows to the city by gravity and is delivered to the lower elevations in Manhattan and the Bronx to the extent of about 1/3 of the total from this source. The remainder of the supply has to be pumped.

Part of the water from sub-surface sources from the Ridgewood, Brooklyn, and Queens Borough systems is delivered directly into the Ridgewood Reservoir, which also receives water from the Catskill system. Ridgewood Reservoir is an equalizing reservoir for the Brooklyn low service.

The daily aggregate consumption of water within Greater New York during 1951 averaged 1,042.1 mgd, including 38.9 mgd furnished by the private water companies in Queens. In addition the city supplied to communities outside the city, 28.1 mgd.

Partial analyses of samples of well supplies in 1952 of the Jamaica Water Service Co. show a range in hardness of 15 to 336 ppm with an average of 126 ppm; and show a range in dissolved solids of 44 to 373 ppm with an average of 181 ppm. Partial analyses of samples of well supplies in 1952 of the N. Y. Water Service Corp. show a range in hardness of 250 to 375 ppm with an average of 292 ppm; and show a range in dissolved solids of 290 to 488 ppm with an average of 393 ppm.

NEW YORK--Continued

ANALYSES

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

	Finished water [a]	Finished water [b]	Finished water [cf]	Well 13 [df] (raw water)	Station 12 [ef]
Silica (SiO_2)	4.9	2.5	2	--	17
Iron (Fe)	.03	.03	.05	.00	.04
Manganese (Mn)	.00	.00	--	--	--
Calcium (Ca)	13	5.3	--	--	--
Magnesium (Mg)	4.3	1.7	--	--	--
Sodium (Na)	3.0	1.4	--	--	--
Potassium (K)	1.4	.6	--	--	--
Carbonate (CO_3)	0	0	--	--	--
Bicarbonate (HCO_3)	36	10	9	49	200
Sulfate (SO_4)	20	11	--	--	--
Chloride (Cl)	5.8	2.6	2.8	11	19
Fluoride (F)	.1	.1	--	--	--
Nitrate (NO_3)	.4	.3	.1	9.0	11
Dissolved solids	75	34	43	202	392
Hardness as $CaCO_3$:					
Total	50	20	20	118	282
Noncarbonate	21	6	--	--	--
Color	0	1	6	5	4
pH	7.1	6.9	6.7	6.3	7.7
Specific conductance (micromhos at 25 C.)	121	53.4	44	260	432
Turbidity	1.2	1.9	3	0	0
Temperature (F.)	55	54	46	54	--
Date of collection	June 4, 1952	June 4, 1952	1952	1952	1952

[a] Croton supply; Central Park Reservoir.
[b] Catskill supply; Shaft 15A, Brooklyn.
[c] Catskill-Long Island supply, Ridgewood Reservoir 3, pipe 23.
[d] Jamaica Water Supply Co.
[e] 76th St. & 86th Ave., N. Y. Water Service Corp.
[f] Analysis by Department of Water Supply, Gas, and Electricity, New York.

NIAGARA FALLS
(Population, 90,872)

Ownership: Municipal.
Source: Niagara River (Tonawanda channel).
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, and chlorine dioxide for taste and odor control.
Rated capacity of treatment plant: 40,000,000 gpd.
Raw-water storage: --
Finished-water storage: 750,000 gal.

NIAGARA FALLS--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	.5	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	126
Manganese (Mn)	.00	Noncarbonate	38
Calcium (Ca)	37		
Magnesium (Mg)	8.2	Color	1
Sodium (Na)	9.3	pH	7.4
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	290
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	107	Temperature (F.)	36
Sulfate (SO_4)	27	Date of collection	Feb. 6, 1952
Chloride (Cl)	22		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	169		

NORTH TONAWANDA
(Population, 24,731)

Ownership: Municipal.
Source: Niagara River.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, and postchlorination (chlorine dioxide).
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 500,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	.5	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	125
Manganese (Mn)	.00	Noncarbonate	37
Calcium (Ca)	37		
Magnesium (Mg)	8.0	Color	1
Sodium (Na)	9.6	pH	7.3
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	290
Carbonate (CO_3)	0	Turbidity	0.4
Bicarbonate (HCO_3)	108	Temperature (F.)	--
Sulfate (SO_4)	28	Date of collection	Feb. 11, 1952
Chloride (Cl)	21		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	167		

OGDENSBURG
(Population, 16,166)

Ownership: Municipal; also supplies the St. Lawrence State Hospital. Total population supplied, about 18,000.
Source: St. Lawrence River. Emergency supply, intake on Oswegatchie River.
Treatment: Slow sand filtration, and chlorination.
Rated capacity of treatment plant: 3,200,000 gpd.
Raw-water storage: None.
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)	2.8	Hardness as $CaCO_3$:	
Iron (Fe)	.00	Total	131
Manganese (Mn)	.00	Noncarbonate	37
Calcium (Ca)	38		
Magnesium (Mg)	8.8	Color	2
Sodium (Na)	8.9	pH	7.7
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	295
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	115	Turbidity	3.6
Sulfate (SO_4)	27	Temperature (F.)	48
Chloride (Cl)	20	Date of collection	Jan. 15, 1952
Fluoride (F)	.0		
Nitrate (NO_3)	.7		
Dissolved solids	169		

OLEAN
(Population, 22,884)

Ownership: Municipal.
Source: Olean Creek.
Treatment: Superchlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, pH control with lime, and dechlorination with sulfur dioxide. Chlorination of distribution reservoirs for control of algae. Fluoridation (begun Nov. 13, 1951) with sodium silicofluoride to an average content of 1.0 ppm of fluoride in the finished water.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 10,500,000 gal.

OLEAN--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.8	Hardness as $CaCO_3$:	
Iron (Fe)	.17	Total	51
Manganese (Mn)	.00	Noncarbonate	36
Calcium (Ca)	18		
Magnesium (Mg)	1.4	Color	2
Sodium (Na)	1.8	pH	6.4
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	129
Carbonate (CO_3)	0	Turbidity	0.5
Bicarbonate (HCO_3)	18	Temperature (F.)	--
Sulfate (SO_4)	30	Date of collection	Feb. 6, 1952
Chloride (Cl)	5.8		
Fluoride (F)	1.3		
Nitrate (NO_3)	1.3		
Dissolved solids	77		

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	62	118	8	7.4	8.5	6.9	66	102	35	27	1,200	3
Finished water	57	106	12	7.1	7.4	6.8	79	113	53	0	0	0

OSSINING
(Population, 16,098)

Ownership: Municipal; also supplies about 500 people outside the city limits. Total population supplied, about 16,600.

Source: 2 impounding reservoirs. Auxiliary supply, old Croton aqueduct of New York City supply.

Treatment: Superchlorination, aeration, coagulation with alum, sedimentation, rapid sand filtration, pH control with lime, alkalinity adjustment (calcite), corrosion control (sodium silicate), and dechlorination with sulfur dioxide.

Rated capacity of treatment plant: 2,000,000 gpd.

Raw-water storage: 101,000,000 gal.

Finished-water storage: 11,500,000 gal.

OSSINING--Continued

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

	Finished water		Finished water
Silica (SiO_2)	8.6	Hardness as $CaCO_3$:	
Iron (Fe)	.20	Total	70
Manganese (Mn)	.02	Noncarbonate	45
Calcium (Ca)	22		
Magnesium (Mg)	3.6	Color	2
Sodium (Na)	3.1	pH	8.8
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	153
Carbonate (CO_3)	2	Turbidity	0.5
Bicarbonate (HCO_3)	26	Temperature (F.)	39
Sulfate (SO_4)	32	Date of collection	Feb. 19, 1952
Chloride (Cl)	12		
Fluoride (F)	.2		
Nitrate (NO_3)	1.6		
Dissolved solids	103		

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	16	24	12	6.6	6.8	6.4	35	40	30	1	1	1
Finished water	29	35	26	8.4	8.4	8.4	55	60	50	<1	<1	<1

OSWEGO
(Population, 22,647)

Ownership: Municipal; also supplies about 1,500 people outside the city limits.
Total population supplied, about 24,100.
Source: Lake Ontario.
Treatment: Chlorination and ammoniation.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 24,300,000 gal.

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	1.2	Hardness as $CaCO_3$:	
Iron (Fe)	.33	Total	140
Manganese (Mn)	.00	Noncarbonate	46
Calcium (Ca)	42		
Magnesium (Mg)	8.6	Color	6
Sodium (Na)	10	pH	7.9
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	323
Carbonate (CO_3)	0	Turbidity	3.0
Bicarbonate (HCO_3)	115	Temperature (F.)	--
Sulfate (SO_4)	29	Date of collection	Feb. 4, 1952
Chloride (Cl)	26		
Fluoride (F)	.1		
Nitrate (NO_3)	1.0		
Dissolved solids	179		

PEEKSKILL
(Population, 17,731)

Ownership: Municipal; also supplies about 1,000 people outside the city limits. Total population supplied, about 18,700.
Source: Peekskill and Hollow brooks impounded. Auxiliary supply, Catskill aqueduct, New York City.
Treatment: Activated carbon, preammoniation, prechlorination, sedimentation, slow sand filtration, postammoniation, and postchlorination.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 1,200,000,000 gal.
Finished-water storage: 3,900,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	7.3	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	36
Manganese (Mn)	.00	Noncarbonate	16
Calcium (Ca)	8.2		
Magnesium (Mg)	3.8	Color	13
Sodium (Na)	2.5	pH	7.2
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	93.7
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	24	Turbidity	1.6
Sulfate (SO_4)	16	Temperature (F.)	--
Chloride (Cl)	4.7	Date of collection	Feb. 4, 1952
Fluoride (F)	.2		
Nitrate (NO_3)	1.4		
Dissolved solids	61		

PLATTSBURG
(Population, 17,738)

Ownership: Municipal; also supplies about 500 people outside the city limits. Total population supplied, about 18,200.
Source: Impounding reservoirs (brook fed) about 5 or 6 miles west of the city. Emergency supply, Saranac River.
Treatment: Filtration and breakpoint chlorination.
Rated capacity of treatment plant: 4,200,000 gpd.
Raw-water storage: 430,000,000 gal.
Finished-water storage: 5,000,000 gal.

PLATTSBURG--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.9	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	109
Manganese (Mn)	.00	Noncarbonate	11
Calcium (Ca)	28		
Magnesium (Mg)	9.5	Color	3
Sodium (Na)	1.4	pH	7.4
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	210
Carbonate (CO_3)	0	Turbidity	4.5
Bicarbonate (HCO_3)	120	Temperature (F.)	38
Sulfate (SO_4)	8.0	Date of collection	Jan. 15, 1938
Chloride (Cl)	3.1		
Fluoride (F)	.1		
Nitrate (NO_3)	.8		
Dissolved solids	124		

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	83	106	30	7.5	7.6	6.9	100	120	70	1.6	2.4	1.0
Finished water	79	100	28	7.3	7.5	6.8	100	120	72	.89	1.3	.40

PORT CHESTER
(Population, 23,970)

Ownership: Port Chester Water Works, Inc. (controlled by American Water Works, Inc.) which obtains its supply from Greenwich Water Works, Inc., Greenwich, Conn.; also supplies the city and town of Rye. Total population supplied, about 40,000.

Source: Putnam Lake, Rockwood Lake, and Brush Dam, located in Greenwich, Connecticut, and Laurel Reservoir (Stamford Water Co., Stamford, Conn.).

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: Brush Dam, 14,000,000 gal; Rockwood Lake, 500,000,000 gal; Putnam Lake, 572,000,000 gal; and Laurel Reservoir, 2,250,000,000 gal.

Finished-water storage: 2,000,000 gal.

Water from both Rockwood Lake and Brush Dam go into Putnam Lake from which the water is taken for treatment. The treatment plant is located in Greenwich, Connecticut.

PORT CHESTER--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	6.8	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	46
Manganese (Mn)	.00	Noncarbonate	26
Calcium (Ca)	14		
Magnesium (Mg)	2.7	Color	5
Sodium (Na)	3.8	pH	8.0
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	124
Carbonate (CO_3)	0	Turbidity	5.4
Bicarbonate (HCO_3)	24	Temperature (F.)	--
Sulfate (SO_4)	26	Date of collection	Jan. 22, 1952
Chloride (Cl)	7.1		
Fluoride (F)	.0		
Nitrate (NO_3)	.7		
Dissolved solids	79		

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	18	25	12	6.9	7.1	6.7	32	36	28	<1	1	0
Finished water	29	41	19	8.5	8.8	8.0	50	58	44	<1	1	0

POUGHKEEPSIE
(Population, 41,023)

Ownership: Municipal; also supplies Fairview and several outside water districts. Total population supplied, about 56,000.
Source: Hudson River.
Treatment: Prechlorination, coagulation, sedimentation, rapid sand filtration, aeration, slow sand filtration, corrosion control with lime, postchlorination, or dechlorination.
Rated capacity of treatment plant: 9,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 5,000,000 gal.

POUGHKEEPSIE--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.7	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	71
Manganese (Mn)	.00	Noncarbonate	30
Calcium (Ca)	23		
Magnesium (Mg)	3.4	Color	2
Sodium (Na)	3.4	pH	7.6
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	170
Carbonate (CO_3)	0	Turbidity	0.8
Bicarbonate (HCO_3)	50	Temperature (F.)	--
Sulfate (SO_4)	28	Date of collection	Feb. 12, 1952
Chloride (Cl)	6.0		
Fluoride (F)	.0		
Nitrate (NO_3)	1.2		
Dissolved solids	102		

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	43	60	20	7.3	7.6	7.1	50	70	40	28	400	8
Finished water	50	60	25	8.0	8.3	7.7	70	80	50	0	0	0

ROCHESTER
(Population, 332,488)

Ownership: Municipal. Supplies about 312,000 people in Rochester. The New York Water Service Corp., Rochester Division, supplies about 20,500 people.
Source: Municipal: Hemlock and Canadice Lakes. New York Water Service Corp., Rochester Division: Lake Ontario.
Treatment: Municipal: Chlorination, and ammoniation at the gatehouse at Hemlock Lake.
Rated capacity of treatment plant: 42,000,000 gpd.
Raw-water storage: --
Finished-water storage: 234,000,000 gal.

ROCHESTER--Continued

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)	3.5	1.4	Hardness as $CaCO_3$:		
Iron (Fe)	.30	.18	Total	79	130
Manganese (Mn)	.00	.00	Noncarbonate	--	41
Calcium (Ca)	22	38			
Magnesium (Mg)	5.8	8.6	Color	5	3
Sodium (Na)	3.0	9.6	pH	7.4	7.4
Potassium (K)	2.4	1.4	Specific conductance (micromhos at 25 C.)	170	295
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	59	109			
Sulfate (SO_4)	26	30	Turbidity	--	0.9
Chloride (Cl)	5.0	20	Temperature (F.)	--	--
Fluoride (F)	.0	.0	Date of collection	June 20, 1951	Mar. 19, 1952
Nitrate (NO_3)	1.0	.7			
Dissolved solids	101	176			

[a] Hemlock Lake.
[b] Lake Ontario.

ROCKVILLE CENTRE
(Population, 22,362)

Ownership: Municipal.
Source: 6 wells (N48, N49, N50, N52, N72, N3745), 519, 330, 523, 534, 604, and 589 ft deep; yield reported to be 1,200, 930, 1,350, 1,500, 1,300, and 1,250 gpm.
Treatment: Aeration and addition of lime.
Rated capacity of treatment plant: --
Raw-water storage: None.
Finished-water storage: 2,000,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	7.1	Hardness as $CaCO_3$:	
Iron (Fe)	.63	Total	14
Manganese (Mn)	.01	Noncarbonate	0
Calcium (Ca)	4.8		
Magnesium (Mg)	.4	Color	0
Sodium (Na)	3.8	pH	7.4
Potassium (K)	.4	Specific conductance (micromhos at 25 C.)	46.3
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	18		
Sulfate (SO_4)	3.5	Turbidity	--
Chloride (Cl)	1.2	Temperature (F.)	--
Fluoride (F)	.0	Date of collection	Jan. 15, 1952
Nitrate (NO_3)	.2		
Dissolved solids	36		

ROME
(Population, 41,682)

Ownership: Municipal.
Source: East Branch of Fish Creek impounded.
Treatment: Ammoniation and chlorination before water enters storage reservoirs for sedimentation, and rechlorination at time of distribution.
Rated capacity of treatment plant: 25,000,000 gpd.
Raw-water storage: 66,000,000 gal.
Finished-water storage: --

ANALYSES

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

	Finished water	Finished water		Finished water	Finished water
Silica (SiO_2)	2.6	5.5	Hardness as $CaCO_3$:		
Iron (Fe)	.25	.00	Total	37	32
Manganese (Mn)	--	.00	Noncarbonate	10	11
Calcium (Ca)	11	8.0			
Magnesium (Mg)	2.3	3.0	Color	35	18
Sodium (Na)	2.5	.6	pH	7.0	7.2
Potassium (K)		.2	Specific conductance (micromhos at 25 C.)	81.6	66.4
Carbonate (CO_3)	0	0	Turbidity	--	4.5
Bicarbonate (HCO_3)	33	26	Temperature (F.)	68	42
Sulfate (SO_4)	7.2	8.5	Date of collection	Aug. 28, 1951	Jan. 15, 1952
Chloride (Cl)	5.1	1.9			
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.7	1.0			
Dissolved solids	63	45			

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	7.5	6.6	--	--	--	2	10	< 2
Finished water	--	--	--	7		6.6	--	--	--	2	5	< 2

SARATOGA SPRINGS
(Population, 15,473)

Ownership: Municipal.
Source: Loughberry Lake (impounded and springfed supply).
Treatment: Aeration, coagulation with alum, carbon, chlorination, sedimentation, rapid sand filtration, addition of lime, postchlorination, and ammoniation.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 240,000,000 gal.
Finished-water storage: 5,250,000 gal.

SARATOGA SPRINGS--Continued

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

	Finished water		Finished water
Silica (SiO_2)	9.1	Hardness as $CaCO_3$:	
Iron (Fe)	.00	Total	100
Manganese (Mn)	.01	Noncarbonate	23
Calcium (Ca)	32		
Magnesium (Mg)	4.9	Color	3
Sodium (Na)	2.1	pH	7.2
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	204
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	94	Turbidity	5.1
Sulfate (SO_4)	22	Temperature (F.)	40
Chloride (Cl)	4.1	Date of collection	Jan. 16, 1952
Fluoride (F)	.0		
Nitrate (NO_3)	1.0		
Dissolved solids	120		

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	79	--	--	7.7	--	--	88	--	--	2.6	--	--
Finished water	70	--	--	7.5	--	--	90	--	--	.0	--	--

SCHENECTADY
(Population, 91,785)

Ownership: Municipal; also supplies about 1,400 people outside the city limits. Total population supplied, about 93,200.
Source: 10 wells (1 to 10) 68, 66, 70, 70, 63, 58, 69, 70, 68, and 71 ft deep; yield reported to be 2,100, 3,600, 3,555, 3,570, 3,515, 3,540, 3,540, 3,570, 3,555, and 3,880 gpm.
Treatment: Occasional chlorination.
Storage: 20,000,000 gal.

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

	Well 2	Wells (city tap)		Well 2	Wells (city tap)
Silica (SiO_2)	7.0	7.0	Hardness as $CaCO_3$:		
Iron (Fe)	.00	.09	Total	141	160
Manganese (Mn)	.00	--	Noncarbonate	21	24
Calcium (Ca)	43	49			
Magnesium (Mg)	8.3	9.1	Color	2	2
Sodium (Na)	4.7	9.6	pH	7.8	7.7
Potassium (K)	1.0		Specific conductance (micromhos at 25 C.)	290	342
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	147	165	Turbidity	9.5	--
Sulfate (SO_4)	24	31	Temperature (F.)	51	--
Chloride (Cl)	4.9	9.0	Date of collection	Jan. 16, 1952	Oct. 7, 1948
Fluoride (F)	.0	.1			
Nitrate (NO_3)	1.4	.2			
Dissolved solids	170	197			

SYRACUSE
(Population, 220,583)

Ownership: Municipal; also supplies about 11,500 people outside the city limits. Total population supplied, about 232,000.
Source: Lake Skaneateles. Emergency connection to New York Water Service Company to the extent of a few million gallons per day.
Treatment: Chlorination.
Raw-water storage: Lake.
Finished-water storage: 249,000,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	2.2	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	109
Manganese (Mn)	.01	Noncarbonate	15
Calcium (Ca)	34		
Magnesium (Mg)	5.8	Color	2
Sodium (Na)	1.5	pH	7.8
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	222
Carbonate (CO_3)	0	Turbidity	1.4
Bicarbonate (HCO_3)	114	Temperature (F.)	--
Sulfate (SO_4)	14	Date of collection	Mar. 24, 1953
Chloride (Cl)	2.2		
Fluoride (F)	.0		
Nitrate (NO_3)	1.6		
Dissolved solids	128		

TROY
(Population, 72,311)

Ownership: Municipal; also supplies about 1,000 people outside the city limits. Total population supplied, about 73,300.
Source: Tomhannock Reservoir 6 miles northeast of Troy, 70 percent of supply; Grafton Reservoir on Quacken Kill Creek 7 miles east of Troy, 30 percent of supply. Auxiliary or emergency supply, Frear Park Lake (used once in 1951).
Treatment: Chlorination.
Raw-water storage: 14,000,000,000 gal.

The distribution of the water is completely by gravity with the Grafton supply split between upper high and high service by Vanderhyden Reservoir and pressure reduction.

TROY--Continued

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	3.5	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	40
Manganese (Mn)	.00	Noncarbonate	13
Calcium (Ca)	12		
Magnesium (Mg)	2.5	Color	4
Sodium (Na)	2.2	pH	6.9
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	98.6
Carbonate (CO_3)	0	Turbidity	6.1
Bicarbonate (HCO_3)	33	Temperature (F.)	45
Sulfate (SO_4)	14	Date of collection	Jan. 23, 1952
Chloride (Cl)	3.1		
Fluoride (F)	.1		
Nitrate (NO_3)	1.3		
Dissolved solids	61		

[a] Tomhannock Reservoir.

UTICA
(Population, 101,531)

Ownership: Municipal; also supplies about 25,000 people in other communities. Total population supplied, about 126,000.
Source: West Canada Creek-Hinckley Reservoir, 97 percent of supply; Springs, 3 percent of supply.
Treatment: Chlorination and ammoniation.
Raw-water storage: 656,989,000 gal.
Finished-water storage: --

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	6.7	Hardness as $CaCO_3$:	
Iron (Fe)	.17	Total	16
Manganese (Mn)	.01	Noncarbonate	10
Calcium (Ca)	4.8		
Magnesium (Mg)	1.0	Color	32
Sodium (Na)	.5	pH	6.5
Potassium (K)	.3	Specific conductance (micromhos at 25 C.)	40.8
Carbonate (CO_3)	0	Turbidity	5.8
Bicarbonate (HCO_3)	8	Temperature (F.)	39
Sulfate (SO_4)	6.0	Date of collection	Jan. 15, 1952
Chloride (Cl)	2.4		
Fluoride (F)	.1		
Nitrate (NO_3)	.7		
Dissolved solids	35		

VALLEY STREAM
(Population, 26,854)

Ownership: Long Island Water Corp., Lynbrook, N. Y.; also supplies Cedarhurst, East Rockaway, Hewlett, Inwood, Lake View, Lawrence, Lynbrook, Malverne, Woodmere, and a number of other communities. Total population supplied, about 164,000.

Source: Wells in several well fields: Valley Stream, main pumping station 51 wells 150 ft deep and 40 wells 20 to 40 ft deep connected to a common suction line; well N3327 (W. Valley Stream) 451 ft deep, reported to yield 1,400 gpm; well N1603 (Lake View) 551 ft deep, reported to yield 1,215 gpm. At any one time about 40 wells are in use.

Treatment: Water from main station (Valley Stream): aeration, addition of lime, filtration, and chlorination. Water from other wells: addition of lime, and chlorination.

Rated capacity of treatment plant: 12,000,000 gpd.

Raw-water storage: --

Finished-water storage: 6,700,000 gal.

ANALYSES

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

	Suction wells		Well N3327		Well N1603
	Raw water	Finished water	Raw water	Finished water	(finished water)
Silica (SiO_2)	8.5	13	10	14	11
Iron (Fe)	2.2	.20	.13	.18	.17
Manganese (Mn)	--	.01	--	.00	.00
Calcium (Ca)	--	16	--	13	18
Magnesium (Mg)	--	1.4	--	1.3	1.7
Sodium (Na)	6.0	4.9	3.9	3.7	4.3
Potassium (K)		.8		.5	.6
Carbonate (CO_3)	0	4	0	3	0
Bicarbonate (HCO_3)	11	44	12	38	62
Sulfate (SO_4)	7	7.5	4	3.5	6.0
Chloride (Cl)	6	5.8	3	4.1	4.5
Fluoride (F)	--	.1	--	.0	.0
Nitrate (NO_3)	.3	.6	.2	.1	.1
Dissolved solids	--	75	--	61	74
Hardness as $CaCO_3$:					
Total	12	46	10	38	52
Noncarbonate	3	3	0	2	1
Color	5	0	5	0	0
pH	5.9	8.7	6.1	8.6	8.2
Specific conductance (micromhos at 25 C.)	56.2	114	41.0	84.3	115
Turbidity	--	1.6	--	1.7	1.1
Temperature (F.)	--	--	--	--	--
Date of collection	Jan. 18, 1952	Jan. 18, 1952	Jan. 18, 1952	Jan. 18, 1952	Jan. 18, 1952

WATERTOWN
(Population, 34,350)

Ownership: Municipal; also supplies about 250 people outside the city limits, and an Air Force installation. Total population supplied, about 35,000.
Source: Black River impounded.
Treatment: Aeration, prechlorination, coagulation with alum, chlorine dioxide, sedimentation, rapid sand filtration, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 9,000,000 gpd.
Raw-water storage: 60,000,000 gal.
Finished-water storage: 8,000,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	7.0	Hardness as $CaCO_3$:	
Iron (Fe)	.00	Total	78
Manganese (Mn)	.01	Noncarbonate	19
Calcium (Ca)	27		
Magnesium (Mg)	2.5	Color	8
Sodium (Na)	8.8	pH	7.2
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	201
Carbonate (CO_3)	0	Turbidity	3.9
Bicarbonate (HCO_3)	71	Temperature (F.)	47
Sulfate (SO_4)	32	Date of collection	Jan. 15, 1952
Chloride (Cl)	4.4		
Fluoride (F)	.1		
Nitrate (NO_3)	2.5		
Dissolved solids	124		

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	40	65	16	7.0	7.4	6.7	54	96	41	3	45	1
Finished water	36	60	14	7.1	7.3	6.9	52	96	38	0	0	0

WATERVLIET
(Population, 15,197)

Ownership: Municipal; also supplies Menands and other consumers outside the city limits. Total population supplied, about 18,500.
Source: Normanskill, Black, and Bozenkill Creeks impounded.
Treatment: Prechlorination, ammoniation, coagulation with alum, carbon, sedimentation, pressure filtration, and postchlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 1,700,000,000 gal.
Finished-water storage: 1,800,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	6.1	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	125
Manganese (Mn)	.00	Noncarbonate	51
Calcium (Ca)	36		
Magnesium (Mg)	8.6	Color	3
Sodium (Na)	4.0	pH	7.2
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	268
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	91.	Temperature (F.)	39
Sulfate (SO_4)	50	Date of collection	Jan. 16, 1952
Chloride (Cl)	5.5		
Fluoride (F)	.0		
Nitrate (NO_3)	.8		
Dissolved solids	162		

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	90	--	--	7.7	--	--	100	--	--	--	--	--

WHITE PLAINS
(Population, 43,466)

Ownership: Municipal; also purchases water wholesale from the New York Water Service Corp.

Source: Municipal supply: 4 dug wells (1 to 4, on Orchard St.) 20, 23, 15, and 23 ft deep, 8.6 percent of supply; 2 Orchard St. reservoirs (small streams impounded) 15.7 percent of supply; New York Water Service Corp. supply: 17 wells (4 to 20) 58 to 118 ft deep on common suction and reported to yield 545 gpm, 21.6 percent of supply. Auxiliary supply, Catskill supply of New York City. (See New York.) New York City furnished 54.1 percent of supply in 1951.

Treatment: Chlorination.

Raw-water storage: Upper Orchard St. reservoir, 90,000,000 gal; lower Orchard St. reservoir, 120,000,000 gal.

Finished-water storage: Standpipe at Orchard St., 9,000,000 gal.

ANALYSES

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

	Dug well 2 (raw water)	Raw water[a]	16 wells[b] (raw water)
Silica (SiO_2)	13	8.0	15
Iron (Fe)	.03	.03	.06
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	30	6.5	48
Magnesium (Mg)	12	1.9	23
Sodium (Na)	3.7	2.9	7.4
Potassium (K)	1.9	1.5	2.7
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	113	9	200
Sulfate (SO_4)	29	15	50
Chloride (Cl)	6.2	5.0	10
Fluoride (F)	.1	.2	.1
Nitrate (NO_3)	1.4	.5	4.2
Dissolved solids	158	49	268
Hardness as $CaCO_3$:			
Total	124	24	214
Noncarbonate	32	17	50
Color	2	2	2
pH	7.6	6.4	7.5
Specific conductance (micromhos at 25 C.)	258	77.3	425
Turbidity	5.1	5.4	5.1
Temperature (F.)	58	--	52
Date of collection	Jan. 28, 1952	Jan. 28, 1952	Jan. 28, 1952
Depth (feet)	23	--	--
Diameter (feet)	30	--	--
Date dug	1886	--	--
Percent of supply	--	--	--

[a] Lower Orchard Street reservoir.

[b] New York Water Service Corp.

YONKERS
(Population, 152,798)

Ownership: Municipal.
Source: Saw Mill River and Grassy Sprain Reservoir 65 percent of supply; Catskill supply, New York City (Hillview Reservoir) 35 percent of supply.
Treatment: Saw Mill River: slow sand filtration, and chlorination; Grassy Sprain Reservoir: chlorination.
Rated capacity of treatment plant: 16,000,000 gpd (Saw Mill River plant).
Raw-water storage: 1,000,000,000 gal (Grassy Sprain Reservoir).
Finished-water storage: 61,000,000 gal.

ANALYSES

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

	Saw Mill River (finished water)	Grassy Sprain Reservoir (finished water)	Hillview Reservoir[a] (finished water)
Silica (SiO_2)	10	8.1	3.2
Iron (Fe)	.04	.10	.20
Manganese (Mn)	.02	.04	.02
Calcium (Ca)	27	15	5.0
Magnesium (Mg)	8.5	6.4	1.8
Sodium (Na)	11	12	1.3
Potassium (K)	4.0	2.3	.6
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	80	29	11
Sulfate (SO_4)	33	28	11
Chloride (Cl)	20	27	2.5
Fluoride (F)	.0	.1	.1
Nitrate (NO_3)	3.6	1.5	.6
Dissolved solids	164	123	35
Hardness as $CaCO_3$:			
Total	102	64	20
Noncarbonate	37	40	11
Color	1	1	2
pH	7.4	6.8	6.8
Specific conductance (micromhos at 25 C.)	272	206	53.3
Turbidity	0.6	0.8	2.3
Temperature (F.)	--	--	--
Date of collection	Feb. 19, 1952	Feb. 19, 1952	Feb. 19, 1952

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[b]	120	126	64	7.4	8.5	7.2	120	180	90	--	>100	--
Finished water[b]	120	126	64	7.4	8.5	7.2	120	180	90	--	5	--
Finished water[c]	60	--	--	7.2	7.3	7.2	75	80	70	--	10	--

[a] Catskill supply, N. Y. City.
[b] Sawmill River.
[c] Grassy Sprain Reservoir.

ALBEMARLE
(Population, 11,798)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 12,300.
Source: Yadkin River. The intake is about 7 miles northwest of Badin.
Treatment: Coagulation with alum, soda ash, chlorination, Calgon, aeration, sedimentation, and rapid sand filtration.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 1 reservoir, 30,000,000 gal.
Finished-water storage: 2 concrete reservoirs, each 1,000,000 gal; elevated tank, 100,000 gal; standpipe, 500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	9.7	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.05	Total	18	19
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	4.4	4.9			
Magnesium (Mg)	1.7	1.7	Color	3	4
Sodium (Na)	5.8	16	pH	7.0	6.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	63.8	118
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	25	32	Temperature (F.)	--	--
Sulfate (SO_4)	4.4	20	Date of collection	May 6, 1951	May 6, 1951
Chloride (Cl)	3.2	4.8			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.7	.4			
Dissolved solids	46	78			

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	20	22	18	7.0	7.1	6.9	20	22	18	20	400	5
Finished water	22	24	20	6.8	6.9	6.8	20	22	18	0	0	0

ASHEBORO
(Population, 7,701)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 12,000,

Source: 3 lakes (1, 3, and 4). Lake 1 furnishes 5 percent of supply; Lake 3, 55 percent; and Lake 4 (Back Creek), 40 percent. The raw water intake is about $4\frac{1}{2}$ miles northwest of the center of the city.

Treatment: Coagulation with alum and lime, prechlorination, sedimentation, rapid sand filtration, Calgon, and adjustment of pH with lime.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: Impounding reservoirs, (Lakes) 1,500,000,000 gal.

Finished-water storage: Elevated tank, 500,000 gal; clear well, 1,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	9.0	Hardness as $CaCO_3$:		
Iron (Fe)	.31	.09	Total	24	50
Manganese (Mn)	.03	.00	Noncarbonate	0	25
Calcium (Ca)	6.0	16			
Magnesium (Mg)	2.3	2.4	Color	13	3
Sodium (Na)	5.0	5.7	pH	6.8	7.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	72.0	137
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	31	30	Temperature (F.)	--	--
Sulfate (SO_4)	4.0	26	Date of collection	July 10, 1951	July 10, 1951
Chloride (Cl)	3.6	7.2			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.4	.1			
Dissolved solids	53	86			

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	20	26	16	7.1	7.3	6.7	20	25	15	8	30	4
Finished water	28	26	24	8.8	9.0	8.6	50	60	40	0	0	0

ASHEVILLE
(Population, 53,000)

Ownership: Municipal; also supplies a number of communities in the Buncombe County Water System. Total population supplied, about 73,000.
Source: Beetree Creek (impounded) and Right and Left Forks of the North Fork of the Swannanoa River (impounded). The intakes are about 12 miles east of the city.
Treatment: Chlorination.
Raw-water storage: Beetree Reservoir, 500,000,000 gal.
Finished-water storage: Beaucatcher Reservoir, 5,000,000 gal; White Fawn Reservoir, 11,300,000 gal; Standpipe, 300,000 gal.

ANALYSES

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

	Beetree Reservoir[a]	Beetree Reservoir[b]	North Fork Swannanoa River[a]	North Fork Swannanoa River[b]
Silica (SiO_2)	8.3	7.4	5.6	6.2
Iron (Fe)	.02	.02	.03	.04
Manganese (Mn)	.00	.00	.00	.00
Calcium (Ca)	1.8	1.6	1.0	1.6
Magnesium (Mg)	.7	.8	.4	.3
Sodium (Na) / Potassium (K)	2.3	1.1	2.4	1.7
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	7	6	4	7
Sulfate (SO_4)	2.9	2.6	2.8	1.5
Chloride (Cl)	2.5	1.2	1.9	1.1
Fluoride (F)	.0	.0	.0	.0
Nitrate (NO_3)	.1	.4	.6	.2
Dissolved solids	22	20	17	16
Hardness as $CaCO_3$:				
Total	7	7	4	5
Noncarbonate	2	2	1	0
Color	3	3	3	4
pH	5.8	6.2	5.9	6.7
Specific conductance (micromhos at 25 C.)	24.0	24.6	15.2	14.0
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Apr. 12, 1950	Apr. 12, 1950	Mar. 28, 1950	Mar. 28, 1950

[a] Finished water.
[b] Raw water.

BURLINGTON
(Population, 24,560)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 25,000.
Source: Stony Creek impounded. The raw water intake is located 3 miles north of the treatment plant.
Treatment: Coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, break-point chlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 5,500,000 gpd.
Raw-water storage: Impounding reservoir, 500,000,000 gal; reservoir at treatment plant, 1,750,000 gal.
Finished-water storage: Clear well, 465,000 gal; 3 elevated tanks, 1,500,000, 100,000, and 100,000 gal.

The treatment plant is in the city.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	16	15	Hardness as $CaCO_3$:		
Iron (Fe)	.16	.04	Total	34	59
Manganese (Mn)	.00	.00	Noncarbonate	0	12
Calcium (Ca)	7.8	18			
Magnesium (Mg)	3.6	3.5	Color	8	3
Sodium (Na)	5.1	4.9	pH	6.8	7.3
Potassium (K)			Specific conductance (micromhos at 25 C.)	93.8	147
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	45	58	Temperature (F.)	--	--
Sulfate (SO_4)	3.4	16	Date of collection	Sept. 23, 1950	Sept. 23, 1950
Chloride (Cl)	3.1	3.8			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.4	.2			
Dissolved solids	67	95			

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	35	57	16	7.0	7.4	6.6	39	56	20	91	850	30
Finished water	40	55	13	8.2	8.8	6.8	58	78	38	0	0	0

CHAPEL HILL
(Population, 9,177)

Ownership: University of North Carolina; supplies Carrboro and other suburban districts. Total population supplied, about 16,000.
Source: University Lake, impounding reservoir fed by Neville, Morgan, and Price Creeks. The intake at University Lake is 3 miles southwest of treatment plant which is located on the edge of town.
Treatment: Coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: University Lake, 600,000,000 gal.
Finished-water storage: 1 reservoir, 1,500,000 gal; elevated tank, 250,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	15	13	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.02	Total	20	38
Manganese (Mn)	.00	.00	Noncarbonate	0	12
Calcium (Ca)	5.0	11			
Magnesium (Mg)	1.9	2.5	Color	7	18
Sodium (Na)	6.5	6.9	pH	6.4	6.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	72.5	103
Carbonate (CO_3)	0	0	Turbidity	0.1	1.4
Bicarbonate (HCO_3)	31	31	Temperature (F.)	--	--
Sulfate (SO_4)	2.3	11	Date of collection	Aug. 23, 1951	Aug. 23, 1951
Chloride (Cl)	4.0	11			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.0	.1			
Dissolved solids	54	77			

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	25	30	21	6.9	7.1	6.8	27	30	24	37	98	15
Finished water	27	34	21	8.3	8.6	8.0	44	46	42	0.99	1.3	0.53

CHARLOTTE
(Population, 134,042)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 167,000.
Source: Catawba River. The intake is about 8 miles northwest of treatment plant.
Treatment: Aeration, coagulation with alum, carbon, primary chlorination, sedimentation, rapid sand filtration, final pH adjustment with hydrated lime, secondary chlorination, ammoniation, and fluoridation with sodium fluoride.
Rated capacity of treatment plant: 24,600,000 gpd.
Raw-water storage: 2 reservoirs, estimated capacity 45,000,000 gal, each.
Finished-water storage: 3 clear wells, 2,875,000, 2,875,000, and 5,750,000 gal; 4 elevated tanks, 1,000,000, 1,000,000, 500,000, and 500,000 gal.

The treatment plant is about 2 miles northwest of center of city. The water is pumped from the Catawba River to raw-water storage; then flows by gravity through the treatment plant to clear water wells; then is pumped to distribution system and elevated storage tanks.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	11	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.02	Total	14	22
Manganese (Mn)	.00	.00	Noncarbonate	0	2
Calcium (Ca)	3.6	6.9			
Magnesium (Mg)	1.2	1.2	Color	13	2
Sodium (Na)	3.6	4.9	pH	7.2	8.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	40.5	75.4
Carbonate (CO_3)	0	3	Turbidity	--	--
Bicarbonate (HCO_3)	19	18	Temperature (F.)	--	--
Sulfate (SO_4)	2.7	5.1	Date of collection	Mar. 2, 1950	Mar. 3, 1950
Chloride (Cl)	2.2	3.2			
Fluoride (F)	.1	1.2			
Nitrate (NO_3)	.2	.2			
Dissolved solids	35	45			

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	15	17	13	7.1	7.8	6.9	12	16	9	8.1	38	2
Finished water	19	23	16	8.6	8.8	8.2	20	24	17	.06	.03	0

CONCORD
(Population, 16,486)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 20,000.
Source: Cold Water Creek impounded in Lake Fisher. Lake Concord, fed by a number of springs, serves as auxiliary or emergency supply.
Treatment: Coagulation with alum, ammoniation, chlorination, activated carbon, sedimentation, rapid sand filtration, Calgon, lime, postchlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: Lake Fisher and Lake Concord 1,100,000,000, and 450,000,000 gal, respectively.
Finished-water storage: Clear well, 2,000,000 gal; 2 elevated tanks, 500,000 and 1,000,000 gal; at old plant, 1,500,000 gal.

The raw water intake is about 5 miles north of the treatment plant which is north of the city in Wil-Mar Park section.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	6.6	4.7	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.05	Total	34	41
Manganese (Mn)	.00	.00	Noncarbonate	0	8
Calcium (Ca)	8.0	11			
Magnesium (Mg)	3.4	3.3	Color	7	7
Sodium (Na)	4.7	5.6	pH	6.7	6.7
Potassium (K)			Specific conductance (micromhos at 25 C.)	94.0	116
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	41	40	Temperature (F.)	--	--
Sulfate (SO_4)	5.1	13	Date of collection	Aug. 15, 1950	Aug. 15, 1950
Chloride (Cl)	3.1	4.5			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.4	.4			
Dissolved solids	56	69			

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	32	36	18	7.2	7.5	6.9	35	41	30	18	40	10
Finished water	26	35	21	7.0	7.6	6.8	43	47	38	--	--	--

DURHAM
(Population 71,311)

Ownership: Municipal; total population supplied, about 73,500.
Source: Flat River impounded in Lake Michie, about 15 miles northwest of the city.
Treatment: Slight aeration, breakpoint chlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and final adjustment of pH with lime. Activated carbon used occasionally for taste and odor control.
Rated capacity of treatment plant: 15,560,000 gpd.
Raw-water storage: Impounding reservoir, 4,500,000,000 gal.
Finished-water storage: 5 clear wells, 4,500,000 gal; 1 elevated tank, 1,500,000 gal; 1 elevated reservoir, 3,000,000 gal.

The treatment plant is 3 miles northwest of the center of Durham. Treatment plant capacity can be increased satisfactorily to an additional 5,530,000 gpd.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	13	14	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.05	Total	20	41
Manganese (Mn)	.00	.00	Noncarbonate	2	18
Calcium (Ca)	4.8	13			
Magnesium (Mg)	2.0	2.0	Color	13	4
Sodium (Na)	5.3	5.7	pH	7.2	8.7
Potassium (K)			Specific conductance (micromhos at 25 C.)	65.2	114
Carbonate (CO_3)	0	3	Turbidity	--	--
Bicarbonate (HCO_3)	22	21	Temperature (F.)	--	--
Sulfate (SO_4)	5.7	20	Date of collection	Feb. 27, 1950	Feb. 27, 1950
Chloride (Cl)	5.1	7.0			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.3	.2			
Dissolved solids	50	77			

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	16	20	13	6.9	7.1	6.7	17	20	14	19	45	7.0
Finished water	27	33	23	9.0	9.1	9.0	44	51	38	.30	.40	.18

ELIZABETH CITY
(Population, 12, 685)

Ownership: Municipal; also supplies suburban district. Total population supplied, about 15,000.
Source: Well field of 200 wells, all 30 ft deep, 80 percent of supply; 3 wells, (1 to 3) each 80 ft deep, 20 percent of supply. The yield of the shallow wells is reported to be from 2 to 5 gpm, and of the deep wells, 200, 200, and 90 gpm, respectively.
Treatment: Lime (softening), coagulation with alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 1 reservoir, 3,000,000 gal.
Finished-water storage: 1 clear well, 1,000,000 gal; 1 elevated tank, 500,000 gal.

The shallow wells yield water that is high in iron and comparatively low in chloride, whereas the deep wells yield water that is low in iron and high in chloride (approximately 300 ppm).

ANALYSES

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

	Raw water [a]	Finished water [a]		Raw water [a]	Finished water [a]
Silica (SiO_2)	41	33	Hardness as $CaCO_3$:		
Iron (Fe)	8.1	.77	Total	182	123
Manganese (Mn)	.00	.00	Noncarbonate	12	35
Calcium (Ca)	45	28			
Magnesium (Mg)	17	13	Color	23	8
Sodium (Na) + Potassium (K)	63	69	pH	6.7	8.3
Carbonate (CO_3)	0	7	Specific conductance (micromhos at 25 C.)	638	564
Bicarbonate (HCO_3)	208	93	Turbidity	1.8	2.0
Sulfate (SO_4)	29	48	Temperature (F.)	68	71
Chloride (Cl)	83	95	Date of collection	Aug. 31, 1951	Aug. 31, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.6	.3			
Dissolved solids	405	352			

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	115	180	98	7.0	7.2	7.0	140	186	110	--	--	--
Finished water	65	98	58	9.4	9.6	9.0	113	130	90	--	--	--

[a] Composite, mixed sample.

FAYETTEVILLE
(Population, 34,715)

Ownership: Municipal; also supplies other suburban districts. Total population supplied, about 50,000.
Source: Little Cross Creek impounded in Bonnie Doone, Kornbow, and Glenville Lakes. Intake on east bank of Glenville Lake about 200 ft west of treatment plant.
Treatment: Aeration at times, primary lime, prechlorination, coagulation with alum, mechanical mixing, sedimentation, activated carbon at times, rapid sand filtration, postchlorination, Calgon, adjustment of pH with lime, ammoniation, and final chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 3 impounding reservoirs: Bonnie Doone, 90,000,000; Kornbow, 125,000,000; Glenville, 100,000,000 gal.
Finished-water storage: 1 clear well, 1,500,000 gal; 2 elevated tanks, each 1,000,000 gal.

The treatment plant is about 1 mile from center of city on Filter Plant Drive.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	3.4	4.1	Hardness as $CaCO_3$:		
Iron (Fe)	.08	.08	Total	7	31
Manganese (Mn)	.00	.00	Noncarbonate	2	16
Calcium (Ca)	1.6	11			
Magnesium (Mg)	.8	.9	Color	8	3
Sodium (Na)	2.3	2.2	pH	5.6	6.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	32.6	79.7
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	6	18	Temperature (F.)	--	--
Sulfate (SO_4)	2.2	10	Date of collection	June 20, 1950	June 20, 1950
Chloride (Cl)	3.2	7.5			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.7	.1			
Dissolved solids	22	53			

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	6.0	6.1	5.9	6	6	6	20	40	10
Finished water	12	15	8	7.1	7.2	7.0	30	32	28	0	0	0

GASTONIA
(Population, 23,069)

Ownership: Municipal; also supplies Lowell, Dallas, and suburban districts. Total population supplied, about 48,200.
Source: Long Creek impounded in Rankin Lake. The raw-water intake is about 3 miles north of city.
Treatment: Prechlorination, coagulation with alum, activated carbon (Nuchar), sedimentation, rapid sand filtration, postchlorination, Calgon, and lime.
Rated capacity of treatment plant: 4,800,000 gpd.
Raw-water storage: Impounding reservoir, about 250,000,000 gal.
Finished-water storage: 1 clear well 3,200,000 gal; 2 elevated tanks 1,000,000 and 300,000 gal.

The treatment plant is almost in the center of the city.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	17	15	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.09	Total	22	28
Manganese (Mn)	.00	.00	Noncarbonate	0	6
Calcium (Ca)	5.4	7.4			
Magnesium (Mg)	2.1	2.2	Color	7	5
Sodium (Na)	4.0	4.3	pH	7.0	7.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	66.2	81.6
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	31	26	Temperature (F.)	--	--
Sulfate (SO_4)	1.9	8.4	Date of collection	July 4, 1951	July 4, 1951
Chloride (Cl)	2.2	4.5			
Fluoride (F)	.1	.2			
Nitrate (NO_3)	.2	.0			
Dissolved solids	50	59			

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	28	24	7.2	7.4	7.0	28	32	24	20	75	10
Finished water	27	29	22	7.2	7.5	6.9	28	32	24	.5	1.5	0

GOLDSBORO
(Population, 21,454)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 25,000.
Source: Little River. The intake is about 300 yd northeast of the treatment plant.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 2,250,000 gpd.
Raw-water storage: None.
Finished-water storage: Clear well, 500,000 gal; elevated tank, 1,000,000 gal.

The treatment plant is 2 miles northwest of Goldsboro on the south bank of Little River.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	13	14	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.06	Total	12	40
Manganese (Mn)	.00	.00	Noncarbonate	0	20
Calcium (Ca)	2.8	14			
Magnesium (Mg)	1.2	1.3	Color	17	3
Sodium (Na)	5.1	5.8	pH	6.6	6.9
Potassium (K)			Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	51.2	120
Bicarbonate (HCO_3)	16	25	Turbidity	--	--
Sulfate (SO_4)	3.5	21	Temperature (F.)	--	--
Chloride (Cl)	4.2	7.2	Date of collection	Aug. 12, 1950	Aug. 12, 1950
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.5	.4			
Dissolved solids	50	86			

GREENSBORO
(Population, 74,389)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 90,000.
Source: Reedy Fork Creek (50 percent of supply), Horsepen Creek (30 percent of supply), Brush Creek (20 percent of supply) impounded in Lake Brandt. The intake is $6\frac{1}{2}$ miles from the treatment plant.
Treatment: Prechlorination (at intermediate point on supply line to inhibit algae growth), coagulation with alum, sedimentation, rapid sand filtration, pH adjustment with lime, and postchlorination.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: Reservoir, 20,000,000 gal, Lake Brandt, 800,000,000 gal.
Finished-water storage: 2 clear wells, 3,000,000 and 18,000,000 gal; 3 elevated tanks, 200,000, 500,000, and 1,500,000 gal.

The treatment plant is in the north-central section of the city.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	16	16	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.05	Total	25	40
Manganese (Mn)	.00	.00	Noncarbonate	0	8
Calcium (Ca)	6.1	12			
Magnesium (Mg)	2.4	3.5	Color	6	2
Sodium (Na)	5.1	4.3	pH	7.2	8.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	70.4	104
Carbonate (CO_3)	0	2	Turbidity	--	--
Bicarbonate (HCO_3)	34	35	Temperature (F.)	--	--
Sulfate (SO_4)	3.5	9.5	Date of collection	Mar. 7, 1950	Mar. 7, 1950
Chloride (Cl)	2.8	4.9			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.2	.2			
Dissolved solids	54	70			

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	30	36	26	7.0	7.5	6.7	24	46	17	62	160	30
Finished water	36	43	30	8.6	9.2	7.3	33	64	23	0	0	0

GREENVILLE
(Population, 16,724)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 17,000.
Source: Tar River.
Treatment: Coagulation with alum, ammoniation, chlorination, sedimentation, rapid sand filtration, and final adjustment of pH with lime.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2 clear wells, 300,000 gal each; 3 elevated tanks, 300,000 gal each.

The treatment plant is in the city near Tar River.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	12	Hardness as $CaCO_3$:		
Iron (Fe)	.11	.03	Total	23	41
Manganese (Mn)	.00	.00	Noncarbonate	0	16
Calcium (Ca)	5.9	13			
Magnesium (Mg)	2.0	2.1	Color	13	4
Sodium (Na)	6.5	7.0	pH	6.7	7.3
Potassium (K)			Specific conductance (micromhos at 25 C.)	80.7	124
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	28	31	Temperature (F.)	--	--
Sulfate (SO_4)	5.4	20	Date of collection	Aug. 24, 1950	Aug. 24, 1950
Chloride (Cl)	5.4	6.4			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.4	.6			
Dissolved solids	58	79			

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	16	13	6.8	7.0	6.3	34	46	29	--	460	16
Finished water	27	36	16	8.0	8.6	6.7	47	57	37	--	--	--

HENDERSON
(Population, 10,996).

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 14,500.
Source: Fox Pond impounding reservoir for East Sandy Creek. Intake is about 1½ miles south of the city. Rowland Lake, auxiliary or emergency supply.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, Calgon, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: Impounding reservoir, 40,000,000 gal (estimated).
Finished-water storage: 1 clear well, 750,000 gal; 1 standpipe, 172,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	12	Hardness as $CaCO_3$:		
Iron (Fe)	.08	.08	Total	11	29
Manganese (Mn)	.00	.00	Noncarbonate	0	17
Calcium (Ca)	2.8	9.8			
Magnesium (Mg)	.9	1.0	Color	8	2
Sodium (Na)	5.9	6.0	pH	6.4	7.2
Potassium (K)			Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	52.5	98.0
Bicarbonate (HCO_3)	13	14	Turbidity	--	--
Sulfate (SO_4)	3.9	16	Temperature (F.)	--	--
Chloride (Cl)	5.1	8.6	Date of collection	Jan. 18, 1951	Jan. 18, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	1.4	.9			
Dissolved solids	43	66			

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	14	8	6.7	7.0	6.3	10	13	6	15	100	10
Finished water	27	30	2.5	7.5	7.8	7.0	13	14	12	0	1	0

HICKORY
(Population, 14,755)

Ownership: Municipal; also supplies Longview, Brookford, Windy City area, and suburban districts. Total population supplied, about 20,000.
Source: Catawba River impounded in Lake Hickory. The intake is 1,500 ft west of the treatment plant.
Treatment: Coagulation with alum, chlorination, sedimentation, rapid sand filtration, and final adjustment of pH to about 8.5 by addition of lime.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: Lake Hickory, 32,440,000,000 gal.
Finished-water storage: 1 clear well, 500,000 gal; 1 elevated tank, 1,000,000 gal; 2 standpipes, 250,000 gal each.

The treatment plant is 2 miles northwest of center of the city.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	9.8	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.07	Total	14	26
Manganese (Mn)	.12	.08	Noncarbonate	0	3
Calcium (Ca)	3.5	8.2			
Magnesium (Mg)	1.4	1.4	Color	3	3
Sodium (Na)	3.6	3.3	pH	6.4	6.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	44.9	70.2
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	20	28	Temperature (F.)	--	--
Sulfate (SO_4)	1.9	5.5	Date of collection	Aug. 15, 1950	Aug. 15, 1950
Chloride (Cl)	2.2	3.0			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.6	.3			
Dissolved solids	34	48			

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	12	9	6.7	6.8	6.6	12	15	11	30	60	25
Finished water	27	30	24	8.6	8.8	8.3	23	29	21	0	0	0

HIGH POINT
(Population, 39,973)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 42,500.
Source: Deep River impounded. The intake on Deep River is 4½ miles northeast of treatment plant, which is 1 mile east of the city.
Treatment: Breakpoint chlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, ammoniation, and final adjustment of pH with lime.
Rated capacity of treatment plant: 7,500,000 gpd.
Raw-water storage: Impounding reservoir, 1,500,000,000 gal.
Finished-water storage: 1 clear well, 3,000,000 gal; 1 elevated tank, 1,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	19	18	Hardness as $CaCO_3$:		
Iron (Fe)	.13	.04	Total	27	42
Manganese (Mn)	.00	.00	Noncarbonate	0	10
Calcium (Ca)	6.1	12			
Magnesium (Mg)	2.8	3.0	Color	5	4
Sodium (Na)	7.3	5.6	pH	7.1	7.3
Potassium (K)			Specific conductance (micromhos at 25 C.)	82.3	115
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	38	39	Temperature (F.)	--	--
Sulfate (SO_4)	5.6	15	Date of collection	Mar. 17, 1950	Mar. 17, 1950
Chloride (Cl)	3.6	4.8			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.3	.0			
Dissolved solids	64	79			

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	29	38	22	6.9	7.3	6.7	30	32	28	88	350	40
Finished water	34	48	26	7.5	8.8	6.8	48	52	42	--	--	--

KANNAPOLIS
(Population, 28,448)

Ownership: Cannon Mills; also supplies suburban districts. Total population supplied, about 33,000.

Source: Buffalo Creek impounded for the regular supply. Coddle Creek serves as an auxiliary supply. The intake at the dam is about 1½ miles west of Kannapolis.

Treatment: Domestic: Prechlorination, coagulation with alum, sedimentation, carbon, rapid sand filtration, ammoniation, postchlorination, and soda ash. Industrial: Prechlorination, coagulation with alum, sedimentation, carbon, rapid sand filtration, and soda ash.

Rated capacity of treatment plant: 7,500,000 gpd.

Raw-water storage: Impounding reservoir, 1,250,000,000 gal.

Finished-water storage: Drinking water system: 2 elevated tanks, 250,000 gal each; 2 clear wells, 100,000 and 75,000 gal. Industrial and sprinkler system: 1 open reservoir, 9,800,000; 2 standpipes, 250,000 gal each; 4 elevated tanks, 250,000, 100,000, 100,000, and 75,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	12	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.02	Total	19	18
Manganese (Mn)	--	--	Noncarbonate	0	0
Calcium (Ca)	4.8	4.8			
Magnesium (Mg)	1.6	1.5	Color	3	2
Sodium (Na)	7.2	18	pH	6.3	6.8
Potassium (K)			Specific conductance (micromhos at 25 C.)	63.1	121
Carbonate (CO_3)	0	0	Turbidity	1.3	0.0
Bicarbonate (HCO_3)	29	43	Temperature (F.)	--	--
Sulfate (SO_4)	4.9	11	Date of collection	Sept. 11, 1951	Sept. 11, 1951
Chloride (Cl)	3.1	6.5			
Fluoride (F)	.3	.3			
Nitrate (NO_3)	.4	.1			
Dissolved solids	49	76			

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	23	28	20	7.0	7.3	6.6	16	19	14	6.7	26	2.0
Finished water	30	40	18	7.1	7.9	6.3	21	60	14	.07	.30	.05

KINGS MOUNTAIN
(Population, 7,206)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 7,300.
Source: Kings Creek impounded in City Lake. The intake on the lake is about 3.3 miles from city.
Treatment: Aeration, coagulation with alum and lime, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: Lake reservoir, 50,000,000 gal.
Finished-water storage: 1 clear well, 300,000 gal; 1 elevated tank, 500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.9	9.3	Hardness as $CaCO_3$:		
Iron (Fe)	.17	.19	Total	26	37
Manganese (Mn)	.00	.00	Noncarbonate	0	5
Calcium (Ca)	6.8	11			
Magnesium (Mg)	2.3	2.3	Color	3	13
Sodium (Na)	4.1	3.4	pH	6.7	7.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	70.3	93.9
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	35	39	Temperature (F.)	--	--
Sulfate (SO_4)	3.1	7.5	Date of collection	July 10, 1951	July 10, 1951
Chloride (Cl)	2.0	2.8			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.1	.3			
Dissolved solids	46	58			

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	20	23	17	7.1	7.4	6.7	34	42	31	50	1500	10
Finished water	26	31	22	7.2	8.0	7.1	32	37	29	0	--	--

KINSTON
(Population, 18,336)

Ownership: Municipal; also supplies suburban districts. Total population supplied, 22,000.

Source: 4 wells (1 to 4) 361, 369, 365, and 552 ft deep; 3 artesian wells (Hillcrest group) 350 to 390 ft deep. The yield of the four wells is reported to be 900, 690, 460, 900 gpm. The flow of the artesian group is 150 gpm.

Treatment: The water from wells 1 to 4 is chlorinated before entering the distribution system. Water from the Hillcrest wells flows into a reservoir and is then pumped into the distribution system.

Finished-water storage: 2 reservoirs, 1,000,000 and 250,000 gal; 1 elevated tank, 500,000 gal.

ANALYSES

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

	Well 1	Well 2	Well 3	Well 4	Hillcrest Group 3 Wells
Silica (SiO_2)	13	11	11	9.8	15
Iron (Fe)	.05	.05	.07	.04	.08
Manganese (Mn)	.00	.00	.00	.00	.00
Calcium (Ca)	7.6	5.6	1.6	6.4	15
Magnesium (Mg)	2.7	2.7	1.6	2.9	7.2
Sodium (Na) / Potassium (K)	40	40	48	47	24
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	127	123	120	145	136
Sulfate (SO_4)	3.1	2.6	3.2	1.4	2.9
Chloride (Cl)	6.0	5.8	8.0	6.0	3.5
Fluoride (F)	.2	.1	.3	.3	.1
Nitrate (NO_3)	.3	.1	.4	.1	.5
Dissolved solids	138	132	136	151	139
Hardness as $CaCO_3$:					
Total	30	25	11	28	67
Noncarbonate	0	0	0	0	0
Color	3	2	7	12	2
pH	7.7	7.9	7.7	7.7	7.5
Specific conductance (micromhos at 25 C.)	227	220	225	252	236
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	--	--
Date of collection	Feb. 19, 1951	Feb. 19, 1951	Feb. 19, 1951	Feb. 19, 1951	Feb. 19, 1951
Depth (feet)	361	369	365	552	350-390
Diameter (inches)	38-24-18	26-18-8	18-8	20-10	3
Date drilled	1926	1937	1945	1949	--
Percent of supply	--	--	--	--	--

LENOIR
(Population, 7,888)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 10,298.
Source: Lake (65 percent of supply); Zacks Fork Creek impounded (35 percent of supply). The intake on lake is about 6 miles north of the city; intake on creek is about 0.9 mile from treatment plant.
Treatment: Coagulation with alum, chlorination, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: Lake, 25,000,000 gal.
Finished-water storage: Clear well, 150,000 gal; 2 reservoirs, 500,000 and 1,100,000 gal.

ANALYSES

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

	Raw water[a]	Finished water		Raw water[a]	Finished water
Silica (SiO_2)	20	20	Hardness as $CaCO_3$:		
Iron (Fe)	.14	.17	Total	13	23
Manganese (Mn)	.04	.00	Noncarbonate	0	1
Calcium (Ca)	3.4	6.8			
Magnesium (Mg)	1.2	1.4	Color	13	3
Sodium (Na) + Potassium (K)	4.9	5.1	pH	6.4	7.3
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	49.3	71.3
Bicarbonate (HCO_3)	23	27	Turbidity	--	--
Sulfate (SO_4)	1.5	6.3	Temperature (F.)	--	--
Chloride (Cl)	1.9	3.4	Date of collection	July 12, 1951	July 12, 1951
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.7	.2			
Dissolved solids	50	58			

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	18	32	12	6.6	6.8	6.4	22	46	10	57	72	37
Finished water	25	48	12	7.6	8.4	7.0	32	40	24	--	--	--

[a] Lake and Zacks Fork Creek, 50 percent of each.

LEXINGTON
(Population, 13,571)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 16,062.

Source: Abbotts Creek. The intake is about 4 miles northeast of the city. Leonard Creek impounded in Leonard Lake is used as an auxiliary or emergency supply.

Treatment: Prechlorination, alum, air-mix flocculation, sedimentation, rapid sand filtration, postchlorination (if required), final adjustment of pH with lime.

Rated capacity of treatment plant: 3,500,000 gpd.

Raw-water storage: Leonard Lake, 365,000,000 gal.

Finished-water storage: At plant, 1,000,000 gal; 1 elevated tank, 1,000,000 gal; 1 standpipe, 350,000 gal.

The treatment plant is located 4.1 miles northeast of Lexington on the Greensboro Road.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	24	23	Hardness as $CaCO_3$:		
Iron (Fe)	.34	.34	Total	33	42
Manganese (Mn)	.00	.00	Noncarbonate	0	3
Calcium (Ca)	7.8	12			
Magnesium (Mg)	3.2	2.9	Color	4	3
Sodium (Na)	8.2	9.2	pH	6.8	6.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	102	131
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	45	47	Temperature (F.)	--	--
Sulfate (SO_4)	3.3	11	Date of collection	Nov. 22, 1950	Nov. 22, 1950
Chloride (Cl)	7.0	8.2			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.1	.1			
Dissolved solids	76	92			

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	28	32	25	7.1	7.5	6.8	28	30	25	50	3000	18
Finished water	36	42	24	8.4	8.6	8.4	36	40	32	--	--	--

LUMBERTON
(Population, 9,186)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 6,000.
Source: Lumber River. The intake is 2 miles west of the city. Auxiliary or emergency supply, 1 well 545 ft deep and reported to yield 600 gpm.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 2,250,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 clear well, 750,000 gal; 1 elevated tank, 300,000 gal.

ANALYSES

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

	Well 1	Lumber River	
		(raw water)	(finished water)
Silica (SiO_2)	21	6.7	7.2
Iron (Fe)	.87	.02	.04
Manganese (Mn)	.00	--	--
Calcium (Ca)	37	2.2	15
Magnesium (Mg)	2.6	.5	.6
Sodium (Na), Potassium (K)	16	3.4	4.7
Carbonate (CO_3)	0	0	6
Bicarbonate (HCO_3)	155	5	8
Sulfate (SO_4)	3.2	4.0	25
Chloride (Cl)	4.0	4.4	5.0
Fluoride (F)	.3	.1	.1
Nitrate (NO_3)	.2	.4	.3
Dissolved solids	160	32	72
Hardness as $CaCO_3$:			
Total	103	8	40
Noncarbonate	0	3	23
Color	6	30	5
pH	7.3	5.8	9.5
Specific conductance (micromhos at 25 C.)	264	30.9	109
Turbidity	--	--	--
Temperature (F.)	68	--	--
Date of collection	June 14, 1950	Jan. 10, 1951	Jan. 10, 1951

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	--	--	--	--	6.4	5.4	--	--	--	--	--	--
Finished water	--	27	8	--	9.8	8.4	--	--	--	--	--	--

MONROE
(Population, 10,140)

Ownership: Municipal; also supplies Wingate, Marshville, and suburban districts. Total population supplied, about 12,600.
Source: Richardson Creek impounded in Lake Lee. The intake at Lake is 2 miles east of treatment plant, which is in the city.
Treatment: Prechlorination, coagulation with alum, lime, activated carbon (Nuchar), sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 450,000,000 gal.
Finished-water storage: 2 clear wells, 420,000 and 540,000 gal; 4 elevated tanks, 165,000, 500,000, 135,000, and 50,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	3.5	3.2	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.06	Total	23	40
Manganese (Mn)	.00	.00	Noncarbonate	7	21
Calcium (Ca)	5.4	12			
Magnesium (Mg)	2.3	2.4	Color	12	3
Sodium (Na)	5.7	6.0	pH	6.8	7.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	80.3	122
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	19	23	Temperature (F.)	--	--
Sulfate (SO_4)	6.8	18	Date of collection	Jan. 8, 1951	Jan. 8, 1951
Chloride (Cl)	8.0	10			
Fluoride (F)	.1	.3			
Nitrate (NO_3)	1.3	.5			
Dissolved solids	50	70			

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	24	32	20	6.7	7.0	6.3	28	31	25	150	961	34
Finished water	30	38	24	7.1	7.2	7.0	47	53	42	0	0	0

MORGANTON
(Population, 8,311)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 10,500.
Source: Henry Fork impounded and Warrior Creek. The intake on Henry Fork is about 15 miles south of the city; the intake on Warrior Creek, about 3 miles north of city.
Treatment: Water from Henry Fork: chlorination; water from Warrior Creek: prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: Impounding reservoir, Henry Fork, 5,000,000 gal.
Finished-water storage: 2 clear wells, 500,000 gal each; standpipe, 1,500,000 gal.

Henry Fork originates in a protected watershed. The water is chlorinated and flows into distribution system by gravity. A separate system obtains water from Warrior Creek which receives extensive treatment before storage and distribution. This creek contributes about 10 percent of the total supply.

ANALYSES

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

	Warrior Creek		Henry Fork
	Raw water	Finished water	(finished water)
Silica (SiO_2)	11	13	6.9
Iron (Fe)	.04	.03	.04
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	2.8	3.0	1.6
Magnesium (Mg)	.9	.7	.6
Sodium (Na)	2.5	5.8	2.5
Potassium (K)			
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	15	18	7
Sulfate (SO_4)	1.7	4.2	3.4
Chloride (Cl)	1.2	2.5	1.6
Fluoride (F)	.1	.1	.1
Nitrate (NO_3)	.2	.1	.0
Dissolved solids	30	37	21
Hardness as $CaCO_3$:			
Total	11	10	6
Noncarbonate	0	0	1
Color	3	1	2
pH	7.4	8.1	7.6
Specific conductance (micromhos at 25 C.)	30.6	62.7	19.4
Turbidity	2	1	1
Temperature (F.)	--	--	--
Date of collection	Jan. 22, 1952	Jan. 22, 1952	Jan. 22, 1952

MOUNT AIRY
(Population, 7,192)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 7,500.
Source: Lovills Creek. The intake on Lovills Creek is about 5 miles northeast of the treatment plant, which is on Orchard Street in the city.
Treatment: Coagulation with lime and alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 2 clear wells, 500,000 and 160,000 gal; 2 elevated tanks, 150,000 and 500,000 gal; 1 standpipe, 200,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	8.8	**Hardness as $CaCO_3$:**		
Iron (Fe)	.15	.02	Total	13	23
Manganese (Mn)	.00	.00	Noncarbonate	0	2
Calcium (Ca)	3.9	7.9			
Magnesium (Mg)	.8	.8	Color	9	3
Sodium (Na)	3.7	3.5	pH	6.4	6.8
Potassium (K)			Specific conductance (micromhos at 25 C.)	36.0	62.5
Carbonate (CO_3)	0	0	Turbidity	5	5
Bicarbonate (HCO_3)	18	26	Temperature (F.)	--	--
Sulfate (SO_4)	2.5	5.1	Date of collection	Aug. 17, 1951	Aug. 17, 1951
Chloride (Cl)	2.2	2.8			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.4	.2			
Dissolved solids	33	42			

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	8	6.8	7.1	6.3	10	14	7	46	6000	7
Finished water	16	18	14	8.7	9.0	8.4	23	28	18	0	0	0

NEW BERN
(Population 15,812)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 17,380.
Source: 8 wells (1 to 8) 90 to 115 ft deep. The total yield of the wells is reported to be 2,100 gpm.
Treatment: Zeolite softening, ammoniation, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 reservoir, 300,000 gal; 1 elevated tank, 100,000 gal.

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	16	17	Hardness as $CaCO_3$:		
Iron (Fe)	1.5	.18	Total	195	66
Manganese (Mn)	.00	.00	Noncarbonate	20	0
Calcium (Ca)	75	25			
Magnesium (Mg)	1.8	.9	Color	18	3
Sodium (Na) + Potassium (K)	4.5	67	pH	7.0	7.4
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	418	411
Bicarbonate (HCO_3)	213	219	Turbidity	1	0
Sulfate (SO_4)	19	15	Temperature (F.)	60	60
Chloride (Cl)	7.0	12	Date of collection	Aug. 30, 1951	Aug. 30, 1951
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.1	.1			
Dissolved solids	233	244			

[a] Mixed sample from 8 wells.

RALEIGH
(Population, 65,679)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 70,000.
Source: Walnut Creek impounded in Lakes Raleigh and Johnson. Swift Creek impounded by mill dam, auxiliary supply (used extensively during periods of drought).
Treatment: Coagulation with alum, ammoniation (ammonium sulfate), prechlorination, sedimentation, activated carbon, rapid sand filtration, adjustment of pH with lime, and postchlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: Lake Raleigh, 150,000,000 gal; Lake Johnson, 500,000,000 gal; Swift Creek impounded, 20,000,000 gal.
Finished-water storage: 2 clear wells, 2,000,000 and 2,400,000 gal; 3 elevated tanks, 100,000; 600,000; 750,000 gal.

The treatment plant is on the old Fayetteville Road 1 mile south of the city.

ANALYSES

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

	Raw water [a]	Finished water [a]		Raw water [a]	Finished water [a]
Silica (SiO_2)	8.9	13	Hardness as $CaCO_3$:		
Iron (Fe)	.16	.04	Total	12	30
Manganese (Mn)	.00	.00	Noncarbonate	0	5
Calcium (Ca)	2.8	9.8			
Magnesium (Mg)	1.3	1.4	Color	7	5
Sodium (Na)	5.0	5.1	pH	7.1	9.1
Potassium (K)			Specific conductance (micromhos at 25 C.)	47.6	99.5
Carbonate (CO_3)	0	6	Turbidity	--	--
Bicarbonate (HCO_3)	19	19	Temperature (F.)	--	--
Sulfate (SO_4)	2.5	8.7	Date of collection	Apr. 20, 1950	Apr. 20, 1950
Chloride (Cl)	3.4	4.8			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.1	.0			
Dissolved solids	35	61			

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	14	34	8.8	7.0	8.3	6.3	--	--	--	11	115	4.0
Finished water	27	39	0.9	9.2	9.5	8.4	--	--	--	.18	.75	.0

[a] Walnut Creek.

REIDSVILLE
(Population, 11,708)

Ownership: Municipal; also supplies other suburban districts. Total population supplied, about 16,000.
Source: Troublesome Creek. The intake is about 3 miles southwest of treatment plant.
Treatment: Aeration (air-mix), coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 clear well, 1,000,000 gal; 1 standpipe, 790,000 gal; 2 elevated tanks, 500,000 and 75,000 gal.

The treatment plant is 3 miles west of the center of the city. The capacity of treatment plant is to be increased to 3,000,000 gpd by 1953. Prechlorination and fluoridation will begin in 1953.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	18	18	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.24	Total	19	20
Manganese (Mn)	.00	.07	Noncarbonate	0	0
Calcium (Ca)	4.4	4.8			
Magnesium (Mg)	1.9	2.0	Color	2	4
Sodium (Na)	2.8	11	pH	7.3	7.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	57.2	108
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	23	32	Temperature (F.)	--	--
Sulfate (SO_4)	1.8	12	Date of collection	Nov. 30, 1950	Nov. 30, 1950
Chloride (Cl)	2.5	3.5			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.1	.1			
Dissolved solids	48	74			

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	25	32	18	6.8	7.1	6.5	18	19	17	33	400	5
Finished water	36	48	22	8.1	8.6	7.6	18	19	17	<1	<1	<1

ROANOKE RAPIDS
(Population, 8,156)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 9,200.
Source: Roanoke River. The intake on Roanoke River is a quarter of a mile north of treatment plant, which is 1 mile north of the center of the city.
Treatment: Coagulation with alum, ammoniation, prechlorination, soda-ash, sedimentation, rapid sand filtration, postchlorination at times, adjustment of pH with soda ash.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 clear well, 1,250,000 gal; 2 elevated tanks, 500,000 gal each.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	15	13	Hardness as $CaCO_3$:		
Iron (Fe)	.27	.06	Total	32	34
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	7.6	8.2			
Magnesium (Mg)	3.1	3.2	Color	5	3
Sodium (Na)	9.8	24	pH	7.2	7.1
Potassium (K)			Specific conductance (micromhos at 25 C.)	108	182
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	46	59	Temperature (F.)	--	--
Sulfate (SO_4)	6.9	25	Date of collection	Nov. 22, 1950	Nov. 22, 1950
Chloride (Cl)	5.5	8.1			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.2	.1			
Dissolved solids	70	111			

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	42	45	40	7.8	8.1	7.5	31	34	27	29	45	22
Finished water	53	55	48	7.5	7.6	7.4	30	33	28	--	--	--

ROCKY MOUNT
(Population, 27,697)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 36,000.
Source: Tar River. The intake is about 400 ft west of treatment plant, which is at the edge of the city.
Treatment: Coagulation with alum and lime, carbon, sedimentation, rapid sand filtration, chlorination, Calgon, ammoniation, and adjustment of pH with lime.
Rated capacity of treatment plant: 6,750,000 gpd.
Raw-water storage: None.
Finished-water storage: 2 reservoirs 500,000 and 1,500,000 gal; 1 elevated tank, 1,000,000 gal.

The river was at high stage and more turbid than usual at the time of the collection of the samples, and the samples are not typical of average conditions.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	16	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.04	Total	18	46
Manganese (Mn)	.00	.00	Noncarbonate	3	23
Calcium (Ca)	4.2	15			
Magnesium (Mg)	1.8	2.0	Color	33	3
Sodium (Na)	3.2	5.4	pH	6.6	7.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	57.3	129
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	18	28	Temperature (F.)	--	--
Sulfate (SO_4)	5.1	26	Date of collection	June 7, 1950	June 7, 1950
Chloride (Cl)	3.1	4.8			
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.5	.5			
Dissolved solids	51	86			

SALISBURY
(Population, 20,102)

Ownership: Municipal; also supplies Spencer and East Spencer and suburban districts. Total population supplied, about 26,600.
Source: Yadkin River. Grant Creek is used in extreme emergency. The intake is at the junction of Yadkin and South Yadkin Rivers about 8 miles from the treatment plant which is on Kerr Street in the city.
Treatment: Prechlorination at raw water reservoir and at plant (breakpoint), coagulation with alum, sedimentation, rapid sand filtration, and adjustment of pH with lime.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: Reservoir (near river), 8,000,000 gal.
Finished-water storage: 2 clear wells, 750,000 and 1,000,000 gal; 2 elevated tanks, 1,000.000 and 250,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	12	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.03	Total	13	35
Manganese (Mn)	.00	.00	Noncarbonate	0	12
Calcium (Ca)	3.2	12			
Magnesium (Mg)	1.3	1.3	Color	4	6
Sodium (Na)	3.7	3.4	pH	7.1	8.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	55.8	91.5
Carbonate (CO_3)	0	1	Turbidity	--	--
Bicarbonate (HCO_3)	18	27	Temperature (F.)	--	--
Sulfate (SO_4)	2.7	12	Date of collection	June 8, 1950	June 8, 1950
Chloride (Cl)	2.2	4.2			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.5	.4			
Dissolved solids	35	61			

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	15	16	14	7.0	7.2	6.9	16	--	--	133	291	36
Finished water	23	26	19	8.4	8.9	7.7	30	--	--	0	0	0

SANFORD
(Population, 10,013)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 10,400.
Source: Partridge Creek impounded in 2 lake reservoirs near treatment plant; Lick Creek impounded in Lake William.
Treatment: Prechlorination, coagulation with lime and alum, sedimentation, rapid sand filtration, postchlorination, Calgon, and final adjustment of pH with lime.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: 3 lake reservoirs about 18,000,000, 75,000,000, and 35,000,000 gal.
Finished-water storage: 1 clear well, 350,000 gal; 1 standpipe, 250,000 gal; 1 elevated tank, 75,000 gal.

Lake William is about 8 miles southeast of the center of town. Water is pumped from Lake William into Partridge Creek, which is impounded in reservoirs at the treatment plant.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	13	13	Hardness as $CaCO_3$:		
Iron (Fe)	.37	.22	Total	13	27
Manganese (Mn)	.00	.03	Noncarbonate	0	9
Calcium (Ca)	3.0	8.6			
Magnesium (Mg)	1.3	1.3	Color	5	4
Sodium (Na)	4.4	4.9	pH	6.7	7.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	44.9	85.2
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	17	22	Temperature (F.)	--	--
Sulfate (SO_4)	2.2	9.5	Date of collection	Jan. 11, 1951	Jan. 11, 1951
Chloride (Cl)	3.9	5.8			
Fluoride (F)	.1	.4			
Nitrate (NO_3)	.5	.2			
Dissolved solids	41	59			

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	18	7	6.4	6.9	5.9	11	14	8	30	1500	8
Finished water	19	26	9	7.7	9.0	6.4	34	52	24	0	0	0

SHELBY
(Population, 15,508)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 16,000.
Source: First Broad River. The intake is on the River about 0.2 mile northwest of treatment plant, which is about 1¼ miles northwest of the center of the city.
Treatment: Copper sulfate, prechlorination, coagulation with alum and lime, ammoniation, carbon, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 2 reservoirs, 8,500,000 and 5,000,000 gal.
Finished-water storage: 1 clear well, 2,000,000 gal; 2 elevated tanks, each 500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	22	11	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.04	Total	15	25
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	3.8	8.1			
Magnesium (Mg)	1.3	1.1	Color	4	3
Sodium (Na)	7.4	8.5	pH	7.4	8.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	63.5	92.9
Carbonate (CO_3)	0	3	Turbidity	--	--
Bicarbonate (HCO_3)	28	24	Temperature (F.)	--	--
Sulfate (SO_4)	3.1	12	Date of collection	Aug. 14, 1950	Aug. 14, 1950
Chloride (Cl)	3.0	4.0			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.4	.1			
Dissolved solids	60	61			

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	--	20	11	--	7.4	6.9	--	--	--	--	330	15
Finished water	--	25	16	8.8	9.1	8.8	--	--	--	0	0	0

STATESVILLE
(Population, 16, 901)

Ownership: Municipal: also supplies suburban districts. Total population supplied, about 18, 600.

Source: Fourth Creek. Morrison Creek, emergency supply. The intake is about 1, 600 ft north of the treatment plant, which is approximately 2 miles north of the city.

Treatment: Prechlorination, coagulation with alum and lime, activated carbon (if needed), sedimentation, rapid sand filtration, postchlorination (if needed), Calgon, and adjustment of pH with lime.

Rated capacity of treatment plant: 3, 000, 000 gpd.

Raw-water storage: None.

Finished-water storage: 1 elevated tank 1, 000, 000 gal; clear well, 1, 100, 000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	20	18	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.07	Total	23	36
Manganese (Mn)	.00	.00	Noncarbonate	0	9
Calcium (Ca)	5.2	10			
Magnesium (Mg)	2.5	2.6	Color	4	3
Sodium (Na) / Potassium (K)	4.6	5.0	pH	7.1	7.2
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	66.8	99.9
Bicarbonate (HCO_3)	34	32	Turbidity	--	--
Sulfate (SO_4)	1.9	14	Temperature (F.)	--	--
Chloride (Cl)	2.1	3.4	Date of collection	Mar. 27, 1951	Mar. 27, 1951
Fluoride (F)	.1	.3			
Nitrate (NO_3)	.2	.2			
Dissolved solids	53	70			

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	28	29	27	7.1	7.2	6.9	--	--	--	37	2000	20
Finished water	28	29	27	7.1	7.2	6.9	40	42	39	.1	2.0	0

TARBORO
(Population, 8,120)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,700.
Source: Tar River. The intake on the river is 1 mile east of the city.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, ammoniation, carbon, and adjustment of pH with lime.
Rated capacity of treatment plant: 1,440,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 clear well, 75,000 gal; 2 reservoirs, 250,000 and 1,000,000 gal; 2 elevated tanks, each 100,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	10	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.02	Total	18	37
Manganese (Mn)	.00	.00	Noncarbonate	6	18
Calcium (Ca)	5.0	12			
Magnesium (Mg)	1.3	1.6	Color	45	13
Sodium (Na) / Potassium (K)	4.4	6.0	pH	6.1	6.7
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	59.7	113
Bicarbonate (HCO_3)	15	23	Turbidity	--	--
Sulfate (SO_4)	7.6	18	Temperature (F.)	--	--
Chloride (Cl)	4.2	7.5	Date of collection	July 31, 1951	July 31, 1951
Fluoride (F)	.1	.3			
Nitrate (NO_3)	1.3	.6			
Dissolved solids	56	76			

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	18	21	13	6.6	6.9	6.3	--	--	--	80	200	30
Finished water	29	32	28	7.6	7.7	7.4	42	50	40	0	0	0

THOMASVILLE
(Population, 11,154)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 14,500.
Source: Abbotts Creek. The intake is $4\frac{1}{4}$ miles northwest of the treatment plant, which is $1\frac{1}{2}$ miles west of the center of the city on U. S. Highway 70.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination at times, and adjustment of pH with lime.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 clear well, 480,000 gal; 1 elevated tank, 1,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	24	23	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.12	Total	33	54
Manganese (Mn)	.00	.00	Noncarbonate	0	15
Calcium (Ca)	7.6	17			
Magnesium (Mg)	3.5	2.9	Color	4	4
Sodium (Na)	8.6	8.0	pH	6.8	7.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	105	155
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	45	48	Turbidity	--	--
Sulfate (SO_4)	3.3	17	Temperature (F.)	--	--
Chloride (Cl)	7.8	10	Date of collection	Nov. 22, 1950	Nov. 22, 1950
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.2	.1			
Dissolved solids	77	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	34	39	26	7.1	7.3	6.9	--	--	--	210	1093	138
Finished water	38	45	28	8.1	8.9	7.2	--	--	--	--	--	--

WASHINGTON
(Population, 9,698)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 9,800.
Source: Tranters Creek. Wells: Group of 20 shallow wells 50 to 170 ft deep; wells 2, 3, and 4. Wells 3 and 4 are 105 and 250 ft deep, respectively.
Treatment: Wells: chlorination and addition of Calgon. Tranters Creek: coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and addition of Calgon and lime.
Rated capacity of treatment plant: --
Raw-water storage: None.
Finished-water storage: Reservoir, 600,000 gal; elevated tank, 300,000 gal.

ANALYSES

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

	Tranters Creek [a]	Well 2 [a]	Well 4 [a]	20 shallow wells	Finished water [b]
Silica (SiO_2)	8.3	14	27	13	7.7
Iron (Fe)	.59	.63	2.2	.61	.05
Manganese (Mn)	.00	.00	.07	.00	.00
Calcium (Ca)	10	28	65	77	24
Magnesium (Mg)	10	14	4.2	3.7	8.7
Sodium (Na)	88	262	7.4	25	68
Potassium (K)					
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	27	447	216	204	40
Sulfate (SO_4)	22	29	11	39	38
Chloride (Cl)	151	210	5.0	36	120
Fluoride (F)	.0	1.3	.0	.0	.2
Nitrate (NO_3)	.5	1.6	.1	3.2	.6
Dissolved solids	346	793	233	311	316
Hardness as $CaCO_3$:					
Total	66	127	179	207	96
Noncarbonate	44	0	2	40	63
Color	34	4	4	2	2
pH	6.4	6.6	7.1	7.1	7.5
Specific conductance (micromhos at 25 C.)	609	1,390	382	528	560
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	--	--
Date of collection	June 27, 1951	June 27, 1951	June 26, 1951	June 27, 1951	June 27, 1951
Depth (feet)	--	--	250	50-170	--
Diameter (inches)	--	8	8-12	3-8	--
Date drilled	--	--	1948	--	--
Percent of supply	--	--	--	--	--

[a] Raw water.
[b] Tranters Creek, 95 percent; Wells 2 and 3, 5 percent.

WILMINGTON
(Population, 45,043)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 48,500.
Source: Cape Fear River. Northeast Cape Fear River and Toomers Creek auxiliary or emergency supplies (neither used in last five years). The intake is approximately 30 miles north of Wilmington at Kings Bluff.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, ammoniation, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 7,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2 reservoirs, 4,000,000 and 1,000,000 gal; 2 elevated tanks, 500,000 and 146,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.4	6.1	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.05	Total	17	34
Manganese (Mn)	.00	.00	Noncarbonate	0	9
Calcium (Ca)	4.2	11			
Magnesium (Mg)	1.5	1.7	Color	9	3
Sodium (Na)	9.2	9.1	pH	7.1	7.8
Potassium (K)			Specific conductance (micromhos at 25 C.)	74.2	116
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	25	31	Temperature (F.)	--	--
Sulfate (SO_4)	6.2	17	Date of collection	Mar. 20, 1950	Mar. 20, 1950
Chloride (Cl)	6.6	7.6			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.3	.2			
Dissolved solids	48	68			

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	19	28	10	6.9	7.3	6.3	23	28	16	60	140	20
Finished water	28	34	21	8.0	8.9	6.9	42	50	30	0	0	0

WILSON
(Population, 23,010)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 24,000.

Source: Contentnea Creek, 75 percent of supply; Toisnot Swamp (Creek), 25 percent. The intake on Contentnea Creek is about 4 miles southwest of treatment plant and the intake on Toisnot Swamp is about 0.5 mile east.

Treatment: Prechlorination, coagulation with alum, lime (if necessary), sedimentation, rapid sand filtration, ammoniation, Calgon, postchlorination, and adjustment of pH with lime.

Rated capacity of treatment plant: 3,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 1 reservoir, 2,000,000 gal; 1 elevated tank, 1,000,000 gal.

During dry periods, Toisnot Swamp (Creek) may furnish about 35 percent of the total raw-water supply. Plans are under way for increasing the treatment plant capacity to 6,000,000 gpd.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.6	8.3	Hardness as $CaCO_3$:		
Iron (Fe)	.21	.06	Total	10	41
Manganese (Mn)	.00	.00	Noncarbonate	0	13
Calcium (Ca)	2.3	14			
Magnesium (Mg)	1.1	1.4	Color	28	4
Sodium (Na)	5.6	13	pH	6.7	7.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	48.1	155
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	15	34	Temperature (F.)	--	--
Sulfate (SO_4)	2.9	30	Date of collection	June 14, 1950	June 14, 1950
Chloride (Cl)	4.9	6.5			
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.3	.8			
Dissolved solids	40	92			

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	16	24	12	6.8	7.2	6.4	20	38	10	5	300	0
Finished water	26	30	16	8.2	9.2	7.2	36	54	20	0	0	0

WINSTON-SALEM
(Population, 87,811)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 100,000.

Source: Salem and Walker Creeks impounded in Salem Lake. The Yadkin River serves as an auxiliary or emergency supply, furnishing an additional 25,000,000 gpd. The intake on Salem Lake is 2 miles east of the treatment plant which is about 2½ miles northeast of the center of the city.

Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, fluoridation, Calgon for corrosion control, and adjustment of pH with lime.

Rated capacity of treatment plant: 20,000,000 gpd.

Raw-water storage: Salem Lake, 1,250,000,000 gal.

Finished-water storage: 3 clear wells, 2,000,000 gal each; 3 elevated tanks, 1,000,000, 200,000, and 50,000 gal.

ANALYSES

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

	Salem and Walker Creeks		Yadkin River
	Raw water	Finished water	(raw water)
Silica (SiO_2)	12	12	10
Iron (Fe)	.02	.03	.06
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	4.3	11	3.4
Magnesium (Mg)	1.6	1.7	.9
Sodium (Na) / Potassium (K)	3.9	3.3	3.3
Carbonate (CO_3)	0	7	0
Bicarbonate (HCO_3)	21	16	15
Sulfate (SO_4)	4.1	9.5	3.0
Chloride (Cl)	2.8	4.6	2.2
Fluoride (F)	.1	[a].0	.2
Nitrate (NO_3)	.3	.7	.4
Dissolved solids	39	58	32
Hardness as $CaCO_3$:			
Total	17	34	12
Noncarbonate	0	10	0
Color	9	2	12
pH	7.5	9.0	6.4
Specific conductance (micromhos at 25 C.)	54.2	87.2	40.1
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	Feb. 24, 1950	Feb. 24, 1950	Feb. 1, 1952

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	18	39	8	7.5	9.0	6.8	20	34	10	17	475	3
Finished water	25	41	15	9.2	9.9	6.9	42	68	23	.09	1.7	.05

[a] The supply was not being fluoridated at the time of the collection of the sample. Fluoridation was begun later.

AKRON, OHIO
(Population, 274,605)

Ownership: Municipal; supplies also part of Mogadore. Total population supplied, about 275,900.
Source: Cuyahoga River impounded, 2.5 miles north of Kent. Emergency supply, wells in Kenmore.
Treatment: Coagulation with alum and ferrous sulfate, activated carbon, sedimentation, rapid sand filtration, chlorination, and final adjustment of pH by addition of lime.
Rated capacity of treatment plant: 50,000,000 gpd.
Raw-water storage: 4,200,000,000 gal.
Finished-water storage: 34,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	1.8	1.5	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.47	Total	90	106
Manganese (Mn)	.00	.00	Noncarbonate	38	47
Calcium (Ca)	25	33			
Magnesium (Mg)	6.8	5.8	Color	18	5
Sodium (Na)	2.7	2.8	pH	7.2	7.8
Potassium (K)	1.4	1.4	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	190	225
Bicarbonate (HCO_3)	64	72	Turbidity	--	--
Sulfate (SO_4)	33	43	Temperature (F.)	--	--
Chloride (Cl)	3.5	6.5	Date of collection	May 2, 1951	May 2, 1951
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.5	.3			
Dissolved solids	116	136			

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	66	106	17	8.0	9.0	7.2	98	138	48	8	50	1
Finished water	69	109	23	8.3	9.0	7.1	119	158	70	--	--	--

ALLIANCE
(Population, 26,161)

Ownership: Municipal; supplies also about 2,300 people outside the city limits. Total population supplied, about 28,500.
Source: Mahoning River impounded. Auxiliary supply, 3 wells (1 to 3), 100, 82, and 102 feet deep; yield reported to be 1,400, 560, and 600 gpm.
Treatment: Prechlorination, coagulation with alum, softening with lime, sedimentation, rapid sand filtration, zeolite softening, and postchlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 350,000,000 gal.
Finished-water storage: 4,000,000 gal.

ALLIANCE--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	2.9	4.7	Hardness as $CaCO_3$:		
Iron (Fe)	.42	.21	Total	156	83
Manganese (Mn)	.00	.00	Noncarbonate	78	50
Calcium (Ca)	44	26			
Magnesium (Mg)	11	4.1	Color	18	0
Sodium (Na)	8.5	22	pH	7.0	9.7
Potassium (K)	1.9	--	Specific conductance (micromhos at 25 C.)	343	303
Carbonate (CO_3)	0	16			
Bicarbonate (HCO_3)	94	6	Turbidity	--	--
Sulfate (SO_4)	77	84	Temperature (F.)	--	--
Chloride (Cl)	10	13	Date of collection	May 3, 1951	May 3, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	1.0	.5			
Dissolved solids	219	184			

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	90	180	20	7.2	7.5	6.9	160	280	66	36	700	8
Finished water	43	109	24	10.0	10.5	7.0	88	160	30	--	--	--

ASHTABULA

(Population, 23,696)

Ownership: Ashtabula Water Works Company (controlled by American Water Works & Electric Co.); supplies also Geneva-on-the-Lake, Madison, and 5,000 people outside the city limits. Total population supplied, about 30,200.

Source: Lake Erie. The raw water intake is located at a submerged crib in Lake Erie, 1,500 feet off the breakwater, and 3,000 feet from the treatment plant.

Treatment: Coagulation with alum, activated carbon at times, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 6,500,000 gpd.

Raw-water storage: Reservoir, 4,000,000 gal.

Finished-water storage: 225,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	1.0	.4	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.30	Total	128	130
Manganese (Mn)	--	.00	Noncarbonate	37	42
Calcium (Ca)	38	39			
Magnesium (Mg)	8.3	7.8	Color	5	2
Sodium (Na)	9.3	10	pH	7.9	7.2
Potassium (K)	1.0	1.6	Specific conductance (micromhos at 25 C.)	301	301
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	112	106	Turbidity	--	--
Sulfate (SO_4)	24	32	Temperature (F.)	--	--
Chloride (Cl)	23	23	Date of collection	May 1, 1951	May 3, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.5	.4			
Dissolved solids	172	182			

BARBERTON
(Population, 27,820)

Ownership: Municipal; supplies also about 800 people outside the city limits. Total population supplied, about 28,600.
Source: Wolfe Creek impounded. Emergency supply can be obtained from Akron through 2 six-inch connections.
Treatment: Prechlorination, ammoniation, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: 760,000,000 gal.
Finished-water storage: 4,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.1	3.7	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.11	Total	118	124
Manganese (Mn)	.00	.00	Noncarbonate	52	58
Calcium (Ca)	38	36			
Magnesium (Mg)	5.3	8.0	Color	9	3
Sodium (Na)	4.1	4.7	pH	7.5	7.7
Potassium (K)	1.7	1.0	Specific conductance (micromhos at 25 C.)	252	277
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	79	79			
Sulfate (SO_4)	47	59	Turbidity	--	--
Chloride (Cl)	6.0	6.5	Temperature (F.)	--	--
Fluoride (F)	.2	.1	Date of collection	May 1, 1951	May 1, 1951
Nitrate (NO_3)	3.0	2.4			
Dissolved solids	151	166			

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	73	114	29	7.7	8.5	7.2	123	183	71	28	280	8
Finished water	74	117	23	7.6	8.4	6.9	135	191	91	--	--	--

CANTON
(Population, 116,912)

Ownership: Municipal; supplies also Meyers Lake and suburban districts. Total population supplied, about 130,900.
Source: 5 wells (9 to 13) at Northeast Station, 172, 161, 195, 184, and 151 ft deep, yield reported to be 1,000, 3,500, 3,500, 3,500, and 1,050 gpm (51 percent of supply). Ranney collector (with 2 recharge units) at Northwest Station, 129.5 ft deep, capacity reported to be 15,000,000 gpd (42 per cent of supply). Auxiliary supply, 2 wells (1 and 2) in the Grovemiller area, 176 and 188 ft deep, yield reported to be 700 and 1,390 gpm, and 1 well at Southwest Station, 140 ft deep, yield reported to be 3,500 gpm. The auxiliary wells are used during the summer months and provide 7 per cent of the total supply.
Treatment: Aeration over coke at times, and chlorination.
Raw-water storage: None.
Finished-water storage: 15,000,000 gal.

CANTON--Continued

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)	13	11	Hardness as $CaCO_3$:		
Iron (Fe)	[c] .73	.61	Total	454	364
Manganese (Mn)	.23	.15	Noncarbonate	167	147
Calcium (Ca)	134	111			
Magnesium (Mg)	29	21	Color	2	4
Sodium (Na)	5.5	5.8	pH	7.3	7.4
Potassium (K)	1.5	1.2	Specific conductance (micromhos at 25 C.)	826	682
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	350	264	Turbidity	--	--
Sulfate (SO_4)	163	147	Temperature (F.)	--	--
Chloride (Cl)	10	9.2	Date of collection	April 9, 1951	April 9, 1951
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.5	.5			
Dissolved solids	550	450			

[a] N. E. Sta. [b] N. W. Sta. [c] Sample slightly turbid when collected.

CHILLICOTHE

(Population, 20,133)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 20,600.

Source: 3 wells (9 to 11), all 105 ft. deep; yield of wells 9 and 11 reported to be 1,200 and 1,500 gpm. The wells are located at the treatment plant on Park Street.

Treatment: Coagulation with alum, softening with lime and soda ash, recarbonation, ammoniation, sedimentation, rapid sand filtration, chlorination, and stabilization by addition of phosphates. The water is softened to a hardness of about 85 ppm.

Rated capacity of treatment plant: 3,500,000 gpd.

Raw-water storage: None

Finished-water storage: Reservoir, 4,000,000 gal.

ANALYSES

(Analyses, in parts per million, by Ohio Department of Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	8	8	Hardness as $CaCO_3$:		
Iron (Fe)	--	.25	Total	431	103
Manganese (Mn)	--	--	Noncarbonate	132	56
Calcium (Ca)	116	19			
Magnesium (Mg)	34	9	Color	0	0
Sodium (Na)	--	--	pH	7.3	10.2
Potassium (K)	--	--	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	23			
Bicarbonate (HCO_3)	365	[a] 0	Turbidity	40	0
Sulfate (SO_4)	--	--	Temperature (F.)	--	--
Chloride (Cl)	10	10	Date of collection	Mar. 11, 1949	Mar. 11, 1949
Fluoride (F)	0	0			
Nitrate (NO_3)	--	.7			
Dissolved solids	--	249			

[a] Hydroxide (OH), 3 ppm.

CHILLICOTHE--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.....	297	380	270	--	--	--	--	--	--	--	--	--
Finished water...	41	80	29	9.5	10.2	9.0	107	149	62	--	--	--

CINCINNATI
(Population, 503,998)

Ownership: Municipal; supplies also Cheviot, Cleves, Deer Park, Elmwood Place, Greenhills, Indian Hill, Madeira, Mariemont, Montgomery, Mt. Healthy, Newtown, North Bend, North College Hill, St. Bernard, Sharonville, Silverton, Terrace Park, Woodlawn, and suburban districts. Total population supplied, about 634,000.
Source: Ohio River.
Treatment: Prechlorination, coagulation with iron salts and lime, activated carbon, sedimentation, chlorination, rapid sand filtration, and ammoniation.
Rated capacity of treatment plant: 200,000,000 gpd.
Raw-water storage: 400,000,000 gal.
Finished-water storage: 151,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.0	6.1	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.13	Total	110	115
Manganese (Mn)	.00	.00	Noncarbonate.....	73	71
Calcium (Ca)	31	34			
Magnesium (Mg).....	8.0	7.5	Color.....	2	1
Sodium (Na)	12	14	pH.....	7.0	8.2
Potassium (K)	3.5	3.3	Specific conductance (micromhos at		
Carbonate (CO_3).....	0	0	25 C.).....	304	324
Bicarbonate (HCO_3)	46	55	Turbidity.....	--	--
Sulfate (SO_4).....	81	78	Temperature (F.)...	--	--
Chloride (Cl).....	14	20	Date of collection...	May 19, 1951	May 19, 1951
Fluoride (F).....	.2	.2			
Nitrate (NO_3).....	2.4	1.5			
Dissolved solids.....	185	195			

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.....	36	60	18	7.2	8.3	6.7	96	152	46	167	1,500	4
Finished water...	39	58	24	8.5	8.7	8.1	111	155	75	--	--	--

CLEVELAND
(Population, 914,808)

Ownership: Municipal; supplies also Bay, Beachwood, Bedford, Bratenahl, Brecksville, Broadview Heights, Brooklyn, Brooklyn Heights, Brook Park, Cleveland Heights, Cuyahoga Heights, Dover, East Cleveland, Euclid, Fairview, Garfield Heights, Gates Mills, Highland Heights, Hunting Valley, Independence, Lakewood, Linndale, Lyndhurst, Maple Heights, Mayfield, Mayfield Heights, Middleburgh Heights, Moreland Hills, Newburgh Heights, North Olmsted, North Randall, North Royalton, Olmsted Falls, Orange, Parkview, Parma, Parma Heights, Richmond Heights, Rocky River, Seven Hills, Shaker Heights, Solon, South Euclid, Strongsville, University Heights, Warrensville Heights, Westview, Wickliffe, Willowwick, and suburban districts. Total population supplied, about 1,370,000.
Source: Lake Erie.
Treatment: Ammoniation, prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, ammoniation, and postchlorination.
Rated capacity of treatment plant: 300,000,000 gpd.
Raw-water storage: 80,600,000 gal.
Finished-water storage: 270,300,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	2.4	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	128
Manganese (Mn)	.00	Noncarbonate	43
Calcium (Ca)	32		
Magnesium (Mg)	7.3	Color	3
Sodium (Na)	8.7	pH	6.8
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	286
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	103	Temperature (F.)	--
Sulfate (SO_4)	30	Date of collection	April 30, 1951
Chloride (Cl)	20		
Fluoride (F)	.1		
Nitrate (NO_3)	1.5		
Dissolved solids	169		

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	91	98	84	8.2	8.4	7.0	125	--	--	19	110	1
Finished water	82	91	60	7.5	7.9	6.8	125	--	--	--	--	--

CLEVELAND HEIGHTS
(Population, 59,141)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

COLUMBUS
(Population, 375,901)

Ownership: Municipal; supplies also Bexley, Gahanna, Grandview Heights, Upper Arlington, Whitehall, and about 17,000 people outside the city limits. Total population supplied, about 450,000.

Source: Scioto River, impounded in Griggs Reservoir and O'Shaughnessy Reservoir (96 percent of supply); 4 wells (1 to 4), about 100 ft deep, total yield reported to be 10,000,000 gpd. Emergency supply, White Sulfur Quarry (seepage water) and Olentangy River.

Treatment: Coagulation with alum, softening with lime and soda ash, activated carbon at times, sedimentation, recarbonation, rapid sand filtration, Calgon, chlorination, and chlorine dioxide when necessary. The water is softened to a hardness of about 70 ppm. The supply from wells is treated at the Nelson Road Plant, which operates for about 4 months each year. All other supplies are treated at the Dublin Road Plant.

Rated capacity of treatment plants: Dublin Road Plant, 54,000,000 gpd; Nelson Road Plant, 8,000,000 gpd.

Raw-water storage: 8,000,000,000 gal.

Finished-water storage: 20,000,000 gal.

An additional system of supply is under construction. The source of this supply will be Big Walnut Creek impounded by a dam just north of Central College creating a reservoir of about 20 billions gal. The supply will be softened and filtered in a treatment plant of a capacity 48 million gpd. The new construction will provide for storage of 16 millions gallons of finished water. The system will serve primarily the north and east end boosters districts, but will be integrated with the present distribution system so that the central section of the city can also be served. It is estimated that the system will be in operation late in 1955 or early in 1956.

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

	Scioto River			Wells 1 to 4	
	Raw water	Finished water	Finished water	Raw water	Finished water
Silica (SiO_2)	4.7	4.3	2.2	17	11
Iron (Fe)	.03	.07	.10	3.0	.07
Manganese (Mn)	.00	.00	--	.00	.00
Calcium (Ca)	65	35	19	122	19
Magnesium (Mg)	19	8.0	3.1	55	12
Sodium (Na)	6.2	6.7	49	19	62
Potassium (K)	2.5	2.5		2.2	2.2
Carbonate (CO_3)	7	14	18	0	27
Bicarbonate (HCO_3)	168	0	4	459	[a]0
Sulfate (SO_4)	85	94	115	161	157
Chloride (Cl)	8.5	9.5	8	12	11
Fluoride (F)	.1	.1	.3	.7	.4
Nitrate (NO_3)	6.2	6.0	2.2	.0	.0
Dissolved solids	296	181	227	614	289
Hardness as $CaCO_3$:					
Total	240	120	60	530	97
Noncarbonate	91	97	27	154	52
Color	30	4	3	10	0
pH	7.9	9.5	10.2	7.1	9.8
Specific conductance (micromhos at 25 C.)	495	309	391	945	512
Turbidity	--	--	--	--	--
Temperature (F.)	77	81	--	55	57
Date of collection	June 23, 1953	June 23, 1953	Sept. 26, 1949	June 23, 1953	June 23, 1953

[a] Hydroxide (OH) 2ppm.

COLUMBUS--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	130	195	50	8.0	8.4	7.3	217	307	58	102	953	10
Finished water	34	76	17	10.2	11.0	9.4	81	157	21	--	--	--

CUYAHOGA FALLS
(Population, 29,195)

Ownership: Municipal; supplies also Silver Lake. Total population supplied, about 30,000.
Source: 5 wells (1, 2, 3, 5, 6), 120, 130, 129, 130, and 120 ft deep; yield of wells 1, 2, 5, and 6 reported to be 1,000, 1,500, 1,500, and 850 gpm.
Treatment: Aeration, rapid sand filtration, part zeolite softening, adjustment of pH with soda ash, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 270,000 gal.
Finished-water storage: 2,600,000 gal.

ANALYSES

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

	Well 2 (raw water)	Finished water		Well 2 (raw water)	Finished water
Silica (SiO_2)	7.8	9.4	Hardness as $CaCO_3$:		
Iron (Fe)	.82	.18	Total	204	97
Manganese (Mn)	.05	.00	Noncarbonate	62	0
Calcium (Ca)	63	26			
Magnesium (Mg)	11	7.8	Color	2	1
Sodium (Na)	7.3	69	pH	7.4	7.8
Potassium (K)	1.3	5.6	Specific conductance (micromhos at 25 C.)	431	504
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	172	197	Temperature (F.)	--	--
Sulfate (SO_4)	67	72	Date of collection	May 2, 1951	May 2, 1951
Chloride (Cl)	9.8	18			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.1	.3			
Dissolved solids	266	303			

Regular determinations at treatment plant, 1949

	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	184	196	167	7.4	--	--	263	282	240	--	--	--
Finished water	188	201	167	7.9	--	--	--	--	--	--	--	--

DAYTON
(Population, 243,872)

Ownership: Municipal; supplies also Oakwood and about 100,000 people outside the city limits. Total population supplied, about 353,000.
Source: 23 wells (11 to 16 and 19 to 35), 20 of which are 54 to 85 ft deep, and 3 of which are 154, 157, and 161 ft deep. Auxiliary supply, 145 wells in groups of 6, 94, 6, 28, and 11 wells.
Treatment: Chlorination.
Raw-water storage: 35,000,000 gal.
Finished-water storage: 5,400,000 gal.

A softening and filtration plant is under construction (1951).

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	10	Hardness as $CaCO_3$:	
Iron (Fe)	.22	Total	358
Manganese (Mn)	--	Noncarbonate	74
Calcium (Ca)	91		
Magnesium (Mg)	32	Color	2
Sodium (Na)	5.7	pH	8.2
Potassium (K)		Specific conductance (micromhos at 25 C.)	654
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	346	Temperature (F.)	--
Sulfate (SO_4)	66	Date of collection	Oct. 18, 1950
Chloride (Cl)	10		
Fluoride (F)	.2		
Nitrate (NO_3)	4.4		
Dissolved solids	391		

EAST CLEVELAND
(Population, 40,047)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

EAST LIVERPOOL
(Population, 24,217)

Ownership: Municipal; supplies also about 7,200 people outside the city limits. Total population supplied, about 31,400.
Source: Ohio River.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, postchlorination, and chlorine dioxide.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 6,000,000 gal.

EAST LIVERPOOL--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.5	4.3	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.16	Total	78	106
Manganese (Mn)	.30	.00	Noncarbonate	67	83
Calcium (Ca)	22	33			
Magnesium (Mg)	5.8	5.8	Color	3	2
Sodium (Na)	6.9	7.0	pH	6.1	8.9
Potassium (K)	.5	1.5	Specific conductance (micromhos at 25 C.)	220	262
Carbonate (CO_3)	0	5			
Bicarbonate (HCO_3)	14	18	Turbidity	--	--
Sulfate (SO_4)	73	85	Temperature (F.)	--	--
Chloride (Cl)	6.2	8.0	Date of collection	May 3, 1951	May 3, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	1.8	1.5			
Dissolved solids	133	170			

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	13	30	3	6.7	7.9	6.1	95	150	60	48	200	13
Finished water	25	37	14	8.6	10.2	7.4	120	160	80	--	--	--

ELYRIA
(Population, 30,307)

Ownership: Municipal; supplies also Amherst, Penfield Junction, Vincent, other small communities, and suburban districts. Total population supplied, about 42,000.

Source: Lake Erie. The treatment plant is located at Lorain. The raw water intake is at two submerged cribs in Lake Erie 1,500 ft offshore, west northwest from the treatment plant, and 2.5 miles west of the mouth of the Black River.

Treatment: Ammoniation, activated carbon, chlorination, coagulation with alum, adjustment of pH to about 7.3 by addition of lime, sedimentation, rapid sand filtration, ammoniation, and postchlorination.

Rated capacity of treatment plant: 12,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 3,000,000 gal.

ELYRIA--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	2.1	1.1	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.14	Total	129	131
Manganese (Mn)	.00	.00	Noncarbonate	33	42
Calcium (Ca)	38	38			
Magnesium (Mg)	8.3	8.7	Color	3	1
Sodium (Na)	8.2	8.4	pH	8.0	7.5
Potassium (K)	2.9	2.8	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	300	310
Bicarbonate (HCO_3)	117	108	Turbidity	--	--
Sulfate (SO_4)	26	35	Temperature (F.)	--	--
Chloride (Cl)	18	22	Date of collection	June 1, 1951	June 19, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.8	1.3			
Dissolved solids	167	180			

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	91	100	71	7.9	8.5	7.6	--	--	--	85	800	5
Finished water	82	92	64	7.3	7.5	6.9	--	--	--	--	--	--

EUCLID

(Population, 41,396)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

FINDLAY

(Population, 23,845)

Ownership: Municipal; supplies also about 250 people outside the city limits. Total population supplied, about 24,100 people.
Source: Blanchard River, impounded, 4 miles east of Findlay; 3 springs and 21 wells (2 to 13, 15 to 19, 22 to 25), 9.5 miles east of Findlay. The wells are 187, 191, 138, 189, 195, 55, 181, 187, 183, 225, 190, 160, 189, 104, 78, 120, 109, 180, 78, 167, and 181 ft deep, with yields reported to be from 37 to 286 gpm. Emergency supply, Blanchard River, intake in Findlay.
Treatment: Prechlorination, softening with lime and soda ash, coagulation with alum and lime, activated carbon, sedimentation, and rapid sand filtration.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 1,356,000,000 gpd.
Finished-water storage: 2,500,000 gal.

FINDLAY--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	3.7	3.8	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.03	Total	280	79
Manganese (Mn)	.00	.00	Noncarbonate	84	44
Calcium (Ca)	69	25			
Magnesium (Mg)	26	3.9	Color	3	0
Sodium (Na)	11	28	pH	7.5	8.5
Potassium (K)	4.2	4.3	Specific conductance (micromhos at 25 C.)	577	322
Carbonate (CO_3)	0	4			
Bicarbonate (HCO_3)	238	38	Turbidity	--	--
Sulfate (SO_4)	76	75	Temperature (F.)	--	--
Chloride (Cl)	21	19	Date of collection	June 5, 1951	June 5, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	12	9.9			
Dissolved solids	362	193			

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	189	240	90	7.2	7.7	6.9	304	398	179	54	70	37
Finished water	36	185	16	8.9	10.2	7.9	82	377	30	--	--	--

FREMONT

(Population, 16,537)

Ownership: Municipal; supplies also about 200 people outside the city limits. Total population supplied, about 16,700.

Source: Sandusky River.

Treatment: Coagulation with ferric sulfate, softening with lime and soda ash, activated carbon, sedimentation, recarbonation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 3,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 750,000 gal.

ANALYSES

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

	Raw water [a]	Finished water		Raw water [a]	Finished water
Silica (SiO_2)	4.5	5.0	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.15	Total	244	78
Manganese (Mn)	--	.00	Noncarbonate	90	62
Calcium (Ca)	67	20			
Magnesium (Mg)	18	7.0	Color	20	1
Sodium (Na)	7.4	39	pH	8.1	9.3
Potassium (K)	2.5	6.2	Specific conductance (micromhos at 25 C.)	486	374
Carbonate (CO_3)	0	7			
Bicarbonate (HCO_3)	184	6	Turbidity	--	--
Sulfate (SO_4)	89	115	Temperature (F.)	--	--
Chloride (Cl)	11	16	Date of collection	May 1-10, 1951	June 19, 1951
Fluoride (F)	.2	.3			
Nitrate (NO_3)	3.4	9.0			
Dissolved solids	321	228			

[a] Composite of daily samples May 1-10, 1951.

FREMONT--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	141	258	46	--	--	--	239	396	82	171	984	5
Finished water	31	67	17	--	--	--	--	--	--	--	--	--

GARFIELD HEIGHTS
(Population, 21,662)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

HAMILTON
(Population, 57,951)

Ownership: Municipal; supplies also about 1,500 people outside the city limits. Total population supplied, about 59,500.
Source: 6 wells (2 to 6, and 8), 155, 142, 115, 180, 138, and 168 ft deep; yield reported to be 2,000, 2,500, 2,000, 2,000, 2,000, and 1,950 gpm. Well 2 provides 5 percent of the supply, well 4, 20 percent, and wells 3, 5, and 6, 25 percent each.
Treatment: Aeration, coagulation with alum, softening with lime and soda ash, recarbonation, sedimentation, rapid sand filtration, chlorination, and ammoniation.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 11,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	8.0	Hardness as $CaCO_3$:		
Iron (Fe)	.66	.18	Total	334	89
Manganese (Mn)	.38	.00	Noncarbonate	53	69
Calcium (Ca)	84	21			
Magnesium (Mg)	30	9.0	Color	3	0
Sodium (Na)	8.4	10	pH	7.3	8.8
Potassium (K)	5.1	5.2	Specific conductance (micromhos at 25 C.)	631	255
Carbonate (CO_3)	0	5	Turbidity	--	--
Bicarbonate (HCO_3)	342	15	Temperature (F.)	--	--
Sulfate (SO_4)	74	76	Date of collection	May 23, 1951	May 23, 1951
Chloride (Cl)	11	12			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.7	.4			
Dissolved solids	379	156			

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	280	295	260	7.3	--	--	344	370	322	--	--	--
Finished water	42	57	27	9.1	--	--	83	119	70	--	--	--

IRONTON
(Population, 16,333)

Ownership: Municipal; supplies also Coal Grove. Total population supplied, about 18,600.
Source: Ohio River.
Treatment: Coagulation with alum and lime, sedimentation, chlorination, and chlorine dioxide.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: 1,000,000 gal.
Finished-water storage: 5,000,000 gal.

ANALYSES

(Analyses, in parts per million, by Ohio Department of Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	3	Hardness as $CaCO_3$:		
Iron (Fe)	--	.15	Total	95	122
Manganese (Mn)	--	--	Noncarbonate	73	96
Calcium (Ca)	35	46			
Magnesium (Mg)	2	2	Color	10	2
Sodium (Na)	--	--	pH	7.4	8.7
Potassium (K)	--	--	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	6			
Bicarbonate (HCO_3)	27	20	Turbidity	30	0
Sulfate (SO_4)	--	--	Temperature (F.)	--	--
Chloride (Cl)	12	12	Date of collection	Jan. 25, 1951	Jan. 25, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	--	.6			
Dissolved solids	--	202			

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	33	130	18	7.0	--	--	121	--	--	118	600	10
Finished water	20	36	15	7.8	--	--	130	--	--	--	--	--

LAKEWOOD
(Population, 68,071)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

LANCASTER
(Population, 24,180)

Ownership: Municipal; supplies also about 450 people outside the city limits. Total population supplied, about 24,600.
Source: 7 wells (4, 5, 7 to 11), each 95 ft deep. The specific capacity (after 8 hours pumping) of wells 4, 5, 7, 8, 9, and 10 was reported to be 243, 931, 501, 491, 648, and 567 gpm. The yield of well 11 is reported to be 1,200 gpm.
Treatment: Aeration, rapid sand filtration, zeolite softening, chlorination, and final adjustment of pH to 7.3-8.0 with soda ash.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,300,000 gal.

LANCASTER--Continued

ANALYSES

(Analyses, in parts per million, by Ohio Department of Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	15	15	Hardness as $CaCO_3$:		
Iron (Fe)	--	.1	Total	430	72
Manganese (Mn)	.25	.03	Noncarbonate	98	0
Calcium (Ca)	114	16			
Magnesium (Mg)	35	8	Color	5	5
Sodium (Na)	--	--	pH	7.2	7.6
Potassium (K)	--	--	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	405	415			
Sulfate (SO_4)	--	--	Turbidity	35	0
Chloride (Cl)	14	14	Temperature (F.)	--	--
Fluoride (F)	.1	.1	Date of collection	Jan. 10, 1951	Jan. 10, 1951
Nitrate (NO_3)	--	.2			
Dissolved solids	--	569			

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	309	--	--	7.3	--	--	413	--	--	54	--	--
Finished water	359	--	--	7.9	8.0	7.5	94	428	55	55	--	--

LIMA

(Population, 50,246)

Ownership: Municipal; supplies also about 15,000 people outside the city limits. Total population supplied, about 65,000.

Source: Ottawa River, stored in upland reservoirs. Auxiliary supply, 6 wells (1 to 6), 410, 400, 245, 400, 400, and 400 ft deep. The yield from each of wells 1 to 4 is reported to be 250 gpm. The total yield from wells 5 and 6 is reported to be 750 gpm.

Treatment: Coagulation with alum, softening with lime and soda ash, sedimentation, recarbonation, rapid sand filtration, addition of polyphosphate, and chlorination.

Rated capacity of treatment plant: 12,000,000 gpd.

Raw-water storage: 2,700,000,000 gal.

Finished-water storage: Clear-water wells, 2,750,000 gal; elevated tank, 1,000,000 gal.

LIMA--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	3.4	4.7	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.09	Total	173	80
Manganese (Mn)	.00	.00	Noncarbonate	60	48
Calcium (Ca)	47	18			
Magnesium (Mg)	13	8.5	Color	17	1
Sodium (Na)	5.0	12	pH	7.9	9.0
Potassium (K)	5.0	4.3	Specific conductance (micromhos at 25 C.)	368	244
Carbonate (CO_3)	0	8			
Bicarbonate (HCO_3)	135	22	Turbidity	--	--
Sulfate (SO_4)	64	66	Temperature (F.)	--	--
Chloride (Cl)	6.0	7.5	Date of collection	June 5, 1951	June 5, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	5.4	5.1			
Dissolved solids	229	153			

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	106	138	84	8.1	8.3	7.5	190	218	164	28	45	5
Finished water	34	60	20	9.6	10.5	9.0	90	115	74	--	--	--

LORAIN

(Population, 51,202)

Ownership: Municipal; supplies also Sheffield Lake and suburban districts. Total population supplied, about 56,000.

Source: Lake Erie. The raw water intake is at a submerged crib in Lake Erie, north northwest of the treatment plant, and 2,800 ft offshore.

Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH to about 7.5 by addition of lime.

Rated capacity of treatment plant: 11,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 4,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	1.1	1.0	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.07	Total	125	132
Manganese (Mn)	--	.00	Noncarbonate	32	40
Calcium (Ca)	32	39			
Magnesium (Mg)	11	8.3	Color	10	1
Sodium (Na)	8.6	8.5	pH	7.7	7.5
Potassium (K)	.9	2.6	Specific conductance (micromhos at 25 C.)	293	319
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	113	111	Turbidity	--	--
Sulfate (SO_4)	27	37	Temperature (F.)	--	--
Chloride (Cl)	18	22	Date of collection	May 1, 1951	June 19, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.2	1.3			
Dissolved solids	164	179			

LORAIN--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.....	87	96	69	7.9	8.6	7.6	123	138	100	49	340	3
Finished water...	77	88	51	7.3	7.6	6.7	131	144	111	--	--	--

MANSFIELD
(Population, 43,564)

Ownership: Municipal; supplies also about 7,000 people outside the city limits. Total population supplied, about 50,600.

Source: 11 wells (1 to 11), average depth reported to be 150 ft; total yield reported to be 7,500,000 gpd. Auxiliary supply, Clear Fork Reservoir located about 5 miles southwest of Mansfield. This reservoir will be used as a source of supply after January, 1952.

Treatment: Surface supply: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination. Well supply: Chlorination.

Rated capacity of treatment plant: 7,500,000 gpd.

Raw-water storage: Reservoir, 4,000,000,000 gal.

Finished-water storage: 6,000,000 gal.

ANALYSIS

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

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.48	Total	229
Manganese (Mn)	.11	Noncarbonate	34
Calcium (Ca)	61		
Magnesium (Mg)	19	Color	0
Sodium (Na)	6.8	pH	7.4
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	471
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	240	Temperature (F.)	--
Sulfate (SO_4)	48	Date of collection	May 1, 1951
Chloride (Cl)	4.2		
Fluoride (F)	.1		
Nitrate (NO_3)	.7		
Dissolved solids	277		

MAPLE HEIGHTS
(Population, 15,586)

Ownership: Municipal.

Source: Supplied by Cleveland. (See Cleveland.)

MARIETTA
(Population, 16,006)

Ownership: Municipal; supplies also about 1,000 people outside the city limits. Total population supplied, about 17,000.
Source: 4 wells (1 to 4), each 59 ft deep; yield for each well reported to be 1,000 gpm. The wells are one-half mile west of the treatment plant. Emergency supply, Muskingum River.
Treatment: Coagulation with alum, softening with lime and soda ash, recarbonation, chlorination, sedimentation, rapid sand filtration, and final adjustment of pH to about 8.6.
Rated capacity of treatment plant: 2,880,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,900,000 gal.

ANALYSES

(Analyses, in parts per million, by Ohio Department of Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	14	13	Hardness as $CaCO_3$:		
Iron (Fe)	.4	.4	Total	302	121
Manganese (Mn)	.02	.02	Noncarbonate	136	78
Calcium (Ca)	95	23			
Magnesium (Mg)	16	16	Color	0	0
Sodium (Na)	--	--	pH	7.7	9.0
Potassium (K)	--	--	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	16	Turbidity	0	0
Bicarbonate (HCO_3)	203	21	Temperature (F.)	--	--
Sulfate (SO_4)	--	--	Date of collection	Aug. 3, 1949	Aug. 3, 1949
Chloride (Cl)	86	87			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	--	.7			
Dissolved solids	--	347			

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	160	--	--	9.3	10.2	8.6	304	480	225	--	--	--
Finished water	34	188	18	--	--	--	116	267	54	--	--	--

MARION
(Population, 33,817)

Ownership: The Marion Water Co. (controlled by American Water Works and Electric Co.); supplies also about 2,000 people outside the city limits. Total population supplied, about 35,800.
Source: 13 wells (13, 15, 17, 18, 20 to 28), 142, 142, 142, 145, 141, 140, 140, 140, 224, 225, 212, 184, and 202 ft deep. The yield of the wells is reported to be 210, 127, 232, 210, 127, 210, 175, 150, 410, 235, 202, 650, and 500 gpm, respectively.
Treatment: Aeration, coagulation with alum, softening with lime and soda ash, sedimentation, recarbonation, and chlorination. The water is softened to a hardness of about 137 ppm.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 1,000,000 gal.
Finished-water storage: 2,500,000 gal.

MARION--Continued

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	15	4.8	Hardness as $CaCO_3$:		
Iron (Fe)	.08	.14	Total	653	126
Manganese (Mn)	.07	.00	Noncarbonate	346	89
Calcium (Ca)	176	32			
Magnesium (Mg)	52	11	Color	3	2
Sodium (Na)	15	125	pH	7.6	9.0
Potassium (K)	4.9	6.0	Specific conductance (micromhos at 25 C.)	1,140	840
Carbonate (CO_3)	0	7			
Bicarbonate (HCO_3)	375	30	Turbidity	--	--
Sulfate (SO_4)	370	348	Temperature (F.)	--	--
Chloride (Cl)	5.8	6.5	Date of collection	June 19, 1951	June 19, 1951
Fluoride (F)	1.3	.6			
Nitrate (NO_3)	.1	.1			
Dissolved solids	882	556			

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	318	328	292	--	--	--	677	742	611	56	66	46
Finished water	31	73	21	--	--	--	149	239	105	--	--	--

[a]Wells 15 and 21 to 28.

MASSILLON
(Population, 29,594)

Ownership: Ohio Water Service Co., (controlled by Federal Water Service Corp.); supplies also Genoa Sewer District and about 700 people outside the city limits. Total population supplied, about 37,000.

Source: 2 wells (1 and 2), 175 and 165 ft deep; yield reported to be 2,100 and 1,400 gpm, (65 percent of supply); Newman Creek. Auxiliary supply, well (North), 175 ft deep. Newman Creek and North well provide 35 percent of the supply.

Treatment: Aeration, coagulation with alum, softening with lime and soda ash, sedimentation, recarbonation, rapid sand filtration, and chlorination. The water is softened to a hardness of about 85 ppm.

Rated capacity of treatment plant: 3,500,000 gpd.

Raw-water storage: None.

Finished-water storage: 900,000 gal.

MASSILLON[1]--Continued

ANALYSES

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

	Wells 1 and 2 (raw water)	North well (raw water)	Newman Creek (raw water)	Finished water
Silica (SiO_2)	14	14	8.5	8.9
Iron (Fe)	.10	1.1	.08	.11
Manganese (Mn)	.00	.08	--	.05
Calcium (Ca)	90	91	52	11
Magnesium (Mg)	24	23	14	7.3
Sodium (Na)	8.4	12	6.8	36
Potassium (K)	1.4	2.2	2.0	1.8
Carbonate (CO_3)	0	0	0	24
Bicarbonate (HCO_3)	274	284	134	0
Sulfate (SO_4)	103	89	77	80
Chloride (Cl)	9.0	20	8.0	12
Fluoride (F)	.1	.1	.2	.1
Nitrate (NO_3)	.2	.1	5.2	1.8
Dissolved solids	396	406	248	180
Hardness as $CaCO_3$:				
Total	322	322	186	58
Noncarbonate	99	89	78	17
Color	5	3	25	4
pH	7.5	7.5	7.5	9.6
Specific conductance (micromhos at 25 C.)	615	651	397	304
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Apr. 9, 1951	Apr. 9, 1951	Apr. 9, 1951	Apr. 9, 1951

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	183	263	52	7.3	--	--	304	412	140	50	64	34
Finished water	32	--	--	9.4	--	--	102	172	62	--	--	--

MIDDLETOWN
(Population, 33,695)

Ownership: Municipal; supplies also about 12,000 people through Lemon Township Sanitary District. Total population supplied, about 45,700.

Source: 18 wells. Three of the wells, 40, 183, and 186 ft deep, individually pumped, are reported to yield 2,000 gpm each. The remaining wells, 32 to 40 ft deep, are grouped, and are reported to yield 3,000,000 gpd.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 6,200,000 gal.

MIDDLETOWN--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	11	Hardness as $CaCO_3$:	
Iron (Fe)	.24	Total	302
Manganese (Mn)	.00	Noncarbonate	43
Calcium (Ca)	78		
Magnesium (Mg)	26	Color	1
Sodium (Na)	6.1	pH	7.4
Potassium (K)	2.9	Specific conductance (micromhos at 25 C.)	580
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	315	Temperature (F.)	--
Sulfate (SO_4)	48	Date of collection	May 23, 1951
Chloride (Cl)	7.8		
Fluoride (F)	.2		
Nitrate (NO_3)	3.3		
Dissolved solids	337		

NEWARK
(Population, 34,275)

Ownership: Municipal; supplies also about 2,500 people outside the city limits. Total population supplied, about 36,800.
Source: North Fork Licking River.
Treatment: Coagulation with alum, softening with lime and soda ash, ammoniation, activated carbon, sedimentation, recarbonation, rapid sand filtration, and chlorination. The water is softened to a hardness of about 70 ppm.
Rated capacity of treatment plant: 9,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,000,000 gal.

ANALYSES

(Analyses, in parts per million, by Ohio Department of Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7	7	Hardness as $CaCO_3$:		
Iron (Fe)	--	.3	Total	199	61
Manganese (Mn)	.04	.04	Noncarbonate	46	29
Calcium (Ca)	57	21			
Magnesium (Mg)	14	2	Color	12	0
Sodium (Na)	--	--	pH	7.8	9.6
Potassium (K)	--	--	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_2)	0	12	Turbidity	10	0
Bicarbonate (HCO_3)	187	15	Temperature (F.)	--	--
Sulfate (SO_4)	--	--	Date of collection	Apr. 10, 1950	Apr. 10, 1950
Chloride (Cl)	3	3			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	--	.3			
Dissolved solids	--	121			

NEWARK--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.....	175	237	62	--	--	--	215	290	84	159	3000	25
Finished water...	33	57	23	--	--	--	70	104	46	--	--	--

NILES
(Population, 16,773)

Ownership: Mahoning Valley Sanitary District. (See Youngstown.)

NORWOOD
(Population, 35,001)

Ownership: Municipal; supplies also about 100 people in Cincinnati. Total population supplied, about 35,100.
Source: 8 wells, 240 to 280 ft deep (50 percent of supply); finished water purchased from Cincinnati (50 percent of supply).
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 1,830,000 gal.

ANALYSIS

(Analyses, in parts per million, by Ohio Department of Health)

	Wells (finished water)		Wells (finished water)
Silica (SiO_2)	15	Hardness as $CaCO_3$:	
Iron (Fe)	2.0	Total	410
Manganese (Mn)	.45	Noncarbonate	38
Calcium (Ca)	119		
Magnesium (Mg)	27	Color	8
Sodium (Na)	--	pH	7.3
Potassium (K)	--	Specific conductance (micromhos at 25 C.).....	--
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	454	Turbidity	5
Sulfate (SO_4)	--	Temperature (F.).....	--
Chloride (Cl)	27	Date of collection	Sept. 6, 1950
Fluoride (F)	.05		
Nitrate (NO_3)	.3		
Dissolved solids	--		

PARMA
(Population, 28,897)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

PIQUA
(Population, 17,447)

Ownership: Municipal; supplies also about 300 people outside the city limits. Total population supplied, about 17,700.
Source: Swiftrun Lake; Miami River.
Treatment: Aeration, coagulation with alum, softening with lime and soda ash, sedimentation, recarbonation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 70,000,000 gal.
Finished-water storage: 1,500,000 gal.

Raw water is pumped from the Miami River into Swiftrun Lake during an average of 6 months each year.

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	3.1	5.8	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.05	Total	210	52
Manganese (Mn)	.00	.00	Noncarbonate	30	17
Calcium (Ca)	46	10			
Magnesium (Mg)	23	6.6	Color	17	1
Sodium (Na)	3.8	12	pH	7.7	9.7
Potassium (K)	3.7	4.4	Specific conductance (micromhos at 25 C.)	413	179
Carbonate (CO_3)	0	17			
Bicarbonate (HCO_3)	219	8	Turbidity	--	--
Sulfate (SO_4)	36	38	Temperature (F.)	--	--
Chloride (Cl)	6.0	5.5	Date of collection	June 5, 1951	June 5, 1951
Fluoride (F)	.3	.2			
Nitrate (NO_3)	3.2	.9			
Dissolved solids	241	100			

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	155	223	54	7.3	7.6	7.0	175	263	51	114	1,800	25
Finished water	32	55	20	9.7	10.2	9.4	46	67	27	--	--	--

[a] Swiftrun Lake.

PORTSMOUTH
(Population, 36,798)

Ownership: Municipal; supplies also New Boston, West Portsmouth, Wheelersburg, and about 3,200 people outside the city limits. Total population supplied, about 48,000.
Source: Ohio River.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, sodium chlorite, chlorination, and final adjustment of pH to 8.0-8.2 by addition of lime.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 22,500,000 gal.

PORTSMOUTH--Continued

ANALYSES

(Analyses, in parts per million, by Ohio Department of Health)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7	5	Hardness as $CaCO_3$:		
Iron (Fe)	--	.05	Total	90	96
Manganese (Mn)	.5	.5	Noncarbonate	68	72
Calcium (Ca)	33	35			
Magnesium (Mg)	2	2	Color	8	0
Sodium (Na)	--	--	pH	7.3	7.5
Potassium (K)	--	--	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	27	29	Turbidity	--	--
Sulfate (SO_4)	--	--	Temperature (F.)	--	--
Chloride (Cl)	15	15	Date of collection	Jan. 2, 1951	Jan. 2, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	--	.6			
Dissolved solids	223	170			

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	28	46	15	6.7	7.1	6.4	105	159	66	164	800	10
Finished water	30	48	18	7.5	8.5	7.0	115	169	92	--	--	--

SANDUSKY

(Population, 29,375)

Ownership: Municipal; supplies also about 5,000 people outside the city limits. Total population supplied, about 34,000.

Source: Lake Erie. The raw water intake is at a submerged crib in Lake Erie, 1,900 ft northeast of Cedar Point beach. Emergency supply through a separate intake in Lake Erie-Sandusky Bay.

Treatment: Prechlorination, coagulation with alum, activated carbon at times, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 9,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 4,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	2.2	1.6	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.04	Total	144	124
Manganese (Mn)	--	.00	Noncarbonate	37	33
Calcium (Ca)	42	36			
Magnesium (Mg)	9.7	8.0	Color	4	1
Sodium (Na)	8.6	8.0	pH	8.1	7.5
Potassium (K)	1.3	2.4	Specific conductance (micromhos at 25 C.)	322	297
Carbonate (CO_3)	6	0			
Bicarbonate (HCO_3)	119	109	Turbidity	--	--
Sulfate (SO_4)	31	29	Temperature (F.)	--	--
Chloride (Cl)	16	20	Date of collection	June 1, 1951	June 19, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	2.2	1.4			
Dissolved solids	186	166			

SANDUSKY--Continued

Regular determinations at treatment plant, 1949

	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.....	92	98	88	7.9	--	--	--	--	--	41	450	10
Finished water...	84	89	71	7.2	--	--	--	--	--	--	--	--

SHAKER HEIGHTS
(Population, 28,222)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

SOUTH EUCLID
(Population, 15,432)

Ownership: Municipal.
Source: Supplied by Cleveland. (See Cleveland.)

SPRINGFIELD
(Population, 78,508)

Ownership: Municipal; supplies also about 3,000 people outside the city limits. Total population supplied, about 81,500.
Source: Buck Creek diverted to natural filter beds, 80 percent of supply; Conduit in underground gravel, 20 percent of supply. Auxiliary supply, Beaver Creek diverted to natural filter beds.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: None.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	10	Hardness as $CaCO_3$:	
Iron (Fe)	.13	Total	332
Manganese (Mn)	.00	Noncarbonate	70
Calcium (Ca)	81		
Magnesium (Mg)	31	Color	0
Sodium (Na)	3.2	pH	7.7
Potassium (K)	2.7	Specific conductance (micromhos at 25 C.)	605
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	317	Temperature (F.)	--
Sulfate (SO_4)	66	Date of collection	May 23, 1951
Chloride (Cl)	5.0		
Fluoride (F)	.2		
Nitrate (NO_3)	6.0		
Dissolved solids	363		

STEUBENVILLE
(Population, 35,872)

Ownership: Municipal; supplies also about 400 people outside the city limits. Total population supplied, about 36,300.
Source: Ohio River.
Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, postchlorination, chlorine dioxide, and stabilization by addition of phosphates.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 6,300,000 gal.
Finished-water storage: 3,700,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.6	8.7	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.25	Total	88	111
Manganese (Mn)	.44	.32	Noncarbonate	75	96
Calcium (Ca)	23	34			
Magnesium (Mg)	7.5	6.3	Color	2	6
Sodium (Na)	7.1	7.4	pH	6.4	7.5
Potassium (K)	.8	1.5	Specific conductance (micromhos at 25 C.)	229	287
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	16	18	Turbidity	--	--
Sulfate (SO_4)	76	100	Temperature (F.)	--	--
Chloride (Cl)	5.8	8.5	Date of collection	May 4, 1951	May 4, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.4	1.3			
Dissolved solids	143	187			

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	15	28	5	6.3	7.3	4.7	114	184	70	88	650	3
Finished water	23	42	9	8.0	9.9	5.4	130	186	90	--	--	--

TIFFIN
(Population, 18,952)

Ownership: The Ohio Cities Water Co. (controlled by American Water Works & Electric Co.).
Source: Sandusky River, 98.5 percent of supply; well, 1.5 percent of supply.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, and activated carbon at times.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: 200,000,000 gal.
Finished-water storage: 1,500,000 gal.

TIFFIN--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.7	2.9	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.07	Total	338	338
Manganese (Mn)	.00	.05	Noncarbonate	135	146
Calcium (Ca)	87	87			
Magnesium (Mg)	29	29	Color	15	7
Sodium (Na)	13	13	pH	7.9	7.5
Potassium (K)	5.5	5.2	Specific conductance (micromhos at 25 C.)	676	678
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	246	232	Temperature (F.)	--	--
Sulfate (SO_4)	147	155	Date of collection	June 5, 1951	June 5, 1951
Chloride (Cl)	15	16			
Fluoride (F)	.4	.2			
Nitrate (NO_3)	1.5	.5			
Dissolved solids	446	446			

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	148	246	38	7.8	8.4	6.2	--	--	--	154	900	25
Finished water	126	234	12	7.1	7.7	6.0	230	384	48	--	--	--

TOLEDO
(Population, 303,616)

Ownership: Municipal; supplies also Maumee, Ottawa Hills, Rossford, and suburban districts. Total population supplied, about 369,000.

Source: Lake Erie. The raw water intake is at a crib in Lake Erie, about 9 miles east of Toledo, near Reno Beach, and 2 miles offshore.

Treatment: Prechlorination, coagulation with alum and lime, activated carbon at times, sedimentation, rapid sand filtration, and postchlorination.

Rated capacity of treatment plant: 80,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 35,000,000 gal.

The crib is a circular concrete structure 100 ft in diameter with walls 16 ft thick having 16 intake ports 10 ft square that are 22 ft under the surface of the water. There is a large cabin superstructure.

The water from the crib is conveyed by gravity flow through 108 in. concrete pipe to the shore to the low service pumping station near Reno Beach. The water is pumped from this station through a 78 in. steel pipeline, 9 miles to the easterly edge of the city (Collins Park) to the treatment plant. The finished water is pumped into the distribution system and into elevated storage by a high service pumping station.

TOLEDO--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	3.3	2.4	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.23	Total	146	170
Manganese (Mn)	--	.00	Noncarbonate	42	56
Calcium (Ca)	42	51			
Magnesium (Mg)	10	10	Color	5	3
Sodium (Na)	7.7	7.5	pH	7.6	7.6
Potassium (K)	1.4	1.5	Specific conductance (micromhos at 25 C.)	314	378
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	127	137	Turbidity	--	--
Sulfate (SO_4)	30	53	Temperature (F.)	--	--
Chloride (Cl)	19	16	Date of collection	May 1, 1951	May 15, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	4.4	2.6			
Dissolved solids	192	228			

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	92	129	53	8.0	8.8	7.5	136	224	81	111	1,360	10
Finished water	89	128	51	7.8	8.1	7.4	146	260	112	--	--	--

WARREN

(Population, 49,856)

Ownership: Municipal; supplies also about 2,500 people outside the city limits. Total population supplied, about 52,400.

Source: Mahoning River.

Treatment: Ammoniation, prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH to about 8.0 by addition of lime.

Rated capacity of treatment plant: 8,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 2,100,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	6.4	5.2	Hardness as $CaCO_3$:		
Iron (Fe)	.08	.42	Total	96	128
Manganese (Mn)	.00	.16	Noncarbonate	56	84
Calcium (Ca)	26	38			
Magnesium (Mg)	7.3	7.8	Color	23	5
Sodium (Na)	5.1	5.2	pH	7.6	7.9
Potassium (K)	2.2	2.2	Specific conductance (micromhos at 25 C.)	238	299
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	48	52	Turbidity	--	--
Sulfate (SO_4)	61	85	Temperature (F.)	--	--
Chloride (Cl)	6.5	9.0	Date of collection	Apr.10, 1951	Apr.10, 1951
Fluoride (F)	.2	.1			
Nitrate (NO_3)	1.9	2.1			
Dissolved solids	150	189			

WARREN--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.....	58	110	14	7.6	8.7	6.6	137	213	50	45	525	3
Finished water...	58	108	16	8.1	9.0	7.6	161	227	83	--	--	--

YOUNGSTOWN
(Population, 168,330)

Ownership: Mahoning Valley Sanitary District (controlled by cities of Youngstown and Niles); supplies also Boardman, Canfield, McDonald, Niles, and about 6,100 people outside of the city limits. Total population supplied, about 204,000.
Source: Meander Creek impounded in Meander Creek Reservoir.
Treatment: Coagulation with alum, softening with lime and soda ash, sedimentation, recarbonation, activated carbon, rapid sand filtration, ammoniation, chlorination, and stabilization by addition of phosphates.
Rated capacity of treatment plant: 40,000,000 gpd.
Raw-water storage: Reservoir, 10,000,000,000 gal.
Finished-water storage: 35,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.7	7.6	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.07	Total	92	86
Manganese (Mn)	.00	.00	Noncarbonate.....	58	69
Calcium (Ca)	24	33			
Magnesium (Mg).....	7.5	.7	Color.....	12	4
Sodium (Na)	4.0	11	pH.....	7.7	10.3
Potassium (K)	2.3	2.2	Specific conductance (micromhos at		
Carbonate (CO_3)	0	10	25 C.).....	223	275
Bicarbonate (HCO_3)	40	[a]0	Turbidity.....	--	--
Sulfate (SO_4)	61	67	Temperature (F.)...	--	--
Chloride (Cl)	5.5	5.8	Date of collection...	Apr.10, 1951	Apr.10, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	2.6	2.0			
Dissolved solids.....	139	156			

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.....	47	62	34	7.7	8.6	7.3	120	150	98	13	55	4
Finished water...	38	45	33	10.6	10.7	10.4	84	92	77	.4	.7	.2

[a]Hydroxide (OH), 7 ppm.

ZANESVILLE
(Population, 40,517)

Ownership: Municipal; supplies also about 1,500 people outside the city limits. Total population supplied, about 42,000.
Source: 8 wells (1 to 8) each 65 ft deep; yield of wells 1 and 2 reported to be 800 gpm each, and of wells 3 to 8, 1,000 gpm each.
Treatment: Chlorination.
Rated capacity of treatment plant: 15,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,700,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	10	Hardness as $CaCO_3$:	
Iron (Fe)	.51	Total	259
Manganese (Mn)	.07	Noncarbonate	129
Calcium (Ca)	83		
Magnesium (Mg)	13	Color	2
Sodium (Na)	37	pH	7.5
Potassium (K)	2.3	Specific conductance (micromhos at 25 C.)	701
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	160	Temperature (F.)	--
Sulfate (SO_4)	92	Date of collection	May 4, 1951
Chloride (Cl)	85		
Fluoride (F)	.2		
Nitrate (NO_3)	.3		
Dissolved solids	424		

ABINGTON township, PENNSYLVANIA
(Population, 28,988)

Ownership: Philadelphia Suburban Water Company. (See Upper Darby.) Also supplies Cheltenham township and adjacent communities. Total population supplied, about 52,000.
Source: Neshaminy Creek.
Treatment: Prechlorination, coagulation with alum (and lime when necessary), taste and odor control with activated carbon, sedimentation, rapid sand filtration, postchlorination, ammoniation, and adjustment of pH with hydrated lime.
Rated capacity of treatment plant: 13,000,000 gpd.
Raw-water storage: 650,000,000 gal.
Finished-water storage: --

The water supplied to Abington and Cheltenham townships is treated at the Neshaminy Creek plant.

ANALYSES

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

	Neshaminy Creek [a] (raw water)	Finished water [b]	Finished water [c]
Silica (SiO_2)	9.1	5.8	5.5
Iron (Fe)	.06	.06	.05
Manganese (Mn)	--	--	--
Calcium (Ca)	17	15	16
Magnesium (Mg)	6.3	4.5	2.5
Sodium (Na)	9.0	17	19
Potassium (K)			
Carbonate (CO_3)	--	0	0
Bicarbonate (HCO_3)	37	48	48
Sulfate (SO_4)	36	30	30
Chloride (Cl)	12	13	12
Fluoride (F)	.2	.0	.0
Nitrate (NO_3)	3.2	5.1	4.9
Dissolved solids	134	113	117
Hardness as $CaCO_3$:			
Total	68	56	50
Noncarbonate	38	17	11
Color	3	3	3
pH	7.0	7.6	7.6
Specific conductance (micromhos at 25 C.)	--	205	205
Turbidity	0.25	--	--
Temperature (F.)	--	77	78
Date of collection	June 13, 1951	Aug. 29, 1951	Aug. 29, 1951

[a] Analysis by Philadelphia Suburban Water Company.
[b] Tap sample, Abington township.
[c] Tap sample, Cheltenham township.

ALIQUIPPA
(Population, 26,132)

Ownership: Woodlawn Water Company.
Source: 5 wells (6, 7, 8, 14, and 16) 85, 88, 88, 90, and 91 ft deep.
Treatment: Prechlorination (chlorine dioxide). Split treatment: about $\frac{1}{4}$ of supply, coagulation with lime and soda ash, sedimentation, rapid sand filtration; about $\frac{3}{4}$ of supply, softening with zeolite. The mixed treated waters are post-chlorinated.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,775,000 gal.

ANALYSES

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

	Raw water	Finished water (city tap)		Raw water	Finished water (city tap)
Silica (SiO_2)	--	14	Hardness as $CaCO_3$:		
Iron (Fe)	--	.14	Total	299	118
Manganese (Mn)	--	--	Noncarbonate	202	14
Calcium (Ca)	--	32			
Magnesium (Mg)	--	9.2	Color	5	3
Sodium (Na)	39	127	pH	8.0	8.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	733	804
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	119	126	Temperature (F.)	76	76
Sulfate (SO_4)	226	219	Date of collection	Aug. 30, 1951	Aug. 30, 1951
Chloride (Cl)	34	41			
Fluoride (F)	--	.0			
Nitrate (NO_3)	3.2	5.3			
Dissolved solids	--	525			

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	106	110	102	7.3	7.4	7.2	270	280	248	0	0	0
Finished water	116	120	106	7.6	7.8	7.5	72	78	68	0	0	0

ALLENTOWN
(Population, 106,756)

Ownership: Municipal; also supplies about 900 people outside the city limits. Total population supplied, about 107,700.
Source: Little Lehigh River (about 30 percent of supply), Shantz and Crystal Springs (about 69 percent of supply), and wells (about 1 percent of supply).
Treatment: Spring water: chlorination; Little Lehigh River: coagulation with alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: 5,000,000 gal (spring basins).
Finished-water storage: 40,000,000 gal.

A treatment plant of 20 million gpd capacity is under construction; to be completed during 1952.

ALLENTOWN--Continued

ANALYSES

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

	Wells (raw water)	Shantz Spring (raw water)	Raw water [a]	Finished water
Silica (SiO_2)	--	10	4.1	11
Iron (Fe)	--	.06	.59	.08
Manganese (Mn)	--	--	--	--
Calcium (Ca)	--	44	34	35
Magnesium (Mg)	--	14	17	17
Sodium (Na)	8.5	1.9	2.0	2.6
Potassium (K)		1.3	1.8	1.8
Carbonate (CO_3)	7	6	3	3
Bicarbonate (HCO_3)	214	152	152	140
Sulfate (SO_4)	39	23	18	26
Chloride (Cl)	11	5.1	5.1	6.5
Fluoride (F)	--	.1	.0	.1
Nitrate (NO_3)	14	14	11	10
Dissolved solids	--	205	184	196
Hardness as $CaCO_3$:				
Total	236	167	155	157
Noncarbonate	49	33	25	38
Color	3	2	4	3
pH	8.1	8.2	8.1	8.0
Specific conductance (micromhos at 25 C.)	479	348	317	324
Turbidity	--	--	--	--
Temperature (F.)	59	55	70	67
Date of collection	June 28, 1951	June 28, 1951	June 28, 1951	June 28, 1951

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	120	140	65	7.6	8.0	7.4	170	188	160	25	500	7
Finished water	116	138	60	7.7	7.9	7.4	170	188	160	0	4	0

[a] Little Lehigh River.

ALTOONA
(Population, 77,177)

Ownership: Municipal; also supplies about 2,500 people outside the city limits. Total population supplied, about 79,700.
Source: Mountain streams impounded.
Treatment: Chlorination.
Rated capacity of treatment plant: 6,500,000 gpd.
Raw-water storage: 1,238,000,000 gal.
Finished-water storage: 9,485,000 gal.

ALTOONA--Continued

ANALYSES

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

	Raw water[a]	Finished water (city tap)		Raw water[a]	Finished water (city tap)
Silica (SiO_2)	13	10	Hardness as $CaCO_3$:		
Iron (Fe)	.70	.38	Total	260	228
Manganese (Mn)	5.9	3.6	Noncarbonate	260	228
Calcium (Ca)	22	20			
Magnesium (Mg)	22	19	Color	4	6
Sodium (Na)	14	2.5	pH	3.45	3.90
Potassium (K)		2.1	Specific conductance (micromhos at 25 C.)	615	398
Carbonate (CO_3)	[b] 0	[c] 0	Turbidity	--	--
Bicarbonate (HCO_3)	0	0	Temperature (F.)	59	--
Sulfate (SO_4)	260	170	Date of collection	July 28, 1951	July 28, 1951
Chloride (Cl)	14	2.6			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	.1	.0			
Dissolved solids	[d] 457	[e] 306			

[a] Glen White Stream.
[b] Total acidity as H_2SO_4, 136 ppm.
[c] Total acidity as H_2SO_4, 74 ppm.
[d] Includes 18 ppm of Aluminum (Al).
[e] Includes 11 ppm of Aluminum (Al).

AMBRIDGE

(Population, 16,429)

Ownership: Municipal; supplies also Baden, and Economy and Harmony townships. Total population supplied, about 27,600.

Source: 8 wells (21 to 28) along the east bank of the Ohio River, 43, 51, 44, 45, 44, 52, 56, and 58 ft deep; yield reported to be 518, 465, 440, 440, 400, 400, 585, and 565 gpm.

Treatment: Sixty percent of supply: softening with lime, sedimentation, rapid sand filtration, and chlorination; forty percent of supply: zeolite softening. Finished water from the two plants is mixed before entering the distribution system.

Rated capacity of treatment plants: 3,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 7,650,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	14	Hardness as $CaCO_3$:		
Iron (Fe)	--	.12	Total	256	79
Manganese (Mn)	--	--	Noncarbonate	179	19
Calcium (Ca)	--	24			
Magnesium (Mg)	--	4.7	Color	8	3
Sodium (Na)	36	109	pH	7.6	7.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	647	673
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	94	74	Temperature (F.)	75	76
Sulfate (SO_4)	212	205	Date of collection	Aug. 30, 1951	Aug. 30, 1951
Chloride (Cl)	23	26			
Fluoride (F)	--	.0			
Nitrate (NO_3)	4.7	7.6			
Dissolved solids	--	432			

BEAVER FALLS
(Population, 17,375)

Ownership: Municipal; also supplies East Rochester, Eastvale, Fallston, Freedom, New Brighton, Patterson Heights, Rochester, West Bridgewater, West Mayfield; and Chippewa, Daugherty, Patterson, Pulaski, Rochester, and White townships. Total population supplied, about 60,000.
Source: Beaver River.
Treatment: (At plants at Eastvale and New Brighton) prechlorination (chlorine dioxide), coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, and postchlorination (chlorine dioxide).
Rated capacity of treatment plants: Eastvale Plant, 6,000,000 gpd; New Brighton Plant, 4,000,000 gpd.
Raw-water storage: --
Finished-water storage: 11,300,000 gal.

ANALYSES

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

	Raw water[a]	Raw water[b]	Finished water[b]
Silica (SiO_2)	--	--	4.5
Iron (Fe)	--	--	.09
Manganese (Mn)	--	--	--
Calcium (Ca)	--	--	60
Magnesium (Mg)	--	--	12
Sodium (Na), Potassium (K)	24	23	20
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	13	34	40
Sulfate (SO_4)	161	158	157
Chloride (Cl)	26	25	28
Fluoride (F)	--	--	.1
Nitrate (NO_3)	6.6	7.7	8.1
Dissolved solids	--	--	353
Hardness as $CaCO_3$:			
Total	168	184	199
Noncarbonate	157	156	166
Color	12	15	8
pH	7.0	7.2	7.5
Specific conductance (micromhos at 25 C.)	481	499	558
Turbidity	--	--	--
Temperature (F.)	81	81	85
Date of collection	Aug. 30, 1951	Aug. 30, 1951	Aug. 30, 1951

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	60	100	15	7.0	8.0	6.3	160	250	75	60	8000	15
Finished water	65	110	15	7.3	8.2	7.0	165	260	80	0	3	0

[a] At New Brighton plant.
[b] At Eastvale plant.

BETHLEHEM
(Population, 66,340)

Ownership: Municipal; supplies also Fountainhill, Freemansburg, Miller Heights, and Salisbury township. Total population supplied, about 78,300.
Source: Wild Creek impounded in Wild Creek Reservoir about 27 mi north of Bethlehem. The water is pumped to Illicks Mill Reservoir and from there direct to consumers. Auxiliary or emergency supplies, Lehigh River; 1 deep well in Freemansburg; and 2 deep wells in Miller Heights.
Treatment: Chlorination when needed, and Calgon for corrosion control.
Raw-water storage: 4,100,000,000 gal.
Finished-water storage: 21,000,000 gal.

ANALYSES

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

	Raw water [a]	Finished water (city tap)		Raw water [a]	Finished water (city tap)
Silica (SiO_2)	--	5.1	Hardness as $CaCO_3$:		
Iron (Fe)	.51	.19	Total	15	6
Manganese (Mn)	--	--	Noncarbonate	5	2
Calcium (Ca)	3.0	1.6			
Magnesium (Mg)	1.4	.6	Color	5	4
Sodium (Na)	8.9	2.0	pH	6.0	7.1
Potassium (K)		.4	Specific conductance (micromhos at 25 C.)	--	22.1
Carbonate (CO_3)	0	0	Turbidity	3.6	--
Bicarbonate (HCO_3)	12	6	Temperature (F.)	53	59
Sulfate (SO_4)	20	3.5	Date of collection	May 23, 1951	June 28, 1951
Chloride (Cl)	2.4	1.6			
Fluoride (F)	--	.0			
Nitrate (NO_3)	--	.5			
Dissolved solids	--	22			

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	5.4	--	--	6.0	--	--	6.0	--	--	3.6	--	--
Finished water	5.5	--	--	6.1	--	--	6.1	--	--	2.7	--	--

[a] Wild Creek; analysis by City Chemist, Bethlehem.

BRADDOCK
(Population, 16,[illegible]88)

Ownership: Municipal.
Source: Monongahela River.
Treatment: Addition of lime and soda ash, coagulation with alum or iron salts when necessary, sedimentation, rapid anthrafilt filtration, chlorination, and ammoniation.
Rated capacity of treatment plant: 3,600,000 gpd.
Raw-water storage: None.
Finished-water storage: 15,000,000 gal.

BRADDOCK--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	5.4	Hardness as $CaCO_3$:		
Iron (Fe)	--	.30	Total	[a] 192	261
Manganese (Mn)	--	--	Noncarbonate	--	246
Calcium (Ca)	--	83			
Magnesium (Mg)	--	13	Color	8	5
Sodium (Na)	--	43	pH	3.7	7.3
Potassium (K)	--		Specific conductance (micromhos at 25 C.)	711	748
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	0	18	Temperature (F.)	82	76
Sulfate (SO_4)	291	305	Date of collection	Sept. 6, 1951	Aug. 31, 1951
Chloride (Cl)	12	12			
Fluoride (F)	--	.1			
Nitrate (NO_3)	4.3	6.0			
Dissolved solids	--	495			

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	2	9	[b] 5	5.1	6.4	4.2	88	168	50	46	1280	15
Finished water	16	21	10	8.9	9.2	8.4	103	168	72	0	0	0

[a] Versenate hardness. [b] Acidity.

BRADFORD

(Population, 17,354)

Ownership: Municipal; also supplies about 2,000 people outside the city limits. Total population supplied, about 19,400.

Source: Gilbert Run impounded in No. 2 Reservoir; Marilla Brook impounded in No. 3 Reservoir. Auxiliary supply, four Layne wells, yield rated at 500 gpm each. The wells are used only during dry periods when the surface supplies are inadequate.

Treatment: Chlorination.

Raw-water storage: No. 2 Reservoir, 206,000,000 gal; No. 3 Reservoir, 120,000,000 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)	5.6	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	62
Manganese (Mn)	--	Noncarbonate	41
Calcium (Ca)	14		
Magnesium (Mg)	6.6	Color	8
Sodium (Na)	34	pH	7.4
Potassium (K)		Specific conductance (micromhos at 25 C.)	720
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	26	Temperature (F.)	60
Sulfate (SO_4)	21	Date of collection	Aug. 28, 1951
Chloride (Cl)	65		
Fluoride (F)	.0		
Nitrate (NO_3)	.4		
Dissolved solids	179		

BUTLER
(Population, 23,482)

Ownership: Butler Water Company (controlled by American Water Works Co., Inc.); supplies also parts of Butler, Center, and Summit townships; borough of East Butler, and village of Lyndora. Total population supplied, about 31,400.
Source: Connoquenessing Creek, 80 percent of supply; Thorn Run Creek, 20 percent of supply.
Treatment: Coagulation with alum, activated carbon, sedimentation, rapid sand filtration, chlorination, ammoniation, and pH control with lime.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 855,000,000 gal.
Finished-water storage: 2,230,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	4.6	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.11	Total	54	98
Manganese (Mn)	--	--	Noncarbonate	29	70
Calcium (Ca)	--	27			
Magnesium (Mg)	--	7.5	Color	7	3
Sodium (Na) + Potassium (K)	18	31	pH	7.0	7.7
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	210	398
Bicarbonate (HCO_3)	31	35	Turbidity	--	--
Sulfate (SO_4)	21	26	Temperature (F.)	67	70
Chloride (Cl)	31	78	Date of collection	Aug. 27, 1951	Aug. 27, 1951
Fluoride (F)	--	.1			
Nitrate (NO_3)	1.7	.7			
Dissolved solids	--	243			

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	20	31	9	6.7	7.2	6.3	--	--	--	15	60	3
Finished water	25	46	13	7.9	8.4	7.2	54	84	40	0	0	0

CARBONDALE
(Population, 16,296)

Ownership: Scranton-Spring Brook Water Service Company. (See Scranton.)
Source: Fall Brook and Brownell Reservoirs, and Reynshanhurst Well.
Treatment: Chlorination.
Raw-water storage: 1,000,000,000 gal.
Finished-water storage: --

CARBONDALE--Continued

ANALYSES

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

	Finished water [a] (city tap)	Finished water [b] (city tap)		Finished water [a] (city tap)	Finished water [b] (city tap)
Silica (SiO_2)	2.1	1.9	Hardness as $CaCO_3$:		
Iron (Fe)	.24	.20	Total	26	11
Manganese (Mn)	--	--	Noncarbonate	12	9
Calcium (Ca)	7.6	2.3			
Magnesium (Mg)	1.6	1.3	Color	5	3
Sodium (Na)	1.7	1.5	pH	7.4	6.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	65.9	30.9
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	16	3	Temperature (F.)	70	70
Sulfate (SO_4)	11	8.5	Date of collection	Sept. 12, 1951	Sept. 12, 1951
Chloride (Cl)	3.0	1.9			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	.5	.5			
Dissolved solids	38	24			

[a] Fall Brook Reservoir.

[b] Brownell Reservoir and Reynshanhurst Well.

CARLISLE

(Population, 16,812)

Ownership: Municipal; also supplies about 750 people outside the city limits. Total population supplied, about 17,600.

Source: Conodoguinet Creek.

Treatment: Plain sedimentation, coagulation with alum, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 8,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 3,500,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.8	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	170
Manganese (Mn)	--	Noncarbonate	28
Calcium (Ca)	50		
Magnesium (Mg)	11	Color	5
Sodium (Na)	2.5	pH	8.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	335
Carbonate (CO_3)	6	Turbidity	--
Bicarbonate (HCO_3)	161	Temperature (F.)	71
Sulfate (SO_4)	21	Date of collection	Sept. 19, 1951
Chloride (Cl)	4.0		
Fluoride (F)	.0		
Nitrate (NO_3)	7.3		
Dissolved solids	189		

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	109	180	40	7.5	8.2	7.1	--	--	--	35	600	15
Finished water	97	176	26	7.2	7.8	6.2	--	--	--	0	2	0

CHAMBERSBURG
(Population, 17,212)

Ownership: Municipal; also supplies about 1,400 people outside the city limits. Total population supplied, about 18,600.
Source: Conococheague Creek (head waters).
Treatment: Chlorination, and adjustment of pH with caustic soda.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 387,000,000 gal.
Finished-water storage: 2,200,000 gal.

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

	Raw water	Finished water (city tap)		Raw water	Finished water (city tap)
Silica (SiO_2)	--	5.7	Hardness as $CaCO_3$:		
Iron (Fe)	--	.10	Total	5	7
Manganese (Mn)	--	--	Noncarbonate	5	0
Calcium (Ca)	--	1.4			
Magnesium (Mg)	--	.8	Color	8	5
Sodium (Na)	--	2.7	pH	6.8	7.8
Potassium (K)	--		Specific conductance (micromhos at 25 C.)	15.6	23.6
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	6	8	Temperature (F.)	62	69
Sulfate (SO_4)	3.5	2.2	Date of collection	Sept. 19, 1951	Sept. 19, 1951
Chloride (Cl)	1.1	2.5			
Fluoride (F)	--	.0			
Nitrate (NO_3)	.0	.4			
Dissolved solids	--	22			

CHARLEROI
(Population, 9,872)

Ownership: Municipal; also supplies Donora, Monessen, N. Charleroi, Speers, and parts of adjacent townships. Total population supplied, about 44,000.
Source: Monongahela River.
Treatment: Coagulation with alum and lime, ammoniation, chlorination, sedimentation, rapid (anthrafilt) filtration, and postchlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 10 reservoirs and 3 standpipes, 13,000,000 gal.

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	2.9	Hardness as $CaCO_3$:		
Iron (Fe)	--	.02	Total	[a]175	231
Manganese (Mn)	--	--	Noncarbonate	175	224
Calcium (Ca)	--	71			
Magnesium (Mg)	--	13	Color	5	5
Sodium (Na)	--	33	pH	3.5	7.0
Potassium (K)	--		Specific conductance (micromhos at 25 C.)	704	630
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	0	8.0	Temperature (F.)	--	75
Sulfate (SO_4)	285	276	Date of collection	Aug. 23, 1951	Aug. 23, 1951
Chloride (Cl)	8.4	5.4			
Fluoride (F)	--	.1			
Nitrate (NO_3)	.6	1.2			
Dissolved solids	--	450			

[a] Versenate.

CHARLEROI--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.....	[b]-13	[b]-23	[b]-1	4.4	6.0	3.4	133	192	82	20	2000	5
Finished water...	18	29	11	8.8	9.5	8.2	140	219	85	00	0	0

[b] Acidity. Methyl orange indicator.

CHELTENHAM township
(Population, 22,854)

Ownership: Supplied by Philadelphia Suburban Water Company. (See Abington township and Upper Darby.)

CHESTER
(Population, 66,039)

Ownership: Chester Municipal Authority.
Source: Octoraro Creek impounded in Chester-Octoraro Lake about 38 miles from the city.
Treatment: Aeration, prechlorination, coagulation with alum, addition of activated carbon (Nuchar), sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 12,500,000 gpd.
Raw-water storage: Chester-Octoraro Lake, 2,500,000,000 gal.
Finished-water storage: 15,000,000 gal.

ANALYSIS

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

	Finished water[a] (city tap)		Finished water (city tap)
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	54
Manganese (Mn)	--	Noncarbonate	33
Calcium (Ca)	16		
Magnesium (Mg)	3.4	Color	3
Sodium (Na)	1.4	pH	7.3
Potassium (K)		Specific conductance (micromhos at 25 C.)	136
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	25	Temperature (F.)	60
Sulfate (SO_4)	17	Date of collection	Jan. 8, 1952
Chloride (Cl)	7.5		
Fluoride (F)	.2		
Nitrate (NO_3)	9.3		
Dissolved solids	86		

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	42	18	6.5	6.6	6.4	80	128	49	140	168	108
Finished water...	41	61	26	8.2	8.3	8.1	106	147	66	0	0	0

[a] New supply. [b] Old supply.

CLAIRTON
(Population, 19,652)

Ownership: Monongahela Valley Water Corporation (controlled by American Water Works, Inc.); also supplies Dravosburg, Elizabeth, Glassport, and West Elizabeth, and portions of surrounding townships. Total population supplied, about 36,100.
Source: Monongahela River.
Treatment: Coagulation with lime and occasionally alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 7,600,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,510,000 gal.
The treatment plant is located at Elizabeth.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	3.0	Hardness as $CaCO_3$:		
Iron (Fe)	--	.18	Total	[a] 184	251
Manganese (Mn)	--	--	Noncarbonate	184	236
Calcium (Ca)	--	76			
Magnesium (Mg)	--	15	Color	8	5
Sodium (Na)	--	42	pH	3.5	7.8
Potassium (K)	--		Specific conductance (micromhos at 25 C.)	724	698
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	0	19	Temperature (F.)	79	80
Sulfate (SO_4)	304	293	Date of collection	Aug. 31, 1951	Aug. 31, 1951
Chloride (Cl)	9.6	12			
Fluoride (F)	--	.0			
Nitrate (NO_3)	.8	6.1			
Dissolved solids	--	474			

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	[b] -1	10	[b] -24	--	--	--	108	214	60	55	400	5
Finished water	18	28	8	8.9	9.6	7.8	120	234	58	0	10	0

[a] Versenate.
[b] Acidity.

DUNMORE
(Population, 20,305)

Ownership: Scranton-Spring Brook Water Service Company. (See Scranton.)
Source: Dunmore No. 1 Reservoir, NayAu Well, and Williams Bridge Reservoir.
Treatment: Chlorination.
Raw-water storage: 412,000,000 gal.
Finished-water storage: --

DUNMORE--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	1.0	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	10
Manganese (Mn)	--	Noncarbonate	1
Calcium (Ca)	1.0		
Magnesium (Mg)	1.7	Color	3
Sodium (Na)	7.8	pH	7.0
Potassium (K)		Specific condnctance (micromhos at 25 C.)	57.2
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	10	Temperature (F.)	72
Sulfate (SO_4)	11	Date of collection	Sept. 12, 1951
Chloride (Cl)	4.4		
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	40		

DUQUESNE
(Population, 17,620)

Ownership: Municipal.
Source: 7 wells (A, B, C, E, F, G, H) 130, 139, 117, 74, 87, 105, and 75 ft deep; yield reported to be 250, 300, 200, 200, 400, 200, and 200 gpm.
Treatment: Addition of lime, sedimentation, rapid sand filtration, and chlorination (in emergencies).
Rated capacity of treatment plant: 2,500,000 gpd.
Raw-water storage: None.
Finished-water storage: reservoir, 2,070,000 gal; standpipe, 450,000 gal.

The wells are located in the immediate vicinity of the waterworks plant. It is reported that there is considerable variation in the chemical composition of the water from the individual wells.

ANALYSES

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

	Wells (raw water)	Finished water		Wells (raw water)	Finished water
Silica (SiO_2)	--	10	Hardness as $CaCO_3$:		
Iron (Fe)	--	.14	Total	314	256
Manganese (Mn)	--	--	Noncarbonate	278	242
Calcium (Ca)	--	73			
Magnesium (Mg)	--	18	Color	5	4
Sodium (Na)	53	35	pH	6.3	8.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	719	693
Carbonate (CO_3)	0	4	Turbidity	--	--
Bicarbonate (HCO_3)	44	9	Temperature (F.)	80	80
Sulfate (SO_4)	297	270	Date of collection	Aug. 21, 1951	Aug. 21, 1951
Chloride (Cl)	22	24			
Fluoride (F)	--	.1			
Nitrate (NO_3)	6.6	3.9			
Dissolved solids	--	493			

DUQUESNE--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.....	43	45	40	6.5	7.2	6.2	--	--	--	--	--	--
Finished water...	20	24	15	9.0	9.2	8.8	--	--	--	--	--	--

EASTON
(Population, 35,632)

Ownership: Municipal; supplies also about 24,000 people outside the city limits. Total population supplied, about 59,600.
Source: Delaware River about 81 percent of supply; 4 wells (2, 3, 5, 6) 70, 347, 92, and 92 ft deep, about 18 percent of supply; springs about 1 percent of supply.
Treatment: Coagulation, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 15,500,000 gal.

One half of the southern part of Easton is supplied by wells and springs. The well water is chlorinated at the source and pumped into the distribution system. Should the consumer use be less than the output of the wells, the excess well water is pumped to a reservoir, which is also fed by springs. Water from this reservoir is used if the consumer demand exceeds the output of the wells.

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

	Wells, composite[a] (raw water)	Delaware River[a] (raw water)	Delaware River (finished water)
Silica (SiO_2)	16	2.2	4.2
Iron (Fe)	.25	.07	.06
Manganese (Mn)	--	--	--
Calcium (Ca)	35	16	21
Magnesium (Mg)	22	3.5	3.0
Sodium (Na)	26	2.7	4.8
Potassium (K)			1.0
Carbonate (CO_3)	0	1	0
Bicarbonate (HCO_3)	207	41	40
Sulfate (SO_4)	41	11	30
Chloride (Cl)	15	9.5	8.2
Fluoride (F)	.1	.05	0
Nitrate (NO_3)	--	--	.7
Dissolved solids	296	103	98
Hardness as $CaCO_3$:			
Total	178	54	65
Noncarbonate	8	16	32
Color	3	3	3
pH	7.3	8.6	7.9
Specific conductance (micromhos at 25 C.)	--	--	161
Turbidity	0.1	0.2	--
Temperature (F.)	58	73	77
Date of collection	July, 1951	July, 1951	July 28, 1951

[a] Analysis by Easton Water Department.

EASTON--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.....	27	39	15	7.0	7.6	6.5	--	--	--	18	450	4.0
Finished water...	32	42	20	8.6	9.0	8.0	67	78	48	.6	1.3	.2

ERIE
(Population, 130,803)

Ownership: Municipal; also supplies a population of about 20,000 outside the city limits. Total population supplied, about 150,000.
Source: Lake Erie.
Treatment: (Both plants) coagulation with alum, activated carbon, sedimentation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plants: West Side Plant, 28,000,000 gpd; Chestnut St. Plant, 32,000,000 gpd.
Raw-water storage: --
Finished-water storage: 43,400,485 gal.

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)	1.2	1.5	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.11	Total	125	129
Manganese (Mn)	--	--	Noncarbonate.....	34	40
Calcium (Ca)	36	37			
Magnesium (Mg).....	8.5	8.9	Color.....	2	2
Sodium (Na)	8.0	9.4	pH.....	7.5	7.8
Potassium (K)	1.2	.6	Specific conductance (micromhos at		
Carbonate (CO_3)	--	0	25 C.).....	--	300
Bicarbonate (HCO_3)	111	108	Turbidity.....	0	--
Sulfate (SO_4)	24	24	Temperature (F.)...	70	73
Chloride (Cl)	19	20	Date of collection...	July 15, 1951	July 26, 1951
Fluoride (F)	.0	.0			
Nitrate (NO_3)	--	.4			
Dissolved solids.....	172	177			

[a] Analysis by Erie Bureau of Water.
[b] At Chestnut Street treatment plant.

GREENSBURG
(Population, 16,923)

Ownership: Municipal Authority of Westmoreland County; also supplies Apollo, Irwin, Jeannette, Leechburg, Mt. Pleasant, Scottsdale, Vandergrift, and a number of other places. Total population supplied, about 68,000.
Source: Beaver Run impounded in Beaver Run Reservoir, 50 percent of supply; collected surface runoff into interconnected Immel and Unity Reservoirs, 50 percent of supply; Greenlick and Bridgeport Reservoirs.
Treatment: Beaver Run supply: coagulation with alum, aeration, addition of lime and carbon, sedimentation, rapid sand filtration, and chlorination. Unity Reservoir supply: Copper sulfate for control of algae, and chlorination.
Rated capacity of treatment plant: Beaver Run supply, 10,000,000 gpd.

GREENSBURG--Continued

Raw-water storage: Beaver Run Reservoir, 9,180,000,000 gal; Immel and Unity Reservoirs, 180,000,000 and 365,000,000 gal, respectively.
Finished-water storage: Irwin reservoir, 45,000,000 gal; Jeanette reservoir, 1,500,000 gal.

Ruffsdale, Mt. Pleasant, and Scottsdale are supplied from Greenlick and Bridgeport Reservoirs.

ANALYSES

(Analyses, in parts per million, by Municipal Authority of Westmoreland County)

	Beaver Run (raw water)	Beaver Run (finished water)	Unity Reservoir
Silica (SiO_2)	--	--	--
Iron (Fe)	.10	.00	.10
Manganese (Mn)	1.4	.00	.05
Calcium (Ca)	26	34	8.0
Magnesium (Mg)	8.6	7.7	6.2
Sodium (Na), Potassium (K)	3.2	7.0	--
Carbonate (CO_3)	0	--	0
Bicarbonate (HCO_3)	17	[a] 28	13
Sulfate (SO_4)	80	85	18
Chloride (Cl)	8.4	14	8.4
Fluoride (F)	.2	.2	--
Nitrate (NO_3)	--	--	--
Dissolved solids	146	162	63
Hardness as $CaCO_3$:			
Total	103	116	45
Noncarbonate	89	94	35
Color	2	0	--
pH	7.2	8.6	7.0
Specific conductance (micromhos at 25 C.)	--	--	--
Turbidity	2.5	0	6.5
Temperature (F.)	--	--	--
Date of collection	1953	1953	Feb. 24, 1953

[a] Total alkalinity as bicarbonate (HCO_3).

HARRISBURG
(Population, 89,544)

Ownership: Municipal; also supplies about 17,000 people outside the city limits. Total population supplied, about 106,500.
Source: Clark Creek impounded in DeHart Reservoir. Auxiliary or emergency supply, Susquehanna River (with 20,000,000 gpd treatment plant).
Treatment: Natural sedimentation, pH control with lime, and chlorination.
Rated capacity of treatment plant: 22,000,000 gpd.
Raw-water storage: 5,260,000,000 gal.
Finished-water storage: 51,000,000 gal.

HARRISBURG--Continued

ANALYSES

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

	Raw water	Finished water (city tap)		Raw water	Finished water (city tap)
Silica (SiO_2)	--	2.6	Hardness as $CaCO_3$:		
Iron (Fe)	--	.08	Total	12	13
Manganese (Mn)	--	--	Noncarbonate	4	5
Calcium (Ca)	--	3.6			
Magnesium (Mg)	--	.9	Color	5	3
Sodium (Na)	2.7	1.7	pH	7.0	7.1
Potassium (K)			Specific conductance (micromhos at 25 C.)	38.2	33.5
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	10	9	Temperature (F.)	71	72
Sulfate (SO_4)	5.2	4.2	Date of collection	Sept. 19, 1951	Sept. 19, 1951
Chloride (Cl)	3	3.4			
Fluoride (F)	--	.0			
Nitrate (NO_3)	.0	.0			
Dissolved solids	--	24			

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	8	5	6.4	6.6	6.0	20	33	16	3.4	7.0	3.0
Finished water	11	17	6	8.1	9.0	6.8	33	42	26	3.0	3.0	3.0

HAVERFORD township

(Population, 39,641)

Ownership: Philadelphia Suburban Water Company. (See Upper Darby.)
Source: Pickering Creek. Emergency supply, Perkiomen Creek.
Treatment: Prechlorination, coagulation with alum (also lime when necessary), taste and odor control with activated carbon, sedimentation, rapid sand filtration, postchlorination, ammoniation, and adjustment of pH with lime.
Rated capacity of treatment plant: 16,000,000 gpd.
Raw-water storage: 350,000,000 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)	11	5.2	Hardness as $CaCO_3$:		
Iron (Fe)	.10	.02	Total	67	79
Manganese (Mn)	--	--	Noncarbonate	25	34
Calcium (Ca)	18	21			
Magnesium (Mg)	5.4	6.5	Color	3	5
Sodium (Na)	8.8	5.8	pH	7.0	7.7
Potassium (K)			Specific conductance (micromhos at 25 C.)	--	208
Carbonate (CO_3)	--	0	Turbidity	0.25	--
Bicarbonate (HCO_3)	51	55	Temperature (F.)	--	80
Sulfate (SO_4)	30	32	Date of collection	May 28, 1951	Aug. 30, 1951
Chloride (Cl)	8.0	8.3			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	2.0	2.2			
Dissolved solids	133	122			

[a] Pickering Creek. Analysis by Philadelphia Suburban Water Company.
[b] Tap sample, South Ardmore, Pa.

HAVERFORD township--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.....	33	--	--	7.3	8.8	6.6	--	--	--	24	800	2
Finished water...	32	--	--	7.0	--	--	--	--	--	.34	--	--

HAZLETON
(Population, 35,491)

Ownership: Municipal; also supplies West Hazleton and other communities. Total population supplied, about 47,500.
Source: Reservoirs (Drek Creek, Wolf Run, and other streams impounded) 97 percent of supply; wells, 3 percent of supply.
Treatment: Chlorination.
Raw-water storage: --
Finished-water storage: 572,412,000 gal.

ANALYSES

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

	Raw water[a]	Raw water[b]	Raw water[c]	Finished water[d]	Finished water[e]
Silica (SiO_2).....	--	--	--	2.1	2.1
Iron (Fe).....	--	--	--	.06	.13
Manganese (Mn).....	--	--	--	--	--
Calcium (Ca).....	--	--	--	1.6	1.2
Magnesium (Mg).....	--	--	--	1.0	.6
Sodium (Na).....	1.4	--	--	1.2	1.6
Potassium (K).....		--	--		
Carbonate (CO_3).....	0	0	0	0	0
Bicarbonate (HCO_3).....	9	4	2	3	5
Sulfate (SO_4).....	2.6	--	--	5.8	2.1
Chloride (Cl).....	1.2	1.0	1.0	1.6	1.9
Fluoride (F).....	--	--	--	.0	.0
Nitrate (NO_3).....	.4	.4	.4	.0	.0
Dissolved solids.....	--	--	--	19	16
Hardness as $CaCO_3$:					
Total.....	9	9	4	8	5
Noncarbonate.....	2	4	2	6	1
Color.....	5	5	5	5	8
pH.....	6.8	6.5	6.0	6.3	6.9
Specific conductance (micromhos at 25 C.)	24.7	22.6	14.5	23.2	18.1
Turbidity.....	--	--	--	--	--
Temperature (F.).....	68	68	71	67	68
Date of collection.....	Sept. 11, 1951	Sept. 11, 1951	Sept. 11, 1951	Sept. 11, 1951	Sept. 11, 1951

[a] Mt. Pleasant Reservoir; supply for part of Hazleton and West Hazleton.
[b] Composite: well water, Wolf Run, and Barnes Run.
[c] Barnes Reservoir.
[d] West Hazleton, city tap.
[e] Hazleton, city tap.

JEANNETTE
(Population, 16,172)

Ownership: Supplied by Municipal Authority of Westmoreland County. (See Greensburg.)

JOHNSTOWN
(Population, 63,232)

Ownership: Johnstown Water Company; also supplies about 35,000 people outside the city limits. Total population supplied, about 98,000.
Source: Mountain streams impounded in 5 reservoirs (Salt Lick, North Fork, Mill Creek, Laurel Run, and Dalton Run).
Treatment: Chlorination on supply line from each reservoir.
Raw-water storage: --
Finished-water storage: --

ANALYSES

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

	Raw water [a]	Raw water [b]	Raw water [c]	Raw water [d]	Finished water (city tap)
Silica (SiO_2)	--	--	--	--	3.8
Iron (Fe)	--	--	--	--	.10
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	--	--	--	--	4.1
Magnesium (Mg)	--	--	--	--	1.7
Sodium (Na) / Potassium (K)	3.4	2.4	1.1	5.4	2.3
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	6	6	11	11	7
Sulfate (SO_4)	11	11	23	11	8.4
Chloride (Cl)	2.0	1.2	1.8	4.2	2.1
Fluoride (F)	--	--	--	--	.0
Nitrate (NO_3)	4.1	1.4	2.3	1.8	5.8
Dissolved solids	--	--	--	--	37
Hardness as $CaCO_3$:					
Total	15	14	35	16	17
Noncarbonate	10	9	26	7	12
Color	10	9	8	8	3
pH	6.8	7.1	7.1	6.9	6.9
Specific conductance (micromhos at 25 C.)	46.0	42.2	90.6	45.5	46.9
Turbidity	--	--	--	--	--
Temperature (F.)	48	60	63	66	61
Date of collection	Aug. 22, 1951	Aug. 22, 1951	Aug. 22, 1951	Aug. 22, 1951	Aug. 22, 1951

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	6.3	10	3.5	6.1	6.4	5.0	21	33	17	5	13	5

[a] North Fork Reservoir.
[b] Dalton Run Reservoir.
[c] Salt Lick Reservoir.
[d] Mill Creek Reservoir.

KINGSTON

(Population, 21,096)

Ownership: Scranton-Spring Brook Water Service Company. (See Scranton.)
Source: Hillside and Spring Brook Reservoirs (creeks impounded).
Treatment: 50 percent of supply: coagulation with alum and lime, sedimentation, filtration, and chlorination. 50 percent of supply: chlorination.
Rated capacity of treatment plant: --
Raw-water storage: --
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)	--	Hardness as $CaCO_3$:	
Iron (Fe)	--	Total	[a] 26
Manganese (Mn)	--	Noncarbonate	16
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	5
Sodium (Na)	3.2	pH	6.9
Potassium (K)		Specific conductance (micromhos at 25 C.)	75.1
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	12	Temperature (F.)	67
Sulfate (SO_4)	17	Date of collection	Sept. 12, 1951
Chloride (Cl)	3.4		
Fluoride (F)	--		
Nitrate (NO_3)	.8		
Dissolved solids	--		

[a] Versenate.

LANCASTER

(Population, 63,774)

Ownership: Municipal; also supplies about 20,000 people outside the city limits. Total population supplied, about 84,000.
Source: Conestoga River.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, ammoniation, chlorination, and aeration.
Rated capacity of treatment plant: 16,000,000 gpd.
Raw-water storage: 30,000,000 gal.
Finished-water storage: 13,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	4.5	Hardness as $CaCO_3$:		
Iron (Fe)	--	.05	Total	180	177
Manganese (Mn)	--	--	Noncarbonate	31	62
Calcium (Ca)	--	43			
Magnesium (Mg)	--	17	Color	8	5
Sodium (Na)	4.6	3.4	pH	8.1	7.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	364	358
Carbonate (CO_3)	8	0	Turbidity	--	--
Bicarbonate (HCO_3)	166	141	Temperature (F.)	71	71
Sulfate (SO_4)	21	45	Date of collection	Aug. 7, 1951	Aug. 7, 1951
Chloride (Cl)	6.5	6.6			
Fluoride (F)	--	.0			
Nitrate (NO_3)	12	16			
Dissolved solids	--	232			

LANCASTER--Continued

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	115	160	30	7.6	8.1	6.3	--	--	--	57	650	8
Finished water	106	148	38	7.1	7.4	6.4	155	205	85	.0	1.0	.0

LEBANON
(Population, 28,156)

Ownership: Municipal; also supplies about 2,000 people outside the city limits. Total population supplied, about 30,200.
Source: Fishing Creek and Gold Mine Run impounded in High Bridge Reservoir, 20 miles north of Lebanon.
Treatment: Chlorination, Calgon and lime for pH and corrosion control.
Rated capacity of treatment plant: 9,000,000 gpd.
Raw-water storage: 370,000,000 gal.
Finished-water storage: --

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	5.8	Hardness as $CaCO_3$:		
Iron (Fe)	--	.16	Total	10	22
Manganese (Mn)	--	--	Noncarbonate	8	14
Calcium (Ca)	--	6.1			
Magnesium (Mg)	--	1.6	Color	8	5
Sodium (Na)	1.7	1.4	pH	6.3	7.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	30.5	58.8
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	3	10	Temperature (F.)	69	68
Sulfate (SO_4)	8.8	8.8	Date of collection	Aug. 7, 1951	Aug. 7, 1951
Chloride (Cl)	1.0	5.1			
Fluoride (F)	--	.1			
Nitrate (NO_3)	.8	.0			
Dissolved solids	--	42			

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	3	--	--	6.0	--	--	10	--	--	2	--	--
Finished water	6	--	--	6.8	--	--	16	--	--	2	--	--

LOWER MERION township
(Population, 48,745)

Ownership: Philadelphia Suburban Water Company. (See Upper Darby.)

LOWER MERION township--Continued

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	7.3	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	80
Manganese (Mn)	--	Noncarbonate	34
Calcium (Ca)	22		
Magnesium (Mg)	6.2	Color	5
Sodium (Na)	8.5	pH	7.8
Potassium (K)		Specific conductance (micromhos at 25 C.)	211
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	57	Temperature (F.)	81
Sulfate (SO_4)	37	Date of collection	Aug. 30, 1951
Chloride (Cl)	8.5		
Fluoride (F)	.0		
Nitrate (NO_3)	2.1		
Dissolved solids	130		

[a] Tap sample, Bryn Mawr, Pa.

McKEESPORT

(Population, 51,502)

Ownership: Municipal; also supplies Eden Park, Liberty, Port Vue, Versailles, and White Oak; and part of North Versailles township. Total population supplied, about 68,300.

Source: Youghiogheny River about 75 percent of supply (1950); Monongahela River about 25 percent of supply (1950).

Treatment: Softening with lime and soda ash, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, ammoniation, and chlorination.

Rated capacity of treatment plant: 10,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 7,725,000 gal.

ANALYSES

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

	Raw water [a]	Raw water [b]	Finished water
Silica (SiO_2)	--	--	7.3
Iron (Fe)	.25	--	.30
Manganese (Mn)	--	--	--
Calcium (Ca)	--	--	70
Magnesium (Mg)	--	--	21
Sodium (Na)	--	--	28
Potassium (K)	--	--	
Carbonate (CO_3)	0	0	6
Bicarbonate (HCO_3)	0	0	14
Sulfate (SO_4)	278	368	275
Chloride (Cl)	9.8	12	10
Fluoride (F)	--	--	.1
Nitrate (NO_3)	2.3	2.3	1.0
Dissolved solids	--	--	460
Hardness as $CaCO_3$:			
Total	[c] 184	[c] 233	261
Noncarbonate	184	233	240

[a] Monongahela and Youghiogheny Rivers at treatment plant.

[b] Monongahela River at McKeesport.

[c] Versenate.

McKEESPORT, Analyses--Continued

	Raw water [a]	Raw water [b]	Finished water
Color	6	5	4
pH	3.8	3.7	9.3
Specific conductance (micromhos at 25 C.)	665	753	653
Turbidity	--	--	--
Temperature (F.)	75	70	75
Date of collection	Aug. 24, 1951	Aug. 24, 1951	Aug. 24, 1951

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	2	11	[d]19	4.6	7.0	3.4	103	224	48	55	1500	5
Finished water	19	29	11	9.2	9.9	8.3	108	176	63	0	0	0

[a] Monongahela and Youghiogheny Rivers at treatment plant.
[b] Monongahela River at McKeesport. [d] Acidity.

McKEES ROCKS
(Population, 16,241)

Ownership: Municipal Authority of the Borough of West View; also supplies Avalon, Bellevue, Ben Avon, Ben Avon Heights, Emsworth, and West View; Kennedy, Kilbuck, McCandless, Neville, Reserve, Ross, and Stowe townships, and 1,500 people in the 28th ward of Pittsburgh. Total population supplied, about 93,300.

Source: 30 wells about 38 ft deep in the main channel of the Ohio River, near Neville Island, yield reported to be about 1,500,000 gpd; 19 wells about 35 ft deep in the back channel of the Ohio River near Neville Island, yield reported to be about 2,800,000 gpd; 3 gravel packed wells (1 to 3) on Neville Island, 65, 60, and 72 ft deep, reported to yield 500,000, 400,000, and 1,000,000 gpd, respectively; 3 gravel packed wells 54 to 58 ft deep on Davis Island, yield reported to be 1,200,000, 1,000,000, and 700,000 gpd, respectively; and 1 Ranney well 60 ft deep on Neville Island, yield reported to be 2,500,000 gpd. The 30 main channel wells are pumped through a common suction line by a centrifugal pump; the 19 back channel wells are connected to one common suction header and are pumped by centrifugal pumps; wells 1, 2, 3, and the Ranney well are each equipped with deep well turbine pumps; wells 4, 5, and 6 are pumped with submersible type well pumps.

Treatment: Prechlorination, and zeolite softening (four pressure type and four gravity type softeners).

Rated capacity of treatment plant: 12,000,000 gpd.

Raw-water storage: --

Finished-water storage: --

Regular determinations at treatment plant [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	104	112	90	7.2	7.4	7.0	230	--	--	--	--	--
Finished water	102	--	--	7.2	--	--	90	--	--	--	--	--

[a] Manganese: average, raw water, 1.50 ppm; average, finished water, 0.25 ppm

McKEES ROCKS--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	11	Hardness as $CaCO_3$:		
Iron (Fe)	--	.08	Total	234	156
Manganese (Mn)	--	--	Noncarbonate	146	76
Calcium (Ca)	--	46			
Magnesium (Mg)	--	10	Color	5	3
Sodium (Na)	33	73	pH	7.7	7.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	612	569
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	108	98	Temperature (F.)	65	68
Sulfate (SO_4)	168	168	Date of collection	Aug. 30, 1951	Aug. 30, 1951
Chloride (Cl)	28	38			
Fluoride (F)	--	.0			
Nitrate (NO_3)	3.5	7.7			
Dissolved solids	--	422			

MEADVILLE

(Population, 18,972)

Ownership: Municipal.
Source: 7 wells (1 to 7) 80, 78, 81, 81, 95, 79, and 60 ft deep; yield reported to be 700, 700, 1,100, 1,100, 1,800, 2,200, and 1,450 gpm.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 4,500,000 gal.

ANALYSES

(Analyses, in parts per million, by Meadville Water Bureau)

	Well 1	Well 5	Well 6	Well 7	Finished water (city tap)
Silica (SiO_2)	--	--	--	--	--
Iron (Fe)	.1	.3	.1	.1	.1
Manganese (Mn)	.1	.0	--	.2	.0
Calcium (Ca)	--	--	--	--	--
Magnesium (Mg)	--	--	--	--	--
Sodium (Na)	--	--	--	--	--
Potassium (K)	--	--	--	--	--
Carbonate (CO_2)	--	--	--	--	--
Bicarbonate (HCO_3)	185	170	190	190	160
Sulfate (SO_4)	--	--	--	--	--
Chloride (Cl)	4	7	13	9	11
Fluoride (F)	.0	.0	.0	.0	.0
Nitrate (NO_3)	.0	.0	.0	.0	.0
Dissolved solids	280	290	445	285	360
Hardness as $CaCO_3$:					
Total	244	220	320	240	245
Noncarbonate	--	--	--	--	--

MEADVILLE, Analyses--Continued

	Well 1	Well 5	Well 6	Well 7	Finished water (city tap)
Color	0	5	0	0	0
pH	7.5	7.5	7.5	8.0	8.0
Specific conductance (micromhos at 25 C.)	--	--	--	--	--
Turbidity	5	5	0	0	0
Temperature (F.)	--	--	--	--	--
Date of collection	Oct. 27, 1952	Oct. 27, 1952	Oct. 27, 1952	Oct. 27, 1952	Oct. 27, 1952
Depth (feet)	80	95	79	60	
Diameter (inches)	12	16	16	16	
Date drilled	1926	--	--	1947	
Percent of supply	--	--	--	--	

MONESSEN
(Population, 17,896)

Ownership: Supplied by Charleroi. (See Charleroi.)

MOUNT LEBANON township
(Population, 26,604)

Ownership: Supplied by South Pittsburgh Water Company. (See Pittsburgh.)

MUNHALL
(Population, 16,437)

Ownership: Supplied by South Pittsburgh Water Company. (See Pittsburgh.)

NANTICOKE
(Population, 20,160)

Ownership: Scranton-Spring Brook Water Service Company. (See Scranton.)
Source: Pike's Creek, Harveys Creek, and Plymouth Relief Creek impounded.
Treatment: Chlorination.
Raw-water storage: 3,012,000,000 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)	--	Hardness as $CaCO_3$:	
Iron (Fe)	--	Total	17
Manganese (Mn)	--	Noncarbonate	8
Calcium (Ca)	--		
Magnesium (Mg)	--	Color	5
Sodium (Na)	3.2	pH	6.9
Potassium (K)		Specific conductance (micromhos at 25 C.)	77.2
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	11	Temperature (F.)	68
Sulfate (SO_4)	9.8	Date of collection	Sept. 12, 1951
Chloride (Cl)	3.0		
Fluoride (F)	--		
Nitrate (NO_3)	.6		
Dissolved solids	--		

NEW CASTLE
(Population, 48,834)

Ownership: City of New Castle Water Company (controlled by American Water Works Co., Inc.); also supplies about 18,400 people outside the city limits. Total population supplied, about 67,200.
Source: Shenango River.
Treatment: Preammoniation, prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postammoniation, postchlorination, chlorine dioxide, and activated carbon.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 7,200,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.5	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	112
Manganese (Mn)	--	Noncarbonate	76
Calcium (Ca)	35		
Magnesium (Mg)	5.9	Color	5
Sodium (Na)	7.3	pH	7.8
Potassium (K)		Specific conductance (micromhos at 25 C.)	274
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	43	Temperature (F.)	69
Sulfate (SO_4)	63	Date of collection	Sept. 3, 1951
Chloride (Cl)	15		
Fluoride (F)	.0		
Nitrate (NO_3)	6.7		
Dissolved solids	171		

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	33	54	10	7.0	8.4	6.5	--	--	--	25	330	6
Finished water	32	56	14	7.5	7.7	7.3	85	107	58	0	1.5	0

NEW KENSINGTON
(Population, 25,146)

Ownership: Municipal; supplies also Arnold, and Lower Burrell township. Total population supplied, about 42,000.
Source: Allegheny River.
Treatment: Prechlorination, coagulation with lime, alum, and sodium silicate, activated carbon for taste control, sedimentation, rapid sand filtration, and postchlorination (chlorine dioxide).
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: --
Finished-water storage: 10,000,000 gal.

NEW KENSINGTON--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	5.6	Hardness as $CaCO_3$:		
Iron (Fe)	[a].65	[b].13	Total	166	219
Manganese (Mn)	[a]1.5	--	Noncarbonate	166	206
Calcium (Ca)	--	58			
Magnesium (Mg)	--	18	Color	4	4
Sodium (Na)	--	19	pH	4.5	7.9
Potassium (K)	--		Specific conductance (micromhos at 25 C.)	546	549
Carbonate (CO_3)	[c]0	0	Turbidity	--	--
Bicarbonate (HCO_3)	0	16	Temperature (F.)	76	76
Sulfate (SO_4)	185	190	Date of collection	Aug. 27, 1951	Aug. 27, 1951
Chloride (Cl)	29	34			
Fluoride (F)	--	.1			
Nitrate (NO_3)	2.1	1.2			
Dissolved solids	--	376			

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	5	14	[d]-9	5.5	6.8	3.7	98	185	68	40	600	3
Finished water	18	22	14	8.2	8.8	8.0	120	200	86	0	0	0

[a] Average for the year 1951 from analyses by the New Kensington Water Dept.
[b] Averages for the year 1951 from analyses by the New Kensington Water Dept.: Iron, 0.1 ppm; manganese, 0.15 ppm.
[c] Total acidity as H_2SO_4, 23 ppm. [d] Acidity.

NORRISTOWN
(Population, 38,126)

Ownership: Norristown Water Company; also supplies Bridgeport, Lower Providence, and West Norristown. Total population supplied, about 54,700.
Source: Schuylkill River.
Treatment: Prechlorination, coagulation with alum, lime, activated carbon, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 12,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 20,000,000 gal.

NORRISTOWN--Continued

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	6.4	Hardness as $CaCO_3$:		
Iron (Fe)	--	.12	Total	163	182
Manganese (Mn)	--	--	Noncarbonate	143	162
Calcium (Ca)	--	40			
Magnesium (Mg)	--	20	Color	5	3
Sodium (Na), Potassium (K)	9.6	6.0	pH	7.4	7.6
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	382	419
Bicarbonate (HCO_3)	24	24	Turbidity	--	--
Sulfate (SO_4)	145	151	Temperature (F.)	75	75
Chloride (Cl)	7.5	11	Date of collection	Aug. 7, 1951	Aug. 7, 1951
Fluoride (F)	--	.0			
Nitrate (NO_3)	3.3	3.3			
Dissolved solids	--	276			

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	36	57	9	7.2	8.1	6.1	140	165	116	44	1500	10
Finished water	38	64	12	7.8	9.3	6.3	133	165	128	.5	8	0

OIL CITY
(Population, 19,581)

Ownership: Municipal; supplies also about 5,000 people outside the city limits. Total population supplied, about 24,600.
Source: 2 dug wells (1, 2) 40 and 44 ft deep and 13 drilled wells. Nine of the drilled wells are 50 ft deep and are pumped by suction; the remaining four wells are deeper and are pumped with electric pumps.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 5,500,000 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)	.06	Total	83
Manganese (Mn)	--	Noncarbonate	23
Calcium (Ca)	26		
Magnesium (Mg)	4.5	Color	3
Sodium (Na)	15	pH	7.6
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	242
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	74	Temperature (F.)	62
Sulfate (SO_4)	12	Date of collection	July 27, 1951
Chloride (Cl)	28		
Fluoride (F)	.0		
Nitrate (NO_3)	.0		
Dissolved solids	140		

PHILADELPHIA
(Population, 2,071,605)

Ownership: Municipal. Total population supplied, about 2,092,000.

Source: Schuylkill River about 52 percent of supply; Delaware River about 48 percent of supply.

Treatment: Schuylkill River water is treated at all of the plants except the Torresdale Plant, which treats Delaware River water. Belmont Plant: ½ of water, coagulation with alum (when necessary), sedimentation, slow sand filtration, chlorination, and addition of metaphosphates; ½ of water, ozonation, coagulation with alum and lime, chlorination, sedimentation, rapid sand filtration, postchlorination, and addition of metaphosphates. Upper and Lower Roxborough Plants: Coagulation with alum, sedimentation, slow sand filtration, chlorination, and addition of metaphosphates. Queen Lane Plant: ½ of water, prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, slow sand filtration, postchlorination, and addition of metaphosphates; ½ of water, coagulation with alum and lime, activated carbon, chlorination, sedimentation, rapid sand filtration, postchlorination, and addition of metaphosphates. Torresdale Plant: prechlorination, coagulation with alum and lime, rapid sand filtration, slow sand filtration, postchlorination, and addition of metaphosphates.

Rated capacity of treatment plants: Belmont Plant, 70,000,000 gpd; Upper and Lower Roxborough Plants, 30,000,000 gpd; Queen Lane Plant, 100,000,000 gpd; Torresdale Plant, 200,000,000 gpd.

Raw-water storage: None.

Finished-water storage: From each of the treatment plants: Belmont Plant, 17,000,000 gal; Upper and Lower Roxborough Plants, 11,000,000 gal; Queen Lane Plant, 40,000,000 gal; Torresdale Plant, 50,000,000 gal. The city has two reservoirs: East Park and Oak Lane, 688,000,000 gal and 70,000,000 gal, respectively. East Park reservoir stores water from the Queen Lane Plant and Oak Lane stores water from Torresdale Plant. However, on occasion East Park reservoir may receive water from the Torresdale Plant, and Oak Lane, water from Queen Lane Plant.

Finished water from the treatment plants is distributed in different sections of the city. Water from the Belmont Plant is supplied to the area west of the Schuylkill River, called West Philadelphia; water from the Roxborough Plants, to the area above Erie Avenue and west of Broad Street extending to the Schuylkill River and north, and in conjunction with the Queen Lane Plant, to the area between Erie and Allegheny Avenues; water from the Queen Lane Plant in addition to that named above, to the area west of Broad Street above Market to the Schuylkill River; water from the Torresdale Plant, to the area east of Broad Street to Market Street and all of South Philadelphia between the Delaware and Schuylkill Rivers.

The central part of the city is furnished high pressure fire service with water pumped directly from the Delaware River at the foot of Race Street.

PHILADELPHIA--Continued

ANALYSES

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

	Schuylkill River				
	at Belmont Filters			Finished water	
	raw water[a]	raw water[b]	raw water[c]	city tap[d]	city tap[e]
Silica (SiO_2)	6.6	7.7	8.3	8.6	8.9
Iron (Fe)	.01	.06	.05	.24	.29
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	45	17	31	23	24
Magnesium (Mg)	22	7.6	14	9.2	8.8
Sodium (Na) + Potassium (K)	19	6.9	9.0	2.7	3.4
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	57	21	46	25	31
Sulfate (SO_4)	163	58	95	64	57
Chloride (Cl)	17	5.1	9.8	6.6	11
Fluoride (F)	.1	.1	.1	.0	.0
Nitrate (NO_3)	5.2	4.6	6.2	5.9	4.0
Dissolved solids	331	130	213	147	151
Hardness as $CaCO_3$:					
Total	203	74	135	95	96
Noncarbonate	156	56	98	75	71
Color	5	5	4	5	5
pH	7.8	6.9	7.2	8.1	8.0
Specific conductance (micromhos at 25 C.)	510	203	332	228	238
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	50	50
Date of collection	Sept. 21-30, 1951	Nov. 26-30, 1951	-- 1951	Feb. 6, 1952	Feb. 6, 1952

Regular determinations at treatment plant, 1951--Belmont 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	40	60	18	7.2	7.8	6.5	153	247	84	33	1000	3
Finished water[f]	32	60	5	6.7	7.1	6.0	153	233	94	0.2	0.5	.0
Finished water[g]	31	56	13	6.6	7.3	6.1	151	226	97	.1	1	.0

[a] Composite of daily samples with maximum dissolved solids for the year 1951.
[b] Composite of daily samples with minimum dissolved solids for the year 1951.
[c] Average of analyses of 10-day composites of daily samples for the year 1951.
[d] Represents water from the Belmont Plant.
[e] Represents water from the Queen Lane Plant.
[f] Rapid sand filters.
[g] Slow sand filters.

PHILADELPHIA--Continued

ANALYSES

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

	Delaware River at Morrisville, Pa. (raw water)[a]	Delaware River at Morrisville, Pa. (raw water)[b]	Delaware River at Morrisville, Pa. (raw water)[c]	Finished water[d]
Silica (SiO_2)	5.9	5.8	4.7	3.1
Iron (Fe)	.02	.10	.06	.10
Manganese (Mn)	--	--	--	--
Calcium (Ca)	19	8.8	14	14
Magnesium (Mg)	5.9	2.8	4.7	4.2
Sodium (Na), Potassium (K)	6.4	1.0	4.4	2.2
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	54	20	38	12
Sulfate (SO_4)	28	14	21	33
Chloride (Cl)	6.6	2.1	4.6	7
Fluoride (F)	.2	.1	.1	.1
Nitrate (NO_3)	2.8	1.9	2.8	3.2
Dissolved solids	119	53	84	84
Hardness as $CaCO_3$:				
Total	72	33	54	52
Noncarbonate	27	17	23	42
Color	8	9	7	3
pH	7.3	7.2	7.1	7.2
Specific conductance (micromhos at 25 C.)	184	81.4	137	145
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Oct.11-20, 1951	Apr. 1-10, 1951	1951	Mar. 27, 1952

Regular determinations at treatment plant, 1951--Torresdale 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	33	59	11	6.9	7.3	6.5	59	94	37	23	330	6
Finished water	22	44	6	6.2	6.6	6.0	52	88	32	0.0	0.0	0.0

[a] Composite of daily samples with maximum dissolved solids for the year 1951.
[b] Composite of daily samples with minimum dissolved solids for the year 1951.
[c] Average of analyses of 10-day composites of daily samples for the year 1951.
[d] City tap; represents water from the Torresdale Plant.

PITTSBURGH
(Population, 676,806)

Ownership: Municipal; also supplies Blawnox, Homestead, and parts of the townships of O'Hara and Reserve. Total population supplied, about 692,000.

South Pittsburgh Water Co. (controlled by American Water Works Co., Inc.) supplies a population of about 100,000 in Pittsburgh, and in addition the boroughs of Bethel, Brentwood, Bridgeville, Carnegie, Castle Shannon, Crafton, Dormont, Dravosburg, Green Tree, Heidelberg, Ingram, Mt. Oliver, Munhall, Pleasant Hills, Rosslyn Farms, Thornburg, West Mifflin, Whitaker, and Whitehall; and the townships of Baldwin, Collier, Jefferson, Mt. Lebanon, Robinson, Scott, Snowden, South Fayette, and Upper St. Clair. Total population supplied, about 315,000.

Wilkinsburg Penn Joint Water Authority; supplies a population of about 14,000 in Pittsburgh. (See Wilkinsburg.)

Municipal Authority of the Borough of West View; supplies a population of about 1,500 in Pittsburgh. (See West View.)

Source: Municipal, Allegheny River; South Pittsburgh Water Co., Monongahela River.

Treatment: Municipal: plain sedimentation, slow sand filtration, chlorination, and adjustment of pH with soda ash when necessary; South Pittsburgh Water Company: lime at raw water intake when necessary, aeration, softening with lime and soda ash, recarbonation when necessary, coagulation with alum, activated carbon and chlorine dioxide at times for taste and odor control, sedimentation, rapid sand filtration, chlorination, and adjustment of pH to about 7.4 with lime.

Rated capacity of treatment plants: Municipal, 140,000,000 gpd; South Pittsburgh Water Company, 51,500,000 gpd.

Raw-water storage: Municipal, 100,000,000 gal; South Pittsburgh Water Company, none.

Finished-water storage: Municipal, 500,000,000 gal; South Pittsburgh Water Company: tank (West Mifflin) 7,250,000 gal; tank (Greentree) 2,500,000 gal; tank (Bethel) 2,500,000 gal; reservoir (Crafton) 3,000,000 gal; tank (Mt. Lebanon) 2,000,000 gal; tank (Lincoln Place) 767,000 gal; tank (West Pittsburgh) 735,000 gal; tank (West Homestead) 634,000 gal; tank (Rosslyn Farms) 100,000 gal; tank (Mt. Oliver) 550,000 gal; tank (Hillcrest) 100,000 gal; clear water basins at Filter plant, 1,170,000 gal. Total, 21,101,000 gal.

Fluoridation with sodium silicofluoride of the municipal supply was begun Dec. 22, 1952; a fluoride content of 0.8 to 1.2 ppm is maintained in the finished water.

PITTSBURGH, Analyses--Continued

ANALYSES

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

	Allegheny River				Monongahela River
	Raw water	Finished water [ac]	Finished water [bc]	Finished water	Finished water
Silica (SiO_2)	--	1.0	6.6	5.4	8.4
Iron (Fe)	--	.10	.3	.14	.15
Manganese (Mn)	--	.0	1.3	--	--
Calcium (Ca)	--	11	60	46	40
Magnesium (Mg)	--	4.0	18	1.9	16
Sodium (Na)	--	5.0	49	58	94
Potassium (K)	--				
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	0	2.1	17	2	46
Sulfate (SO_4)	199	37	248	190	298
Chloride (Cl)	32	8	58	32	14
Fluoride (F)	--	--	--	.0	.1
Nitrate (NO_3)	2.4	.4	2.7	6.3	3.6
Dissolved solids	--	80	507	373	554
Hardness as $CaCO_3$:					
Total	[d]180	44	227	123	166
Noncarbonate	180	42	213	121	128
Color	5	--	--	5	6
pH	4.0	--	--	6.1	7.6
Specific conductance (micromhos at 25 C.)	562	--	--	569	822
Turbidity	--	--	--	--	--
Temperature (F.)	79	--	--	80	86
Date of collection	Aug. 30, 1951	[e]1951	1951	Aug. 30, 1951	Aug. 24, 1951

Regular determinations at treatment plant, 1950[c]

	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	43	[f]-21	6.5	6.8	5.3	76	208	30	29	500	3
Finished water	7	26	0	6.3	6.8	5.8	75	172	33	0	5	0

[a] Weekly composite of daily samples with minimum dissolved solids.
[b] Weekly composite of daily samples with maximum dissolved solids.
[c] Analyses by Pittsburgh Water Works laboratory. [d] Versenate method.
[e] In 1951, 13 composite samples were acid (Aug. 19-Nov. 11, 1951). [f] Acidity.

PITTSTON

(Population, 15,012)

Ownership: Supplied by Scranton. (See Scranton.)

POTTSTOWN

(Population, 22,589)

Ownership: Municipal; supplies also about 7,000 people outside the city limits. Total population supplied, about 29,600.
Source: Schuylkill River.
Treatment: Coagulation with alum, addition of activated carbon, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: --
Finished-water storage: 12,000,000 gal.

POTTSTOWN--Continued

ANALYSES

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

	Raw water a	Finished water (city tap)		Raw water a	Finished water (city tap)
Silica (SiO_2)	7.6	6.5	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.20	Total	142	172
Manganese (Mn)	.03	--	Noncarbonate	113	133
Calcium (Ca)	34	41			
Magnesium (Mg)	14	17	Color	5	5
Sodium (Na)	9.8	9	pH	--	7.5
Potassium (K)		2.5	Specific conductance (micromhos at 25 C.)	337	413
Carbonate (CO_3)	--	0	Turbidity	--	--
Bicarbonate (HCO_3)	36	48	Temperature (F.)	55	78
Sulfate (SO_4)	115	137	Date of collection	1945-1946	June 28, 1951
Chloride (Cl)	6.9	11			
Fluoride (F)	.1	.2			
Nitrate (NO_3)	5.5	5.2			
Dissolved solids	223	280			

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	40	50	30	7.1	7.2	7.0	180	--	--	100	--	--
Finished water	35	45	25	6.9	6.8	7.0	175	250	100	--	--	--

a Average of analyses of 10-day composites of daily samples of Schuylkill River at Pottstown for the year Oct. 1, 1945 to Sept. 30, 1946.

POTTSVILLE
(Population, 23,640)

Ownership: Pottsville Water Company; supplies also Port Carbon, St. Clair, Schuylkill Haven, and E. Norwegian and North Manheim townships. Total population supplied, about 42,800.

Source: Eisenhuth Run impounded in Eisenhuth Reservoir near Frackville; Kaufman Run, Tar Run, and Wolf Creek impounded in reservoirs of the same name near St. Clair; Indian Run impounded in Indian Run Reservoir, near Pottsville. Auxiliary or emergency supply, Mud Run (tributary to Stoney Creek) impounded.

Treatment: Chlorination.

Rated capacity of treatment plant: 20,000,000 gpd.

Raw-water storage: 1,475,000,000 gal.

Finished-water storage: --

POTTSVILLE--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.8	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	5
Manganese (Mn)	--	Noncarbonate	2
Calcium (Ca)	1.0		
Magnesium (Mg)	.6	Color	5
Sodium (Na)	1.8	pH	6.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	21.4
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	3	Temperature (F.)	66
Sulfate (SO_4)	4.0	Date of collection	Sept. 11, 1951
Chloride (Cl)	1.4		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	19		

READING
(Population, 109,320)

Ownership: Municipal; also supplies about 15,000 people outside the city limits. Total population supplied, about 124,300.

Source: Maiden Creek impounded in Lake Ontelaunee about 93 percent of the supply; Antietam Creek impounded in Antietam Lake about 7 percent of supply.

Treatment: The Maiden Creek Plant: coagulation, sedimentation, rapid sand filtration, aeration, and chlorination. The Antietam Creek Plant: Slow sand filtration and chlorination.

Rated capacity of treatment plants: Maiden Creek Plant, 20,000,000 gpd; Antietam Creek Plant, 2,000,000 gpd.

Raw-water storage: 3,980,000,000 gal.

Finished-water storage: 38,000,000 gal (elevated).

READING--Continued

ANALYSES

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

	Maiden Creek (raw water)	Antietam Creek (raw water)	Maiden Cr. (finished water)	Maiden Cr. (finished water) [a]	Maiden Cr. (finished water) [a]
Silica (SiO_2)	--	--	5.0	4.7	6.9
Iron (Fe)	--	--	.06	.07	.04
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	--	--	25	20	35
Magnesium (Mg)	--	--	6.2	4.8	6.5
Sodium (Na) / Potassium (K)	4.3	3.9	1.9	1.2	5.8
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	73	34	70	48	93
Sulfate (SO_4)	16	14	24	22	33
Chloride (Cl)	4.8	2.5	5.4	3.0	4.6
Fluoride (F)	--	--	--	--	--
Nitrate (NO_3)	4.0	1.8	2.6	7	12
Dissolved solids	--	--	115	102	152
Hardness as $CaCO_3$:					
Total	77	34	88	70	114
Noncarbonate	17	6	31	30	38
Color	5	10	5	1	1
pH	7.5	7.8	8.0	8.1	8.1
Specific conductance (micromhos at 25 C.)	173	99.4	204	--	--
Turbidity	--	--	--	0.1	0.1
Temperature (F.)	72	67	71	39	48
Date of collection	Aug. 7, 1951	Aug. 7, 1951	Aug. 7, 1951	January, 1949	November, 1949

Regular determinations at treatment plant, 1949--Maiden Creek

	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	60	76	39	8.0	8.2	7.9	87	114	70	0.1	--	--

[a] Monthly composite of daily samples. Analyses (by Reading Water Department) showing minimum and maximum dissolved solids.

SCRANTON

(Population, 125,536)

Ownership: Scranton-Spring Brook Water Service Company. The company serves 57 civil divisions extending roughly from Forest City on the north through Newport township on the south, a distance of about 70 miles, including Carbondale, Dunmore, Kingston, Nanticoke, Pittston, Plains township, Scranton, and Wilkes-Barre. Total population supplied, about 600,000.

Sources: Reservoirs: No. 5, No. 7, Lake Scranton, Williams Bridge, and Chinchilla.

Treatment: Chlorination.

Raw-water storage: 3,000,000,000 gal.

Finished-water storage: --

The company has 76 reservoirs of a total capacity of about 19,500,000,000 gal. The reservoirs supply water from 35 points of distribution.

SCRANTON--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	3.7	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	26
Manganese (Mn)	--	Noncarbonate	21
Calcium (Ca)	7.8		
Magnesium (Mg)	1.5	Color	5
Sodium (Na)	1.3	pH	6.3
Potassium (K)		Specific conductance (micromhos at 25 C.)	69.5
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	6	Temperature (F.)	45
Sulfate (SO_4)	15	Date of collection	Nov. 25, 1951
Chloride (Cl)	5.0		
Fluoride (F)	.0		
Nitrate (NO_3)	1.0		
Dissolved solids	55		

SHAMOKIN

(Population, 16,879)

Ownership: The Roaring Creek Water Company; supplies also the boroughs Centralia and Girardville, the townships of Conyngham, Mt. Carmel, Ralpho, and Shamokin, and furnishes water to Kulmont Water Company, Marion Heights Water Company, Mt. Carmel Water Company, and Trevorton Water Company. Total population supplied, about 67,000.

Source: Streams and lakes.

Treatment: Chlorination and the addition of soda ash. Calgon is added to 60 percent of the supply.

Rated capacity of treatment plant:---

Raw-water storage: --

Finished-water storage: 2,007,700 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.4	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	7
Manganese (Mn)	--	Noncarbonate	2
Calcium (Ca)	2.0		
Magnesium (Mg)	.6	Color	5
Sodium (Na)	2.9	pH	6.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	33.2
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	7	Temperature (F.)	70
Sulfate (SO_4)	5.5	Date of collection	Sept. 12, 1951
Chloride (Cl)	1.2		
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	27		

SHARON
(Population, 26,454)

Ownership: Shenango Valley Water Company; supplies also Farrel, Wheatland, and Hickory township. Total population supplied, about 48,000.
Source: Shenango River.
Treatment: Prechlorination, sedimentation, coagulation with lime and alum, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 8,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,000,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	1.9	Hardness as $CaCO_3$:		
Iron (Fe)	--	.05	Total	66	84
Manganese (Mn)	--	--	Noncarbonate	28	35
Calcium (Ca)	--	26			
Magnesium (Mg)	--	4.7	Color	10	8
Sodium (Na)	6.6	13	pH	7.1	7.8
Potassium (K)			Specific conductance (micromhos at 25 C.)	289	247
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	47	60	Temperature (F.)	81	--
Sulfate (SO_4)	31	47	Date of collection	July 27, 1951	July 27, 1951
Chloride (Cl)	3.6	9.9			
Fluoride (F)	--	--			
Nitrate (NO_3)	5.7	.0			
Dissolved solids	--	145			

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	39	52	28	7.3	7.7	6.8	65	77	58	29	42	17
Finished water	43	60	32	7.6	8.2	7.3	82	92	64	.2	.4	.1

SHENANDOAH
(Population, 15, 704)

Ownership: Municipal; also supplies about 23,000 people outside the city limits. Total population supplied, about 38,700.
Source: Springs and streams.
Treatment: Chlorination.
Raw-water storage: 1,112,000,000 gal.
Finished-water storage: 270,000 gal.

SHENANDOAH--Continued

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	2.0	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	7
Manganese (Mn)	--	Noncarbonate	6
Calcium (Ca)	1.4		
Magnesium (Mg)	.9	Color	3
Sodium (Na)	1.6	pH	6.3
Potassium (K)		Specific conductance (micromhos at 25 C.)	26.8
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	2	Temperature (F.)	63
Sulfate (SO_4)	6.6	Date of collection	Sept. 11, 1951
Chloride (Cl)	1.5		
Fluoride (F)	.0		
Nitrate (NO_3)	.0		
Dissolved solids	18		

STATE COLLEGE

(Population, 17,227)

Ownership: The Pennsylvania State College. Population supplied, about 12,000. The borough of State College has a separate system of supply.

Source: 5 wells (1, 2, 3, 16, 17) 365, 333, 305, 230, and 336 ft deep; yield reported to be 700, 350, 350, 350, and 600 gpm, 83 percent of supply. Streams, 17 percent of supply.

Treatment: Chlorination.

Storage: 500,000 gal.

ANALYSES

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

	Musser's Gap stream	Well 17 (raw water)	Finished water Tap sample[a]
Silica (SiO_2)	--	--	6.4
Iron (Fe)	--	--	.06
Manganese (Mn)	--	--	--
Calcium (Ca)	--	--	22
Magnesium (Mg)	--	--	13
Sodium (Na)	1.1	1.0	.5
Potassium (K)			.6
Carbonate (CO_3)	0	0	6
Bicarbonate (HCO_3)	8	138	108
Sulfate (SO_4)	1.7	4.2	3.4
Chloride (Cl)	1.4	1.4	1.5
Fluoride (F)	--	--	.0
Nitrate (NO_3)	.1	1.0	2.0
Dissolved solids	--	--	112
Hardness as $CaCO_3$:			
Total	8	118	108
Noncarbonate	1	5	10
Color	5	3	4
pH	7.1	7.7	8.0
Specific conductance (micromhos at 25 C.)	25.5	230	205
Turbidity	--	--	--
Temperature (F.)	61	51	51
Date of collection	Aug. 28, 1951	Aug. 28, 1951	Aug. 28, 1951

[a] 88 percent well water; 12 percent stream water.

SUNBURY
(Population, 15,570)

Ownership: The Sunbury Water Company; also supplies about 1,000 people outside the city limits. Total population supplied, about 16,600.
Source: Little Shamokin Creek.
Treatment: Coagulation with alum and soda ash, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 47,450,000 gal.
Finished-water storage: 3,500,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.4	Hardness as $CaCO_3$:	
Iron (Fe)	.03	Total	34
Manganese (Mn)	--	Noncarbonate	13
Calcium (Ca)	9.8		
Magnesium (Mg)	2.3	Color	5
Sodium (Na)	3.3	pH	7.4
Potassium (K)		Specific conductance (micromhos at 25 C.)	92.7
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	26	Temperature (F.)	75
Sulfate (SO_4)	12	Date of collection	Sept. 26, 1951
Chloride (Cl)	4.2		
Fluoride (F)	.0		
Nitrate (NO_3)	1.7		
Dissolved solids	60		

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	24	46	5	--	--	--	--	--	--	15	30	6
Finished water	25	52	9	7.2	--	--	--	38	--	0	0	0

SWISSVALE
(Population, 16,488)

Ownership: Supplied by Wilkinsburg. (See Wilkinsburg.)

UNIONTOWN
(Population, 20,471)

Ownership: Uniontown Water Company (controlled by American Water Works Co., Inc.); also supplies about 10,100 people outside the city limits. Total population supplied, about 30,600.
Source: Reservoirs, 85 percent of supply; Youghiogheny River, 15 percent of supply.
Treatment: Impounded supply: chlorination, fluoridation with sodium silicofluoride and addition of Calgon. Youghiogheny River water: coagulation with alum and lime, sedimentation, rapid sand filtration, fluoridation with sodium silicofluoride, and chlorination. Calgon is also applied at the outlet of the distribution reservoir.
Rated capacity of treatment plant (River Station): 1,500,000 gpd.
Raw-water storage: Impounded sources, 169,900,000 gal.
Finished-water storage: Distribution reservoir, 6,000,000 gal; clear water basin, 40,000 gal.

UNIONTOWN--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.0	Hardness as $CaCO_3$:	
Iron (Fe)	.27	Total	32
Manganese (Mn)	--	Noncarbonate	17
Calcium (Ca)	9.9		
Magnesium (Mg)	1.7	Color	8
Sodium (Na)	.5	pH	7.9
Potassium (K)		Specific conductance (micromhos at 25 C.)	70.2
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	18	Temperature (F.)	45
Sulfate (SO_4)	13	Date of collection	Feb. 13, 1952
Chloride (Cl)	2.2		
Fluoride (F)	.0		
Nitrate (NO_3)	1.7		
Dissolved solids	48		

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[a]	2	7	0	6.2	6.9	4.8	--	--	--	15	300	0
Finished water[a]	5	10	2	7.1	8.0	6.7	44	72	30	0	0	0
Raw water[b]	19	39	7	7.0	7.3	6.8	36	50	26	--	--	--
Finished water[b]	19	39	7	7.0	7.3	6.8	36	50	26	--	--	--

[a] Youghiogheny River.

[b] Cool Springs Reservoir.

UPPER DARBY township

(Population, 84,951)

Ownership: Philadelphia Suburban Water Company, 762 Lancaster Avenue, Bryn Mawr, Pa. This company supplies a number of places and townships in Chester, Delaware, and Montgomery counties, a suburban area of approximately 300 square miles, adjacent to the city of Philadelphia. Total population supplied, about 475,000.

Source: Crum Creek; Pickering Creek, supplemented with water from Perkiomen Creek; Neshaminy Creek, supplemented with water from Iron Works Creek. Reservoirs on these creeks store about 5,000,000,000 gal of water. About 80 percent of the supply of Upper Darby township is taken from Crum Creek, and about 20 percent from Pickering Creek.

Treatment: Coagulation with alum (and lime when necessary), activated carbon for taste and odor control, sedimentation, rapid sand filtration, postchlorination, ammoniation, and adjustment of pH with hydrated lime.

Rated capacity of treatment plants: Crum Creek Plant, 20,000,000 gpd; Pickering Creek Plant, 16,000,000 gpd.

Raw-water storage: Crum Creek, 3,500,000,000 gal; Pickering Creek, 350,000,000 gal.

Finished-water storage: --

UPPER DARBY township--Continued

The Philadelphia Suburban Water Company supplies Aldan, Bryn Athyn, Clifton Heights, Collingdale, Colwyn, Conshohocken, Darby, East Lansdowne, Eddystone, Folcroft, Glenolden, Jenkintown, Lansdowne, Millbourne, Morton, Narbeth, Norwood, Prospect Park, Rockledge, Rutledge, Sharon Hill, Swarthmore, West Conshohocken, Yeadon, and the following townships: Abington, Cheltenham, Darby, Easttown, East Whiteland, Haverford, Lower Merion, Lower Moreland, Marple, Newtown, Plymouth, Radnor, Ridley, Schuylkill, Springfield (Delaware Co.), Springfield (Montgomery Co.), Tinicum, Tredyffrin, Upper Darby, Upper Merion, Upper Moreland, Whitemarsh, and Willistown.

Finished water from the Neshaminy Creek plant is supplied to Abington and Cheltenham township; finished water from the Pickering Creek plant, to Haverford township on the main line; a mixture of water from Crum Creek and Pickering plants, to Lower Merion and Upper Darby townships. Certain parts of each township may receive water from either plant or various percentage mixtures of water from both plants.

ANALYSES

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

	Crum Creek (raw water) [a]	Pickering Creek (raw water) [a]	Finished water [b]
Silica (SiO_2)	8.6	11	6.2
Iron (Fe)	.07	.10	.02
Manganese (Mn)	--	--	--
Calcium (Ca)	12	18	10
Magnesium (Mg)	4.8	5.4	3.5
Sodium (Na), Potassium (K)	4.8	8.8	7.5
Carbonate (CO_3)	--	--	0
Bicarbonate (HCO_3)	33	51	32
Sulfate (SO_4)	22	30	20
Chloride (Cl)	5.6	8.0	5.2
Fluoride (F)	.1	.1	.0
Nitrate (NO_3)	2.4	2.0	1.6
Dissolved solids	97	133	76
Hardness as $CaCO_3$:			
Total	50	67	39
Noncarbonate	23	25	13
Color	3	3	2
pH	7.4	7.0	7.0
Specific conductance (micromhos at 25 C.)	--	--	122
Turbidity	0.25	0.25	--
Temperature (F.)	--	--	78
Date of collection	June 4, 1951	May 28, 1951	Aug. 30, 1951

[a] Analysis by Philadelphia Suburban Water Company.
[b] Tap sample, Darby, Pa.

WASHINGTON
(Population, 26,280)

Ownership: The Citizens Water Company of Washington, Pa. (controlled by American Water Works Co., Inc.); also supplies East Washington, and parts of the townships of Amwell, Canton, Chartiers, North Franklin, and South Strabane. Total population supplied, about 39,500.
Source: 2 impounding reservoirs and Chartiers Creek.
Treatment: Aeration, softening with lime, coagulation with alum, prechlorination, sedimentation, rapid sand filtration, ammoniation, and postchlorination.
Rated capacity of treatment plant: 5,300,000 gpd.
Raw-water storage: 1,182,000,000 gal.
Finished-water storage: 13,350,000 gal.

ANALYSES

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

	Raw water[a]	Finished water		Raw water[a]	Finished water
Silica (SiO_2)	--	2.8	Hardness as $CaCO_3$:		
Iron (Fe)	--	.03	Total	101	60
Manganese (Mn)	--	--	Noncarbonate	31	40
Calcium (Ca)	--	17			
Magnesium (Mg)	--	4.2	Color	5	5
Sodium (Na)	8.3	14	pH	7.5	7.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	233	201
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	86	24	Temperature (F.)	--	74
Sulfate (SO_4)	34	53	Date of collection	Aug. 23, 1951	Aug. 23, 1951
Chloride (Cl)	9.0	11			
Fluoride (F)	--	.1			
Nitrate (NO_3)	.6	.4			
Dissolved solids	--	124			

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	87	124	69	7.7	8.3	7.3	127	170	98	12	55	9
Finished water	26	69	21	9.6	9.8	7.7	67	86	51	0	0	0

[a] Reservoir 344.

WEST CHESTER
(Population, 15,168)

Ownership: Municipal; also supplies about 1,200 people outside the city limits. Total population supplied, about 16,400.
Source: Chester Creek impounded. Emergency supply, reservoir fed by springs and runoff water.
Treatment: Prechlorination, activated carbon (Nuchar), coagulation with alum and lime, sedimentation, and rapid sand filtration.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: 238,000,000 gal.
Finished-water storage: 3,000,000 gal.

WEST CHESTER--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	10	Hardness as $CaCO_3$:		
Iron (Fe)	--	.16	Total	39	61
Manganese (Mn)	--	--	Noncarbonate	8	20
Calcium (Ca)	16	16			
Magnesium (Mg)	--	5.1	Color	5	5
Sodium (Na)	7.7	3.4	pH	7.9	7.9
Potassium (K)			Specific conductance (micromhos at 25 C.)	111	153
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	38	50	Temperature (F.)	78	74
Sulfate (SO_4)	13	13	Date of collection	Aug. 7, 1951	Aug. 8, 1951
Chloride (Cl)	5.4	8.6			
Fluoride (F)	--	.0			
Nitrate (NO_3)	4.3	1.9			
Dissolved solids	--	109			

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	--	--	7.4	--	--	33	--	--	15	--	--
Finished water	43	--	--	8.2	--	--	26	--	--	0	--	--

WEST MIFFLIN

(Population, 17,985)

Ownership: Supplied by South Pittsburgh Water Company. (See Pittsburgh.)

WILKES-BARRE

(Population, 76,826)

Ownership: Scranton-Spring Brook Water Service Company. (See Scranton.)

Source: Laurel Run, Plymouth Relief Creek, Pine Run, Gardners Creek, Mill Creek, Spring Brook, and Hillside.

Treatment: Chlorination.

Raw-water storage: 2,700,000,000 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)	2.2	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	17
Manganese (Mn)	--	Noncarbonate	8
Calcium (Ca)	4.0		
Magnesium (Mg)	1.6	Color	3
Sodium (Na)	2.3	pH	7.1
Potassium (K)		Specific conductance (micromhos at 25 C.)	53.3
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	10	Temperature (F.)	68
Sulfate (SO_4)	8.5	Date of collection	Sept. 12, 1951
Chloride (Cl)	3.0		
Fluoride (F)	.0		
Nitrate (NO_3)	.5		
Dissolved solids	38		

WILKINSBURG
(Population, 31,418)

Ownership: Municipal; also supplies Braddock (4th ward), Braddock Hills, Chalfant, Churchill, East Pittsburgh, Edgewood, Forest Hills, North Braddock, Pitcairn, Pittsburgh (part of 13th ward), Swissvale, Trafford, Turtle Creek, and Wilmerding; the townships of North Versailles (part), Patton (part), Penn, and Wilkins; and redistributed in the boroughs of East McKeesport, Rankin, and Wall. Total population supplied, about 206,000.

Source: Allegheny River.

Treatment: Coagulation with alum and lime, potassium permanganate, chlorine dioxide, activated carbon, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 25,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 3 open reservoirs; 1 covered reservoir; and 7 standpipes. Total, 44,730,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	--	7.6	Hardness as $CaCO_3$:		
Iron (Fe)	.39	.12	Total	206	269
Manganese (Mn)	--	--	Noncarbonate	206	253
Calcium (Ca)	--	78			
Magnesium (Mg)	--	18	Color	6	3
Sodium (Na)	34	16	pH	4.15	7.3
Potassium (K)			Specific conductance (micromhos at 25 C.)	643	656
Carbonate (CO_3)	[a] 0	0	Turbidity	--	--
Bicarbonate (HCO_3)	0	19	Temperature (F.)	84	83
Sulfate (SO_4)	250	238	Date of collection	Aug. 21, 1951	Aug. 21, 1951
Chloride (Cl)	23	28			
Fluoride (F)	--	.1			
Nitrate (NO_3)	1.8	1.4			
Dissolved solids	--	463			

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	15	35	0	6.2	6.8	4.5	98	150	60	89	1200	20
Finished water	30	50	18	7.4	8.8	7.2	125	175	85	0.5	3	0

[a] Total acidity as sulfuric acid (H_2SO_4) 42 ppm.

WILLIAMSPORT
(Population, 45,047)

Ownership: Williamsport Municipal Water Authority; also supplies Duboistown, South Williamsport, and parts of Armstrong, Loyalsock, and Old Lycoming townships. Total population supplied, about 57,000.
Source: Mosquito Creek 61 percent of supply; Hagerman Run 26 percent of supply; and 8 wells (used during dry seasons) 13 percent of supply.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 25,200,000 gal.

ANALYSES

(Analyses, in parts per million, by South Pittsburgh Water Company)

	Mosquito Creek (raw water)	Hagerman Run (raw water)	Wells (raw water)	Finished water [a] (city tap)
Silica (SiO_2)	--	--	--	2.1
Iron (Fe)	--	--	.2	.14
Manganese (Mn)	--	--	--	--
Calcium (Ca)	4.3	5.0	17	4.1
Magnesium (Mg)	2.0	2.1	3.5	1.5
Sodium (Na)	--	--	--	.8
Potassium (K)	--	--	--	
Carbonate (CO_3)	--	--	--	0
Bicarbonate (HCO_3)	12	5	24	10
Sulfate (SO_4)	--	--	--	5.7
Chloride (Cl)	4.0	4.0	12	2.5
Fluoride (F)	.05	.05	.10	0
Nitrate (NO_3)	--	--	--	.5
Dissolved solids	25	--	56	24
Hardness as $CaCO_3$:				
Total	14	20	100	16
Noncarbonate	--	--	--	8
Color	--	--	--	5
pH	6.8	6.8	6.2	6.7
Specific conductance (micromhos at 25 C.)	--	--	--	36.8
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	42
Date of collection	1949	1949	1949	Feb. 19, 1952

[a] Analysis by U. S. Geological Survey.

YORK
(Population, 59,953)

Ownership: The York Water Company; also supplies Manchester, Mt. Wolf, North York, Spring Garden township and other communities. Total population supplied, about 88,000.
Source: East and south branches of Codorus Creek impounded.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plant: 21,000,000 gpd.
Raw-water storage: 953,000,000 gal.
Finished-water storage: 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)	4.2	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	49
Manganese (Mn)	--	Noncarbonate	19
Calcium (Ca)	14		
Magnesium (Mg)	3.4	Color	5
Sodium (Na)	6.0	pH	7.2
Potassium (K)		Specific conductance (micromhos at 25 C.)	139
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	36	Temperature (F.)	72
Sulfate (SO_4)	13	Date of collection	Sept. 19, 1951
Chloride (Cl)	9.4		
Fluoride (F)	.1		
Nitrate (NO_3)	6.9		
Dissolved solids	88		

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	20	20	6.4	6.6	6.3	60	--	--	40	2000	5
Finished water	22	25	20	8.0	8.5	7.7	60	--	--	0	0	0

BRISTOL
(Population, 10,335)

Ownership: Bristol County Water Company; also supplies Warren and Barrington towns. Total population supplied, about 26,000.
Source: Impounding Reservoirs on Kickemuit and Palmer Rivers. Barrington supply, 2 wells each 83 ft deep, and each reported to yield 1,000,000 gpd.
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: 460,000,000 gal.
Finished-water storage: 3,290,000 gal.

Fluoridation with sodium silicofluoride to a content of 1.0 ppm of fluoride in the supply from the Warren station was begun May 21, 1952, and in the supply from the Barrington station Mar. 1, 1953.

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	0.7
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.)

CUMBERLAND town
(Population, 12,842)

Ownership: Municipal; Pawtucket Water Company. (See Pawtucket.) Total population supplied, 7,873.
Source: Municipal: Sneech Pond 13 percent of supply; 1 well 18 ft deep, on the Lippitt estate, 2 percent. Pawtucket Water Company, 85 percent of supply.
Treatment: Municipal: chlorination.
Raw-water storage: 175,000,000 gal.
Finished-water storage: 360,000 gal.

ANALYSIS

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

	Sneech Pond (raw water)		Sneech Pond (raw water)
Silica (SiO_2)	2.0	Hardness as $CaCO_3$:	
Iron (Fe)	1.9	Total	20
Manganese (Mn)	.00	Noncarbonate	10
Calcium (Ca)	5.1		
Magnesium (Mg)	1.8	Color	22
Sodium (Na)	4.2	pH	6.7
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	69.2
Carbonate (CO_3)	0	Turbidity	0.9
Bicarbonate (HCO_3)	12	Temperature (F.)	77
Sulfate (SO_4)	10	Date of collection	July 16, 1951
Chloride (Cl)	5.8		
Fluoride (F)	.2		
Nitrate (NO_3)	1.4		
Dissolved solids	46		

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	6.8	6.6	24	26	21	0	0	0
Finished water	--	--	--	--	--	--	--	--	--	--	--	--

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.

EAST PROVIDENCE town--Continued

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	0.7
Temperature (F.)	74	56	51
Date of collection	July 11, 1951	July 11, 1951	June 23, 1951

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

[a] Surface supply.

JOHNSTON town

(Population, 12,725)

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

LINCOLN town

(Population, 11,270)

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

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	0.6	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			

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

[a] Sum of determined constituents.
[b] Combined Newport and Lawton Valley supplies.

NORTH KINGSTON town
(Population, 14,810)

Ownership: Municipal. Population supplied, 8,000.
Source: 1 well (Nok. 26) 50 ft deep and reported to yield 1,000 gpm.
Treatment: Chlorination and adjustment of pH to 7.0 with soda ash.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: --
Finished-water storage: 625,000 gal.

NORTH KINGSTON town--Continued

ANALYSIS

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

	Well Nok. 26 (raw water)		Well Nok. 26 (raw water)
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	17
Manganese (Mn)	.02	Noncarbonate	8
Calcium (Ca)	5.0		
Magnesium (Mg)	1.2	Color	1
Sodium (Na)	7.4	pH	6.1
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	82.1
Carbonate (CO_3)	0	Turbidity	0.9
Bicarbonate (HCO_3)	12	Temperature (F.)	54
Sulfate (SO_4)	4.8	Date of collection	July 9, 1951
Chloride (Cl)	13		
Fluoride (F)	.2		
Nitrate (NO_3)	1.0		
Dissolved solids	61		
Depth (feet)			50
Diameter (inches)			12
Date drilled			1942
Percent of supply			100

NORTH PROVIDENCE town
(Population, 13,927)

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

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. Emergency 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.

PAWTUCKET--Continued

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			

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.

PROVIDENCE--Continued

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)	[a].02	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	[a]0.6
Bicarbonate (HCO_3)	13	Temperature (F.)	62
Sulfate (SO_4)	13	Date of collection	July 17, 1951
Chloride (Cl)	4.0		
Fluoride (F)	[b].1		
Nitrate (NO_3)	.5		
Dissolved solids	52		

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

	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] Analysis October 9, 1953.

[b] Fluoridation of the supply was begun in September 1952. A fluoride content of 1.0 is maintained in the supply for the months of June, July, August, and September, and 1.2 ppm for the remainder of the year.

[c] 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.)

WESTERLY
(Population, 8,415)

Ownership: Municipal; also supplies 500 people in Bradford and about 1,000 in Pawcatuck, Connecticut. Total population supplied, about 9,900.
Source: 166 wells (Wes. 1 to 166) at Westerly; 25 wells (Wes. 167 to 191) at Bradford. Pumping station 1 (Varietyville) 102 wells (Wes.1 to 102) 45 to 80 ft deep, reported to yield a total of 1,389 gpm; pumping station 2 (Whiterock) 64 wells (Wes. 103 to 166) 35 to 60 ft deep, reported to yield a total 1,215 gpm; pumping station 3 (Bradford) 25 wells (167 to 191) 35 to 55 ft deep, reported to yield a total of 62.5 gpm.
Treatment: None.
Storage: 1,500,000 gal.

The water is pumped directly to the distribution mains.

ANALYSIS

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

	Tap sample[a]		Tap sample[a]
Silica (SiO_2)	12	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	20
Manganese (Mn)	.03	Noncarbonate	4
Calcium (Ca)	5.4		
Magnesium (Mg)	1.5	Color	7
Sodium (Na)	9.4	pH	6.3
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	94.8
Carbonate (CO_3)	0	Turbidity	1.1
Bicarbonate (HCO_3)	19	Temperature (F.)	56
Sulfate (SO_4)	9.2	Date of collection	July 25, 1951
Chloride (Cl)	8.0		
Fluoride (F)	.0		
Nitrate (NO_3)	4.0		
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[b]	19	21	16	5.9	6.0	5.8	26	27	24	0	0	0
Raw water[c]	13	15	10	5.8	5.8	5.8	33	36	27	0	0	0

[a] Town Hall, Westerly. [b] Westerly. [c] Bradford.

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)	.07	.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	0.8	0.5	0
Temperature (F.)	72	54	60
Date of collection	July 17, 1951	July 9, 1951	May 8, 1951

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	--	--	--	--	--	--	--	--	--	--	--	--

[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.

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	Turbidity	0.8
Bicarbonate (HCO_3)	6	Temperature (F.)	78
Sulfate (SO_4)	6.5	Date of collection	July 16, 1951
Chloride (Cl)	4.4		
Fluoride (F)	.1		
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	--	--	--	---	--	--	--	--	--	--	--	--

ABBEVILLE
(Population, 5,395)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 5,420.
Source: Long Cane Creek. The intake is about 4.5 miles southeast of Abbeville.
Treatment: Prechlorination, coagulation with lime and alum, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 1,500,000 gal (designed for 25 percent overload).
Raw-water storage: None.
Finished-water storage: 1 clear well, 750,000 gal; 1 elevated tank, 500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	21	18	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.02	Total	22	26
Manganese (Mn)	.00	.00	Noncarbonate	0	10
Calcium (Ca)	5.0	7.1			
Magnesium (Mg)	2.2	2.1	Color	8	--
Sodium (Na)	7.5	5.6	pH	6.9	7.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	68.3	85.8
Carbonate (CO_3)	0	0	Turbidity	18	0
Bicarbonate (HCO_3)	34	20	Temperature (F.)	--	59
Sulfate (SO_4)	3.7	13	Date of collection	Mar. 26, 1953	Mar. 26, 1953
Chloride (Cl)	4.0	6.0			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.2	.2			
Dissolved solids	63	62			

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	--	--	--	6.8	6.9	6.7	--	--	--	200	2000	125
Finished water	--	--	--	7.2	7.4	7.0	--	--	--	5	15	5

AIKEN
(Population, 7,083)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,500.
Source: Springs about 6.5 miles north of the city.
Treatment: Chlorination and lime.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Two standpipes, 200,000 and 600,000 gal.

AIKEN--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.9	5.4	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.03	Total	4	11
Manganese (Mn)	.00	.00	Noncarbonate	1	1
Calcium (Ca)	.8	4.0			
Magnesium (Mg)	.4	.3	Color	7	3
Sodium (Na)	2.8	3.3	pH	5.2	6.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	29.6	38.3
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	3	13	Temperature (F.)	66	64
Sulfate (SO_4)	.7	1.6	Date of collection	Mar. 5, 1951	Mar. 5, 1951
Chloride (Cl)	2.6	2.6			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	3.5	3.0			
Dissolved solids	23	30			

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	0	--	--	4.8	5.2	4.6	2.0	--	--	0	--	--
Finished water	20	--	--	7.0	--	--	20	--	--	0	--	--

ANDERSON
(Population, 19,770)

Ownership: Duke Power Company; also supplies suburban districts and Equinox-Appleton Mills. Total population, supplied, about 25,000.

Source: Rocky River, 75 percent of supply; Bailey Creek, 25 percent of supply.

Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with soda ash.

Rated capacity of treatment plant: 5,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 1 clear well, 40,000 gal; 1 standpipe, 198,000 gal; 2 elevated tanks, 500,000 gal each; 2 reservoirs, 1,327,000 and 155,000 gal.

ANDERSON--Continued

ANALYSES

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

	Rocky River Raw water	Bailey Creek Raw water	Finished water (city tap)
Silica (SiO_2)	17	16	16
Iron (Fe)	.11	.06	.05
Manganese (Mn)	.00	.00	.06
Calcium (Ca)	2.2	2.2	5.8
Magnesium (Mg)	.8	.8	1.5
Sodium (Na), Potassium (K)	8.0	8.5	8.5
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	22	21	27
Sulfate (SO_4)	3.0	5.0	12
Chloride (Cl)	2.8	2.5	2.4
Fluoride (F)	.1	.1	.1
Nitrate (NO_3)	1.0	1.4	1.0
Dissolved solids	48	46	62
Hardness as $CaCO_3$:			
Total	9	9	21
Noncarbonate	0	0	0
Color	27	6	7
pH	7.0	6.6	6.6
Specific conductance (micromhos at 25 C.)	53.6	52.8	84.2
Turbidity	--	--	--
Temperature (F.)	51	52	45
Date of collection	Feb. 13, 1951	Feb. 13, 1951	Feb. 13, 1951

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	19	19	19	6.8	6.9	6.7	--	--	--	77	1,500	25
Finished water	23	23	23	7.6	7.7	7.5	22	22	22	0	0	0

BEAUFORT
(Population, 5,081)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 9,350.
Source: 5 wells (1 to 5) 120, 87, 65, 65, and 65 ft deep; yield reported to be 350, 350, 250, 250, and 400 gpm.
Treatment: Zeolite softening, chlorination at times.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 elevated tank, 100,000 gal; 1 standpipe, 126,000 gal.

BEAUFORT--Continued

ANALYSIS

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

	Finished[a] water		Finished[a] water
Silica (SiO_2)	9.4	Hardness as $CaCO_3$:	
Iron (Fe)	.54	Total	107
Manganese (Mn)	.00	Noncarbonate	26
Calcium (Ca)	40		
Magnesium (Mg)	1.7	Color	4
Sodium (Na)	16	pH	7.0
Potassium (K)		Specific conductance (micromhos at 25 C.)	294
Carbonate (CO_3)	0	Turbidity	1
Bicarbonate (HCO_3)	98	Temperature (F.)	64
Sulfate (SO_4)	31	Date of collection	Dec. 12, 1951
Chloride (Cl)	20		
Fluoride (F)	.2		
Nitrate (NO_3)	.3		
Dissolved solids	171		

[a] From wells 2, 3, and 5.

BENNETTSVILLE
(Population, 5,140)

Ownership: Municipal; supplies also suburban districts. Total population supplied, about 6,000.
Source: 2 deep wells 300 and 350 ft deep; 1 well field of 8 wells each 60 ft deep; and 1 well field of 5 wells each 60 ft deep.
Treatment: Adjustment of pH with soda ash.
Rated capacity of treatment plant: 756,000 gpd.
Raw-water storage: None.
Finished-water storage: 1 clear well, 300,000 gal; 1 elevated tank, 100,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	10	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.06	Total	9	9
Manganese (Mn)	.00	.02	Noncarbonate	4	0
Calcium (Ca)	1.3	1.6			
Magnesium (Mg)	1.4	1.3	Color	3	3
Sodium (Na)	14	28	pH	5.3	6.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	96.9	150
Carbonate (CO_3)	0	0	Turbidity	1	1
Bicarbonate (HCO_3)	6	46	Temperature (F.)	65	55
Sulfate (SO_4)	2.8	1.8	Date of collection	Dec. 17, 1951	Dec. 17, 1951
Chloride (Cl)	14	14			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	15	14			
Dissolved solids	64	93			

CAMDEN
(Population, 6,986)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,000.
Source: Little Pine Tree Creek. The intake is about 3 miles east of the city.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, addition of Calgon, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: one clear well 65,000 gal; 1 reservoir, 450,000 gal; 1 standpipe, 235,000 gal; 1 elevated tank, 250,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.3	4.8	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.02	Total	3	4
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	.6	1.0			
Magnesium (Mg)	.3	.3	Color	45	7
Sodium (Na)	2.6	14	pH	5.4	6.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	21.2	73.1
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	3	20	Temperature (F.)	--	--
Sulfate (SO_4)	2.1	8.9	Date of collection	Mar. 8, 1951	Mar. 8, 1951
Chloride (Cl)	2.2	5.2			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.4	.3			
Dissolved solids	27	45			

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	4	6.2	6	5.5	4	4	4	65	70	--
Finished water	19	22	16	7	7	7	5	5	5	5	5	5

CHARLESTON
(Population, 70,174)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 120,000.
Source: Edisto River 99 percent of supply; Goose Creek impounded in Goose Creek Reservoir 1 percent of supply.
Treatment: Prechlorination, coagulation with alum and sodium aluminate, addition of copper sulfate and activated carbon (Nuchar) occasionally, sedimentation, rapid sand filtration, postchlorination, and addition of caustic soda.
Rated capacity of treatment plant: 22,000,000 gpd.
Raw-water storage: Goose Creek storage reservoir, 2,780,000,000 gal.
Finished-water storage: 2 ground reservoirs, 2,000,000 and 350,000 gal; 4 elevated tanks, 2,000,000, 250,000, 200,000, 75,000 gal.

Water from the Edisto River flows by gravity through a tunnel aqueduct direct to pumping station or to Goose Creek as desired.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.1	3.3	Hardness as $CaCO_3$:		
Iron (Fe)	.22	.02	Total	20	21
Manganese (Mn)	.00	.00	Noncarbonate	1	2
Calcium (Ca)	6.8	6.8			
Magnesium (Mg)	.8	.9	Color	54	2
Sodium (Na)	4.1	15	pH	6.1	6.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	60.1	119
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	23	23	Temperature (F.)	--	--
Sulfate (SO_4)	1.8	21	Date of collection	Apr. 26, 1951	Apr. 26, 1951
Chloride (Cl)	5.6	8.0			
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.6	.1			
Dissolved solids	46	68			

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	17	5	6.6	7.1	6.0	--	--	--	81	180	50
Finished water	17	27	12	8.4	9.2	7.6	--	--	--	6	30	2

CHERAW
(Population, 4,836)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 5,000.
Source: Pee Dee River. The intake is on Pee Dee River about 0.5 mile northeast of Cheraw.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 500,000 gpd.
Raw-water storage: None.
Finished-water storage: 2 clear wells, 50,000 and 250,000 gal; 2 elevated tanks, 200,000 and 100,000 gal.

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	8.6	9.1	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.05	Total	17	18
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	4.0	4.5			
Magnesium (Mg)	1.6	1.7	Color	4	2
Sodium (Na)	7.7	23	pH	7.1	7.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	69.9	152
Carbonate (CO_3)	0	0	Turbidity	16	1
Bicarbonate (HCO_3)	25	33	Temperature (F.)	43	49
Sulfate (SO_4)	4.8	31	Date of collection	Dec. 18, 1951	Dec. 18, 1951
Chloride (Cl)	4.8	6.4			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.7	.3			
Dissolved solids	46	92			

CHESTER
(Population, 6,893)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,000.
Source: Sandy River impounded. The intake is about 2.5 miles west of the city.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 2,500,000 gpd.
Raw-water storage: Impounding reservoir, 534,000,000 gal.
Finished-water storage: 2 reservoirs, 500,000, 267,000 gal; 2 elevated tanks, 250,000 and 150,000 gal.

CHESTER--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	20	18	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.05	Total	25	26
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	5.4	5.8			
Magnesium (Mg)	2.7	2.9	Color	5	4
Sodium (Na)	7.6	25	pH	6.4	6.6
Potassium (K)		2.1	Specific conductance (micromhos at 25 C.)	91.3	176
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	35	65	Temperature (F.)	--	--
Sulfate (SO_4)	3.4	20	Date of collection	Mar. 9, 1951	Mar. 8, 1951
Chloride (Cl)	5.2	8.6			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.4	.0			
Dissolved solids	65	112			

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	24	32	17	6.8	7.4	6.0	--	--	--	150	4,000	100
Finished water	46	42	40	8.4	8.4	8.4	12	16	10	0	0	0

CLINTON

(Population, 7,168)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 4,580. Private systems supply the remaining population of the city.

Source: Duncan Creek. The intake is about 5 miles northeast of the city.

Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and adjustment of pH with soda ash.

Rated capacity of treatment plant: 1,000,000 gpd.

Raw-water storage: 2 reservoirs, 600,000 and 625,000 gal.

Finished-water storage: 1 clear well, 250,000 gal; 2 elevated tanks, 250,000 and 100,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	23	23	Hardness as $CaCO_3$:		
Iron (Fe)	.05	.03	Total	16	21
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	4.1	5.6			
Magnesium (Mg)	1.5	1.6	Color	9	4
Sodium (Na)	6.0	14	pH	7.1	7.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	61.2	114
Carbonate (CO_3)	0	0	Turbidity	24	1
Bicarbonate (HCO_3)	25	37	Temperature (F.)	43	43
Sulfate (SO_4)	3.0	15	Date of collection	Dec. 20, 1951	Dec. 20, 1951
Chloride (Cl)	3.4	3.9			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.5	.3			
Dissolved solids	57	84			

COLUMBIA
(Population, 86,914)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 102,000.
Source: Congaree River.
Treatment: Coagulation with alum and lime, prechlorination (breakpoint), sedimentation, rapid sand filtration, and adjustment of pH with lime.
Rated capacity of treatment plant: 18,000,000 gpd.
Raw-water storage: 40,000,000 gal.
Finished-water storage: 2 clear water reservoirs, 2,800,000 and 3,000,000 gal; 1 standpipe, 375,000 gal; 1 elevated tank, 1,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	14	12	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.03	Total	22	29
Manganese (Mn)	.00	.00	Noncarbonate	0	3
Calcium (Ca)	6.0	8.5			
Magnesium (Mg)	1.6	1.9	Color	2	3
Sodium (Na)	7.7	6.9	pH	6.5	6.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	71.5	97.1
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	34	32	Temperature (F.)	--	--
Sulfate (SO_4)	4.0	10	Date of collection	Mar. 9, 1951	Mar. 9, 1951
Chloride (Cl)	4.0	4.9			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.5	.3			
Dissolved solids	55	63			

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	23	28	16	7.0	7.3	6.8	--	--	--	75	370	25
Finished water	24	29	18	8.4	8.9	7.2	33	42	24	--	--	--

CONWAY
(Population, 6,073)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,000.
Source: 10 wells: Park Well and Hill Well, 438 and 406 ft deep; 3 artesian wells at plant 400 ft deep; 3 artesian wells in cemetery, 210 ft deep; 2 artesian wells on 1st Avenue, 290 and 286 ft deep. The wells are flowing except the first two named.
Treatment: None.
Rated capacity of plant: 1,000,000 gpd.
Storage: Reservoirs, 400,000 gal; 1 elevated tank, 100,000 gal.

CONWAY--Continued

ANALYSES

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

	Park Well	Hill Well	3 wells at plant
Silica (SiO_2)	15	12	15
Iron (Fe)	.05	.16	.04
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	2.6	2.8	2.3
Magnesium (Mg)	.8	1.3	1.1
Sodium (Na)	264	245	254
Potassium (K)			
Carbonate (CO_3)	22	14	24
Bicarbonate (HCO_3)	540	568	542
Sulfate (SO_4)	.9	1.2	1.0
Chloride (Cl)	67	31	47
Fluoride (F)	3.5	4.2	3.8
Nitrate (NO_3)	.5	.4	.4
Dissolved solids	647	601	620
Hardness as $CaCO_3$:			
Total	10	12	10
Noncarbonate	0	0	0
Color	13	12	14
pH	8.2	8.1	8.3
Specific conductance (micromhos at 25 C.)	1,070	974	1,010
Turbidity	1	1	1
Temperature (F.)	69	69	60
Date of collection	Dec. 19, 1951	Dec. 19, 1951	Dec. 19, 1951
Depth (feet)	438	406	400
Diameter (inches)	8	8	10
Date drilled	1936	1946	1918
Percent of supply	--	--	--

DARLINGTON
(Population, 6,619)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 7,600.
Source: 4 wells (1 to 4) 315, 317, 570, and 450 ft deep; yield reported to be 300, 400, 100, 530 gpm. Well 4 is for emergency use.
Treatment: Adjustment of pH with lime.
Rated capacity of treatment plant: 800,000 gpd.
Raw-water storage: None.
Finished-water storage: Reservoir, 300,000 gal; 1 elevated tank, 90,000 gal.

DARLINGTON--Continued

ANALYSES

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

	Well 1 (raw water)	Finished water [a]		Well 1 (raw water)	Finished water [a]
Silica (SiO_2)	11	11	Hardness as $CaCO_3$:		
Iron (Fe)	.84	.66	Total	5	37
Manganese (Mn)	.00	.00	Noncarbonate	3	7
Calcium (Ca)	1.0	12			
Magnesium (Mg)	.7	1.7	Color	1	4
Sodium (Na), Potassium (K)	4.4	2.0	pH	5.1	7.2
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	31.6	83.5
Bicarbonate (HCO_3)	3	36	Turbidity	0	2
Sulfate (SO_4)	9.8	9.1	Temperature (F.)	66	59
Chloride (Cl)	1.2	1.5	Date of collection	Dec. 18, 1951	Dec. 18, 1951
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.0	.1			
Dissolved solids	30	56			

[a] Wells 1 and 2.

DILLON
(Population, 5,171)

Ownership: Municipal; total population supplied, about 3,000. Private systems supply the remaining population of the city.
Source: 9 wells: 2 deep wells 284 and 280 ft deep; 7 shallow wells at plant 37 to 40 ft deep. The yield of the 2 deep wells is reported to be 600 and 870 gpm; of the 7 shallow wells, total of 155 gpm.
Treatment: Chlorination.
Raw-water storage: Reservoir, 250,000 gal.
Finished-water storage: Elevated tank, 75,000 gal.

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)	12	20	Hardness as $CaCO_3$:		
Iron (Fe)	.10	.54	Total	12	16
Manganese (Mn)	.00	.00	Noncarbonate	7	0
Calcium (Ca)	2.4	2.9			
Magnesium (Mg)	1.5	2.2	Color	3	15
Sodium (Na), Potassium (K)	9.0	20	pH	5.4	7.1
Carbonate (CO_3)	0	0	Specific conductance (micromhos at 25 C.)	82.6	118
Bicarbonate (HCO_3)	6	57	Turbidity	0	0
Sulfate (SO_4)	3.3	3.0	Temperature (F.)	65	58
Chloride (Cl)	11	5.8	Date of collection	Dec. 17, 1951	Dec. 17, 1951
Fluoride (F)	.2	.2			
Nitrate (NO_3)	9.0	2.2			
Dissolved solids	59	84			

[a] From 7 shallow wells.
[b] From 2 deep wells and 7 shallow wells.

EASLEY
(Population, 6,316)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,400.
Source: Burdine Creek (70 percent of supply); Maddog Branch (30 percent of supply). The intake on Burdine Creek is 3 miles northeast of the city; on Maddog Branch, about 1 mile northeast of the city.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, adjustment of pH with soda ash, (sodium metaphosphate and ammonia occasionally).
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Clear well, 900,000 gal; 3 elevated tanks, 500,000, 200,000, and 60,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	10	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.04	Total	10	14
Manganese (Mn)	.00	.00	Noncarbonate	2	0
Calcium (Ca)	2.8	4.4			
Magnesium (Mg)	.7	.7	Color	5	2
Sodium (Na)	2.3	7.3	pH	6.8	7.2
Potassium (K)			Specific conductance (micromhos at 25 C.)	31.2	65.9
Carbonate (CO_3)	0	0	Turbidity	30	1
Bicarbonate (HCO_3)	10	18	Temperature (F.)	44	46
Sulfate (SO_4)	2.0	8.1	Date of collection	Dec. 20, 1951	Dec. 20, 1951
Chloride (Cl)	2.1	3.5			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	1.5	1.3			
Dissolved solids	28	45			

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	14	17	10	6.3	6.9	5.7	--	--	--	30	1,000	25
Finished water	22	27	--	7.3	7.4	7	16	20	14	5	5	5

EAU CLAIRE
(Population, 9,238)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 13,500.
Source: Broad River.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, addition of soda ash, chlorination, and ammoniation.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,350,000 gal.

EAU CLAIRE--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	13	14	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.03	Total	14	18
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	3.8	4.2			
Magnesium (Mg)	1.1	1.7	Color	12	4
Sodium (Na)	12	15	pH	7.1	7.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	82.5	103
Carbonate (CO_3)	0	0	Turbidity	--	1
Bicarbonate (HCO_3)	34	40	Temperature (F.)	64	66
Sulfate (SO_4)	4.1	11	Date of collection	Apr. 6, 1953	Apr. 6, 1953
Chloride (Cl)	4.0	3.6			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	1.0	.4			
Dissolved solids	63	68			

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	13	14	12	7.1	7.2	7.0	--	--	--	200	3000	150
Finished water	22	24	19	7.8	8.2	7.8	17	18	16	--	--	--

FLORENCE

(Population, 22,513)

Ownership: Municipal; also supplies suburban areas. Total population supplied, about 25,000.

Source: 5 wells (6, 9 to 12) 735, 728, 768, 740, and 758 ft deep; yield reported to be 860, 300, 740, 820, and 920 gpm.

Treatment: Aeration, filtration (iron and carbon dioxide removal), pH adjustment, and chlorination.

Rated capacity of treatment plant: 4,896,000 gpd.

Raw-water storage: None.

Finished-water storage: 2 ground reservoirs, 1,400,000 gal; 3 elevated tanks, 100,000, 500,000, and 300,000 gal.

FLORENCE--Continued

ANALYSES

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

	Well 6 (raw water)	Well 12 (raw water	Wells 6, 9, 10, 11 (finished water)
Silica (SiO_2)	31	18	21
Iron (Fe)	3.4	1.2	.14
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	7.6	2.1	12
Magnesium (Mg)	2.6	1.5	2.7
Sodium (Na), Potassium (K)	12	17	31
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	19	27	85
Sulfate (SO_4)	9.8	8.5	10
Chloride (Cl)	20	12	20
Fluoride (F)	.3	.1	.2
Nitrate (NO_3)	.0	.0	.1
Dissolved solids	96	71	140
Hardness as $CaCO_3$:			
Total	30	11	41
Noncarbonate	14	0	0
Color	3	4	2
pH	5.8	6.2	7.2
Specific conductance (micromhos at 25 C.)	129	106	228
Turbidity	0	0	0
Temperature (F.)	67	69	69
Date of collection	Dec. 18, 1951	Dec. 18, 1951	Dec. 18, 1951
Depth (feet)	735	758	--
Diameter (inches)	18	20	--
Date drilled	November 1930	July 1950	--
Percent of supply	--	--	--

GAFFNEY

(Population, 8,123)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 11,000.
Source: Cherokee Creek.
Treatment: Coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, chlorination, Calgon, and adjustment of pH with lime.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 2,000,000 gal.
Finished-water storage: 2 clear wells, 450,000 and 100,000 gal; 1 standpipe, 500,000 gal; 1 elevated tank, 500,000 gal.

The treatment plant is on the creek 3.5 miles from the city.

GAFFNEY--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	10	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.04	Total	11	15
Manganese (Mn)	.0	.07	Noncarbonate	0	4
Calcium (Ca)	2.4	4.0			
Magnesium (Mg)	1.2	1.2	Color	7	6
Sodium (Na)	4.1	3.4	pH	6.0	6.3
Potassium (K)			Specific conductance (micromhos at 25 C.)	41.7	52.4
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	15	14	Temperature (F.)	54	46
Sulfate (SO_4)	2.4	5.8	Date of collection	Feb. 14, 1951	Feb. 14, 1951
Chloride (Cl)	3.0	3.1			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	1.0	.7			
Dissolved solids	33	37			

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	9	10	7	6.7	7.1	6.5	--	--	--	75	375	30
Finished water	12	14	10	7.3	7.5	7.1	21	26	18	--	--	--

GEORGETOWN

(Population, 6,004)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,500.

Source: 5 wells (1 to 5) 650, 850, 850, 925, and 800 ft deep; yield reported to be 190, 210, 150, 200, and 400 gpm.

Treatment: Chlorination.

Raw-water storage: A reservoir, 230,000 gal.

Finished-water storage: 1 standpipe, 146,000 gal.

Water from well 1 and 2 is pumped into a reservoir and is chlorinated when pumped from this to the distribution system.

GEORGETOWN--Continued

ANALYSES

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

	Wells 1 and 2 (raw water)	Well 3 (raw water)	Well 4 (raw water)
Silica (SiO_2)	13	12	14
Iron (Fe)	.13	.17	.12
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	2.1	2.0	2.4
Magnesium (Mg)	.6	.9	.7
Sodium (Na), Potassium (K)	215	219	246
Carbonate (CO_3)	26	20	17
Bicarbonate (HCO_3)	467	463	528
Sulfate (SO_4)	1.4	3.0	2.1
Chloride (Cl)	32	46	54
Fluoride (F)	.9	1.1	1.1
Nitrate (NO_3)	1.1	.8	.8
Dissolved solids	522	536	599
Hardness as $CaCO_3$:			
Total	8	9	9
Noncarbonate	0	0	0
Color	5	4	3
pH	8.5	8.3	8.4
Specific conductance (micromhos at 25 C.)	856	878	982
Turbidity	0	1	1
Temperature (F.)	--	76	--
Date of collection	Dec. 19, 1951	Dec. 19, 1951	Dec. 19, 1951
Depth (feet)	650, 850	850	925
Diameter (inches)	8, 8	8	8
Date drilled	1899, 1932	1932	1947
Percent of supply	-- --	--	--

GREENVILLE

(Population, 58,161)

Ownership: Municipal; also supplies suburban districts and several industrial areas. Total population supplied, about 135,000.

Source: Mountain streams, impounded.

Treatment: Chlorination, ammoniation, and soda-ash at Plant 1. Additional chlorination and ammoniation at Plants 2 and 3.

Rated capacity of treatment plants: 40,000,000 gpd.

Raw-water storage: Impounding reservoir about 9,500,000,000 gal.

Finished-water storage: 1 reservoir, 22,000,000 gal; 2 standpipes, 1,220,000 and 460,000 gal.

Table Rock Reservoir is about 22.8 miles from the city limits. Plant 1 is about 1,000 ft from the reservoir. Water from Table Rock Reservoir is treated at Plant 1, flows to two equalizing reservoirs, No. 3, 19.3 miles east of Table Rock Reservoir and No. 6, 16.7 miles southeast of Table Rock Reservoir. From these reservoirs, water flows through two separate lines to chemical plants 2 and 3 for additional treatment with ammonia and chlorine before entering the distribution system and standpipes.

GREENVILLE--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.8	9.2	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.09	Total	4	4
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	.9	1.1			
Magnesium (Mg)	.4	.3	Color	6	9
Sodium (Na)	2.9	7.0	pH	6.2	6.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	18.0	45.0
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	8	18	Temperature (F.)	43	54
Sulfate (SO_4)	1.8	1.8	Date of collection	Feb. 16, 1951	Feb. 16, 1951
Chloride (Cl)	1.0	1.5			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.2	.4			
Dissolved solids	17	30			

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	5	6	4	6.9	7.2	6.6	1	1	1	0	0	0
Finished water	15	17	13	8.4	8.5	8.3	1	1	1	0	0	0

GREENWOOD
(Population, 13,806)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 18,000.

Source: Coronoco Creek impounded in two lakes (1 percent of supply); Saluda River impounded in Lake Greenwood (99 percent of supply). The intake for Coronoco Creek water is 5 miles east of the city, and the intake in Lake Greenwood is about 10 miles east-northeast of the city.

Treatment: Coagulation with alum, sedimentation, rapid sand filtration, addition of lime, and chlorination.

Rated capacity of treatment plant: 3,500,000 gpd.

Raw-water storage: Impounding lakes for Coronoco Creek 75,000,000 gal; reservoir 10,000,000; Lake Greenwood exceeds 1,000,000,000 gal.

Finished-water storage: Clear wells, 1,125,000 gal; 1 elevated tank, 300,000 gal. (Additional facilities under construction).

GREENWOOD--Continued

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

	Raw water [a]	Finished water		Raw water [a]	Finished water
Silica (SiO_2)	13	13	Hardness as $CaCO_3$:		
Iron (Fe)	.12	.29	Total	8	19
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	2.0	6.0			
Magnesium (Mg)	.8	1.0	Color	45	7
Sodium (Na)	9.1	7.9	pH	6.8	6.8
Potassium (K)			Specific conductance (micromhos at 25 C.)	72.1	76.4
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	22	27	Temperature (F.)	46	66
Sulfate (SO_4)	3.4	7.3	Date of collection	Feb. 16, 1951	Feb. 16, 1951
Chloride (Cl)	3.9	4.2			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.8	.5			
Dissolved solids	47	53			

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	20	24	18	7.2	7.3	6.9	17	--	--	45	55	25
Finished water	22	26	18	7.9	8.4	7.7	20	22	--	--	--	--

[a] Lake Greenwood.

GREER
(Population, 5,050)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 10,100.

Source: South Tyger River, 90 percent of supply; enclosed springs, 10 percent of supply. The intake on South Tyger River is about 2.5 miles northeast of the city.

Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, Calgon and lime for adjustment of pH. Water from springs: chlorination only.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: Reservoir, 2,500,000 gal.

Finished-water storage: Clear well, 625,000 gal; elevated tank, 500,000 gal.

GREER--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	11	12	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.04	Total	9	22
Manganese (Mn)	.00	.00	Noncarbonate	0	8
Calcium (Ca)	2.3	7.5			
Magnesium (Mg)	.9	.9	Color	5	1
Sodium (Na)	4.1	3.6	pH	6.9	7.0
Potassium (K)			Specific conductance (micromhos at 25 C.)	35.0	70.3
Carbonate (CO_3)	0	0	Turbidity	28	1
Bicarbonate (HCO_3)	14	17	Temperature (F.)	43	43
Sulfate (SO_4)	2.6	10	Date of collection	Dec. 20, 1951	Dec. 20, 1951
Chloride (Cl)	2.5	3.0			
Fluoride (F)	.1	.4			
Nitrate (NO_3)	.5	.8			
Dissolved solids	32	51			

HARTSVILLE

(Population, 5,658)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 11,000.

Source: 12 wells: 2 Layne wells (old well at plant, new well at center of town) 240 and 375 ft deep; 2 wells at plant about 180 ft deep; 4 wells at plant, 160 to 180 ft deep; 4 wells drilled inside of the four last named wells to a depth of 220 ft. The yield of the Layne wells is reported to be 814 and 800 gpm. The Layne well at the plant is used all of the time. The other wells of low yield, pump into a reservoir and are used for an auxiliary or emergency supply.

Treatment: Calgon, caustic soda for adjustment of pH.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: Reservoir, 500,000 gal.

Finished-water storage: 2 elevated tanks, 300,000 and 75,000 gal.

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	8.7	8.9	Hardness as $CaCO_3$:		
Iron (Fe)	.14	.18	Total	3	3
Manganese (Mn)	.00	.00	Noncarbonate	1	0
Calcium (Ca)	.7	.8			
Magnesium (Mg)	.3	.3	Color	1	2
Sodium (Na)	1.5	11	pH	5.1	6.7
Potassium (K)			Specific conductance (micromhos at 25 C.)	16.8	49.9
Carbonate (CO_3)	0	0	Turbidity	0	0
Bicarbonate (HCO_3)	3	25	Temperature (F.)	65	64
Sulfate (SO_4)	1.6	1.9	Date of collection	Jan. 10, 1952	Jan. 10, 1952
Chloride (Cl)	1.6	2.0			
Fluoride (F)	.0	.3			
Nitrate (NO_3)	.0	.0			
Dissolved solids	17	37			

Depth (feet)	240	240
Diameter (inches)	20	20
Date drilled	1941	1941
Percent of supply	--	--

[a] Layne well at plant.

LAKE CITY
(Population, 5,112)

Ownership: Municipal.
Source: 3 wells (Swimming Pool, Plant, Fairview) 500, 480, 500 ft deep.
Treatment: None.
Storage: Reservoir, 150,000 gal; elevated tank, 100,000 gal.

ANALYSIS

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

	Plant well		Plant well
Silica (SiO_2)	18	Hardness as $CaCO_3$:	
Iron (Fe)	.06	Total	3
Manganese (Mn)	.00	Noncarbonate	0
Calcium (Ca)	1.0		
Magnesium (Mg)	.2	Color	1
Sodium (Na)	30	pH	7.4
Potassium (K)		Specific conductance (micromhos at 25 C.)	135
Carbonate (CO_3)	0	Turbidity	0
Bicarbonate (HCO_3)	66	Temperature (F.)	69
Sulfate (SO_4)	8.2	Date of collection	Dec. 19, 1951
Chloride (Cl)	3.2		
Fluoride (F)	.4		
Nitrate (NO_3)	.1		
Dissolved solids	94		

Depth (feet)	480
Diameter (inches)	6
Date drilled	1919
Percent of supply	--

LANCASTER
(Population, 7,159)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 9,000.
Source: Turkey Creek (impounded). The intake is about 3,000 ft south of the city limits.
Treatment: Prechlorination, coagulation with alum, soda ash, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: Impounding reservoir, 100,000,000 gal.
Finished-water storage: 1 clear well, 200,000 gal; 2 elevated tanks, 125,000 and 200,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	12	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.03	Total	10	14
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	2.4	3.6			
Magnesium (Mg)	.9	1.2	Color	40	15
Sodium (Na)	10	44	pH	6.6	8.5
Potassium (K)			Specific conductance (micromhos at 25 C.)	67.2	222
Carbonate (CO_3)	0	4	Turbidity	15	0
Bicarbonate (HCO_3)	24	74	Temperature (F.)	64	61
Sulfate (SO_4)	5.0	24	Date of collection	Apr. 3, 1953	Apr. 3, 1953
Chloride (Cl)	5.1	12			
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.3	.1			
Dissolved solids	61	138			

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	22	23	20	--	--	--	--	--	--	--	--	--
Finished water	45	50	40	7.4	8.4	6.8	--	--	--	--	--	--

LAURENS
(Population, 8,658)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 11,000.
Source: Little River 50 percent of supply; Rabon Creek 50 percent of supply.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: 2 impounding reservoirs, 5,100,000 gal.
Finished-water storage: Clear well, 500,000 gal; 3 elevated tanks, 375,000 gal.

ANALYSES

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

	Little River (raw water)	Rabon Creek (raw water)	Little River (finished water)
Silica (SiO_2)	19	18	19
Iron (Fe)	.04	.08	.03
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	3.8	4.3	11
Magnesium (Mg)	1.5	1.4	1.6
Sodium (Na), Potassium (K)	5.8	6.1	6.3
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	25	27	30
Sulfate (SO_4)	2.7	2.3	15
Chloride (Cl)	3.0	3.1	4.9
Fluoride (F)	.1	.1	.1
Nitrate (NO_3)	.5	.8	.6
Dissolved solids	52	52	74
Hardness as $CaCO_3$:			
Total	16	16	34
Noncarbonate	0	0	9
Color	6	7	3
pH	7.1	7.2	6.8
Specific conductance (micromhos at 25 C.)	62.7	60.4	104
Turbidity	--	--	--
Temperature (F.)	60	61	62
Date of collection	Mar. 9, 1951	Mar. 9, 1951	Mar. 9, 1951

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	24	30	20	6.6	7.0	6.2	--	--	--	38	159	14
Finished water	24	32	22	7.6	7.8	7.2	--	--	--	<3	--	--

MARION
(Population, 6,834)

Ownership: Municipal.
Source: 5 wells (1, 3 to 6) 200, 81, 150, 378, and 190 ft deep; yield reported to be 100, 80, 180, 300, and 200 gpm.
Treatment: None.
Storage: Reservoir, 240,000 gal; elevated tank, 150,000 gal.

ANALYSES

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

	Wells (composite sample)	Well 3	Well 5
Silica (SiO_2)	36	40	38
Iron (Fe)	.24	.83	.26
Manganese (Mn)	.00	.00	.00
Calcium (Ca)	5.7	2.2	2.0
Magnesium (Mg)	.7	.9	.9
Sodium (Na), Potassium (K)	44	43	43
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	115	115	109
Sulfate (SO_4)	7.5	1.3	3.3
Chloride (Cl)	6.8	3.9	6.0
Fluoride (F)	.5	.5	.7
Nitrate (NO_3)	.1	.1	.0
Dissolved solids	162	149	147
Hardness as $CaCO_3$:			
Total	17	9	9
Noncarbonate	0	0	0
Color	9	4	13
pH	7.4	7.2	7.2
Specific conductance (micromhos at 25 C.)	217	196	193
Turbidity	1	1	--
Temperature (F.)	61	66	70
Date of collection	Dec. 18, 1951	Dec. 18, 1951	Feb. 1, 1950
Depth (feet)	--	81	378
Diameter (inches)	--	8	10
Date drilled	--	--	1948
Percent of supply	--	--	--

MULLINS
(Population, 4,916)

Ownership: Municipal.
Source: 2 deep wells (3, 5) 345 and 370 ft deep; yield reported to be 300 and 500 gpm.
Treatment: None.
Storage: 1 reservoir, 100,000 gal; 1 elevated tank, 100,000 gal.

ANALYSES

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

	Well 3	Well 5		Well 3	Well 5
Silica (SiO_2)	41	41	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.04	Total	4	5
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	.8	1.2			
Magnesium (Mg)	.6	.5	Color	3	3
Sodium (Na)	48	50	pH	7.4	7.3
Potassium (K)			Specific conductance (micromhos at 25 C.)	214	221
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	116	120	Turbidity	1	1
Sulfate (SO_4)	2.3	2.3	Temperature (F.)	69	--
Chloride (Cl)	6.4	6.8	Date of collection	Dec. 17, 1951	Dec. 17, 1951
Fluoride (F)	.9	.9			
Nitrate (NO_3)	.1	.2			
Dissolved solids	161	163			

Depth (feet)	345	370
Diameter (inches)	12	12
Date drilled	--	1951
Percent of supply	--	--

NEWBERRY
(Population, 7,546)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 8,500.
Source: Bush River. The intake on Bush River is about 2.8 miles southwest of the city.
Treatment: Coagulation with alum, chlorination, ammoniation, rapid sand filtration, and adjustment of pH with lime.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 1,000,000 gal.
Finished-water storage: 3 clear wells, 1,000,000 gal; 2 elevated tanks, 150,000 gal each.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	26	25	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.03	Total	32	54
Manganese (Mn)	.00	.00	Noncarbonate	0	7
Calcium (Ca)	7.5	16			
Magnesium (Mg)	3.3	3.4	Color	43	7
Sodium (Na)	8.9	9.2	pH	6.8	7.7
Potassium (K)			Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	108	156
Bicarbonate (HCO_3)	47	57	Turbidity	--	--
Sulfate (SO_4)	3.8	16	Temperature (F.)	--	--
Chloride (Cl)	6.0	6.9	Date of collection	Feb. 21, 1951	Feb. 21, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.5	.6			
Dissolved solids	80	109			

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	45	50	40	7.2	7.4	7.0	80	100	60	20	200	10
Finished water	45	50	40	8.2	8.4	8.0	80	100	60	5	8	3

ORANGEBURG
(Population, 15,322)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 16,000.
Source: North Fork Edisto River. The intake on North Fork Edisto River is within the city limits.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2 clear wells, 750,000 gal; 3 elevated tanks, 150,000, 250,000, and 50,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.7	1.4	Hardness as $CaCO_3$:		
Iron (Fe)	.12	.03	Total	9	27
Manganese (Mn)	.00	.00	Noncarbonate	1	13
Calcium (Ca)	2.4	10			
Magnesium (Mg)	.7	.6	Color	22	2
Sodium (Na)	3.3	3.1	pH	5.8	6.4
Potassium (K)			Specific conductance (micromhos at 25 C.)	30.2	77.8
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	10	18	Temperature (F.)	--	--
Sulfate (SO_4)	2.1	8.7	Date of collection	Mar. 6, 1951	Mar. 6, 1951
Chloride (Cl)	3.6	7.2			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.4	.1			
Dissolved solids	27	50			

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	5	--	--	5.8	--	--	--	--	--	48	59	35
Finished water	13	--	--	8.7	--	--	40	55	28	--	--	--

ROCK HILL
(Population, 24,502)

Ownership: Municipal; also supplies suburban districts. Total population supplied, about 27,000.
Source: Catawba River. The intake in the river is about 5 miles north of the city.
Treatment: Coagulation with alum, activated carbon, sedimentation, rapid sand filtration, ammoniation, and chlorination.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Clear well, 1,000,000 gal; elevated tank, 1,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	9.6	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.02	Total	14	13
Manganese (Mn)	.00	.05	Noncarbonate	0	0
Calcium (Ca)	3.4	3.2			
Magnesium (Mg)	1.4	1.3	Color	3	3
Sodium (Na)	5.9	12	pH	6.7	6.7
Potassium (K)			Specific conductance (micromhos at 25 C.)	58.2	83.8
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	20	28	Temperature (F.)	46	44
Sulfate (SO_4)	4.9	9.5	Date of collection	Feb. 14, 1951	Feb. 14, 1951
Chloride (Cl)	3.2	3.5			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.9	.5			
Dissolved solids	42	54			

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	18	22	16	6.8	7.0	6.5	14	16	12	25	500	20
Finished water	28	32	26	8.3	8.5	8.1	14	16	12	1	1	1

SPARTANBURG
(Population, 36,795)

Ownership: Municipal; also supplies suburban areas. Total population supplied, about 60,000.

Source: South Pacolet River impounded. The intake is about 13 miles north of the city.

Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, adjustment of pH with soda-ash, and addition of phosphate for corrosion control.

Rated capacity of treatment plant: 10,000,000 gpd.

Raw-water storage: Impounding reservoir, 879,000,000 gal.

Finished-water storage: Clear well, 1,000,000 gal; 2 reservoirs, 6,000,000 gal; elevated tank, 1,500,000 gal. Additional facilities: at Camp Croft 1 standpipe, 2,300,000 gal; at Camp Wadsworth 1 reservoir, 216,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	12	11	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.04	Total	18	18
Manganese (Mn)	.00	.00	Noncarbonate	6	5
Calcium (Ca)	5.7	5.6			
Magnesium (Mg)	.9	1.0	Color	3	7
Sodium (Na)	.6	4.9	pH	6.5	6.3
Potassium (K)			Specific conductance (micromhos at 25 C.)	35.1	64.6
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	15	16	Temperature (F.)	41	43
Sulfate (SO_4)	2.9	10	Date of collection	Feb. 16, 1951	Feb. 16, 1951
Chloride (Cl)	2.2	3.1			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.7	.6			
Dissolved solids	34	46			

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	14	8	6.6	7.0	6.1	--	--	--	100	500	20
Finished water	16	14	18	7.2	7.3	7.1	--	--	--	2.5	1.0	5.0

SUMTER
(Population, 20,185)

Ownership: Municipal; also supplies Shannontown. Total population supplied, about 26,000.

Source: 7 wells: 4 deep wells (1 to 4) 625, 625, 625, and 615 ft deep; 1 battery of 3 shallow wells. The yield of the deep wells is reported to be 1,400, 1,580, 1,000 and 1,650 gpm, and of the battery of 3 shallow wells, 550 gpm.

Treatment: Water from wells 2 and 3 treated with Calgon; water from shallow wells, not treated.

Raw-water storage: None.

Finished-water storage: Standpipe, 335,000 gal; elevated tank, 100,000 gal; reservoir, 1,000,000 gal.

ANALYSES

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

	Raw water [a]	Finished water [a]		Raw water [a]	Finished water [a]
Silica (SiO_2)	13	11	Hardness as $CaCO_3$:		
Iron (Fe)	2.1	.62	Total	5	7
Manganese (Mn)	.00	.00	Noncarbonate	2	2
Calcium (Ca)	1.0	1.4			
Magnesium (Mg)	.5	.9	Color	1	1
Sodium (Na)	4.4	6.5	pH	5.2	5.6
Potassium (K)			Specific conductance (micromhos at 25 C.)	33.1	47.5
Carbonate (CO_3)	0	0	Turbidity	1	1
Bicarbonate (HCO_3)	3	6	Temperature (F.)	--	--
Sulfate (SO_4)	7.5	6.3	Date of collection	Dec. 19, 1951	Dec. 19, 1951
Chloride (Cl)	2.6	4.5			
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.0	4.1			
Dissolved solids	30	37			

[a] Mixed water from wells 2, 3, and 3 shallow wells.

UNION
(Population, 9,730)

Ownership: Municipal; also supplies suburban areas. Total population supplied, about 11,000.

Source: Broad River 50 percent of supply; Big Browns Creek and Unnamed Creek 50 percent of supply. The intake on Broad River is about 9 miles north of the city.

Treatment: Coagulation with alum, soda-ash, chlorination, sedimentation, rapid sand filtration, and ammoniation.

Rated capacity of treatment plant: 4,000,000 gpd.

Raw-water storage: Impounding reservoirs, 65,000,000 gal.

Finished-water storage: 2 clear wells, 500,000 and 275,000 gal; standpipe, 250,000 gal; 1 elevated tank, 400,000 gal.

ANALYSES

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

	Broad River (raw water)	Big Browns Creek (raw water)	Unnamed Creek (raw water)	Broad River (finished water)
Silica (SiO_2)	15	20	19	15
Iron (Fe)	.04	.25	.08	.05
Manganese (Mn)	.00	.00	.00	.00
Calcium (Ca)	4.6	3.8	3.6	4.0
Magnesium (Mg)	1.5	1.5	1.4	1.5
Sodium (Na) / Potassium (K)	5.3	6.3	5.6	16
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	25	27	24	39
Sulfate (SO_4)	3.1	1.6	2.1	12
Chloride (Cl)	3.2	3.2	3.0	3.9
Fluoride (F)	.1	.2	.2	.1
Nitrate (NO_3)	.9	.6	.4	.4
Dissolved solids	46	51	47	72
Hardness as $CaCO_3$:				
Total	18	16	15	16
Noncarbonate	0	0	0	0
Color	16	27	7	3
pH	6.7	6.4	6.6	7.3
Specific conductance (micromhos at 25 C.)	60.8	58.6	56.0	109
Turbidity	--	--	--	--
Temperature (F.)	59	68	70	58
Date of collection	Mar. 8, 1951	Mar. 8, 1951	Mar. 8, 1951	Mar. 8, 1951

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	22	20	22	7.2	7.4	6.8	--	--	--	80	300	80
Finished water	30	32	30	7	7.4	7.2	14	14	14	--	--	--

BRISTOL
(Population, 16,771)

Ownership: Municipal; population supplied outside the city limits, about 3,300. Total population supplied, about 20,100.
Source: South Fork Holston River. The intake is about three-quarters of a mile east of the treatment plant.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and ammoniation.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,700,000 gal.

The treatment plant is on Rural Route 421, 6.5 miles northeast of Bristol. There is some variation in the character of the water throughout the year.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.4	4.5	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.07	Total	64	67
Manganese (Mn)	.0	.0	Noncarbonate	4	14
Calcium (Ca)	17	18			
Magnesium (Mg)	5.3	5.3	Color	8	5
Sodium (Na)	2.2	2.5	pH	7.3	7.2
Potassium (K)	.6	1.1	Specific conductance (micromhos at 25 C.)	137	143
Carbonate (CO_3)	0	0	Turbidity	3	1
Bicarbonate (HCO_3)	74	64	Temperature (F.)	48	48
Sulfate (SO_4)	6.4	13	Date of collection	Mar. 28, 1951	Mar. 28, 1951
Chloride (Cl)	2.2	5.0			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	1.6	1.6			
Dissolved solids	82	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	79	128	40	7.9	8.9	7.2	74	160	24	30	500	2
Finished water	70	117	16	6.9	7.6	5.9	80	166	34	0	0	0

CHATTANOOGA
(Population, 131,041)

Ownership: City Water Co. Supplies also, outside of city limits, a population of about 61,000, and the communities of East Brainer, East Ridge, Lookout Mountain, Lookout Valley, and Red Bank. Total population supplied, about 230,700.
Source: Tennessee River. The intake is about half a mile east of the treatment plant.
Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, ammoniation, chlorination, and adjustment of pH.
Rated capacity of treatment plant: 32,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 6,500,000 gal.

The treatment plant is in the eastern part of the city. There is some variation in the chemical character of the raw water throughout the year, but the amount of dissolved solids is usually low. The raw-water analysis represents water from the river at flood stage.

CHATTANOOGA--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.5	3.8	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.09	Total	34	59
Manganese (Mn)	.0	.0	Noncarbonate	5	29
Calcium (Ca)	10	19			
Magnesium (Mg)	2.1	2.8	Color	20	5
Sodium (Na)	3.3	2.1	pH	6.9	7.6
Potassium (K)	.7	1.1	Specific conductance (micromhos at 25 C.)	85.8	138
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	35	36	Turbidity	--	3
Sulfate (SO_4)	5.8	28	Temperature (F.)	--	56
Chloride (Cl)	2.0	4.0	Date of collection	Mar. 30, 1951	Mar. 30, 1951
Fluoride (F)	.2	.0			
Nitrate (NO_3)	2.7	1.1			
Dissolved solids	72	88			

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	57	74	36	7.5	7.5	7.1	--	66	42	38	433	14
Finished water	58	73	35	7.6	8.1	7.4	62	75	45	0	0	0

CLARKSVILLE

(Population, 16,246)

Ownership: Municipal. Population supplied outside the city limits, about 800. Total population supplied, about 17,000.

Source: Cumberland River. The intake is located near the treatment plant, which is on the bank of the river in the southwestern part of the city.

Treatment: Coagulation with alum and lime, sedimentation, rapid sand filtration, chlorination, and adjustment of pH with lime.

Rated capacity of treatment plant: 3,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 650,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.4	4.0	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.08	Total	76	99
Manganese (Mn)	.0	.0	Noncarbonate	11	25
Calcium (Ca)	24	33			
Magnesium (Mg)	4.0	4.1	Color	10	6
Sodium (Na)	2.7	3.2	pH	7.3	7.5
Potassium (K)	1.4	1.4	Specific conductance (micromhos at 25 C.)	161	218
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	80	90	Turbidity	3	3
Sulfate (SO_4)	13	26	Temperature (F.)	48	50
Chloride (Cl)	1.2	4.0	Date of collection	Mar. 26, 1951	Mar. 26, 1951
Fluoride (F)	.2	.0			
Nitrate (NO_3)	1.9	1.4			
Dissolved solids	103	141			

CLARKSVILLE--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.....	84	130	41	7.5	8.4	7.0	94	130	64	70	900	4
Finished water...	74	117	20	7.3	8.4	6.0	101	144	64	.8	1.0	.3

CLEVELAND
(Population, 12,605)

Ownership: Municipal. Population supplied outside of the city limits, about 6,600. Total population supplied, about 19,200.
Source: Payne Spring and Waterville Spring.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 3,100,000 gal.

ANALYSIS

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

	Springs (finished water)		Springs (finished water)
Silica (SiO_2)	6.8	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	109
Manganese (Mn)	.0	Noncarbonate	2
Calcium (Ca)	24		
Magnesium (Mg)	12	Color	2
Sodium (Na)	2.9	pH	7.6
Potassium (K)		Specific conductance (micromhos at 25 C.).....	203
Carbonate (CO_3)	0	Turbidity	2
Bicarbonate (HCO_3)	131	Temperature (F.).....	58
Sulfate (SO_4)	2.0	Date of collection	Mar. 30, 1951
Chloride (Cl)	3.0		
Fluoride (F)	.0		
Nitrate (NO_3)	2.4		
Dissolved solids	117		

COLUMBIA
(Population, 10,911)

Ownership: Municipal. Population supplied outside of the city limits, about 5,100. Total population supplied, about 16,000.
Source: Duck River. The intake is located at the treatment plant which is on the bank of the river in the eastern part of the city.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid anthrafilt filtration, and postchlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 940,000 gal.

The river was at high stage at the time of the collection of the samples.

COLUMBIA--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.5	1.1	Hardness as $CaCO_3$:		
Iron (Fe)	.06	.02	Total	86	110
Manganese (Mn)	.0	.0	Noncarbonate	10	51
Calcium (Ca)	30	40			
Magnesium (Mg)	2.6	2.5	Color	40	4
Sodium (Na)	1.2	2.0	pH	7.4	6.9
Potassium (K)	1.4	.9	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	92	72	25 C.)	166	227
Sulfate (SO_4)	7.6	43	Turbidity	9	2
Chloride (Cl)	2.0	5.0	Temperature (F.)	55	56
Fluoride (F)	.3	.0	Date of collection	Mar. 31, 1951	Mar. 31, 1951
Nitrate (NO_3)	2.0	2.1			
Dissolved solids	134	150			

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	119	126	116	8.0	8.4	7.4	111	120	100	121	1200	45
Finished water	134	148	130	7.6	7.8	6.8	137	144	128	--	--	--

DYERSBURG

(Population, 10,885)

Ownership: Municipal; supplies also about 3,100 people outside of the city limits. Total population supplied, about 14,000.

Source: 5 wells (1, 3, and 4 to 6), only 2 of which (5 and 6) are in operation. The depth of the wells is reported to be as follows: 600-700, 600-700, 610, 690, and 635 ft. Well 5, with a reported yield of 2,000 gpm, furnishes 90 percent of the supply.

Treatment: Aeration (limestone trays), sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 3,000,000 gal.

Raw-water storage: None.

Finished-water storage: 834,000 gal.

The treatment plant is near the Municipal Building.

DYERSBURG--Continued

ANALYSES

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

	Well 5 (raw water)	Well 6 (raw water)	Well 5 (finished water)
Silica (SiO_2)	8.3	9.4	9.0
Iron (Fe)	4.0	3.4	.08
Manganese (Mn)	.0	--	.0
Calcium (Ca)	12	11	11
Magnesium (Mg)	6.0	6.5	6.7
Sodium (Na)	5.4	4.9	5.0
Potassium (K)	1.2	.7	.6
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	74	74	73
Sulfate (SO_4)	4.1	4.6	4.0
Chloride (Cl)	2.5	2.8	3.5
Fluoride (F)	.0	.2	.0
Nitrate (NO_3)	.4	.3	.5
Dissolved solids	76	74	77
Hardness as $CaCO_3$:			
Total	55	54	55
Noncarbonate	0	0	0
Color	2	7	4
pH	6.3	6.2	6.8
Specific conductance (micromhos at 25 C.)	127	134	128
Turbidity	3	--	2
Temperature (F.)	65	65	68
Date of collection	Mar. 25, 1951	July 5, 1951	Mar. 25, 1951
Depth (feet)	690	635	
Diameter (inches)	24	18	
Date drilled	1945	1951	
Percent of supply	90	10	

EAST RIDGE

(Population, 9,645)

Ownership: Supplied by Chattanooga. (See Chattanooga.)

ELIZABETHTON

(Population, 10,754)

Ownership: Municipal. Population supplied outside of the city limits, about 1,300. Total population supplied, 12,100.
Source: Hampton Spring.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 900,000 gal.

ELIZABETHTON--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	11	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	63
Manganese (Mn)	.0	Noncarbonate	4
Calcium (Ca)	13		
Magnesium (Mg)	7.4	Color	3
Sodium (Na)	1.4	pH	7.9
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	128
Carbonate (CO_3)	0	Turbidity	2
Bicarbonate (HCO_3)	72	Temperature (F.)	53
Sulfate (SO_4)	6.0	Date of collection	Mar. 29, 1951
Chloride (Cl)	1.8		
Fluoride (F)	.2		
Nitrate (NO_3)	1.4		
Dissolved solids	73		

FAYETTEVILLE
(Population, 5,447)

Ownership: Municipal; also supplies about 2,560 people outside the city limits. Total population supplied, about 8,000.
Source: Elk River, Kelso Springs, and Wells Hill Springs.
Treatment: Coagulation with lime and alum, sedimentation, rapid sand filtration, and chlorination of Elk River water. Chlorination only of spring water.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,338,000 gal.

The river was at flood stage at the time of the collection of the samples.

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	4.5	4.7	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.08	Total	52	56
Manganese (Mn)	.03	.0	Noncarbonate	4	22
Calcium (Ca)	17	18			
Magnesium (Mg)	2.4	2.7	Color	16	6
Sodium (Na)	2.4	1.1	pH	7.4	6.8
Potassium (K)	.9	1.0	Specific conductance (micromhos at 25 C.)	105	123
Carbonate (CO_3)	0	0	Turbidity	11	2
Bicarbonate (HCO_3)	59	42	Temperature (F.)	57	56
Sulfate (SO_4)	3.9	18	Date of collection	Mar. 30, 1951	Mar. 30, 1951
Chloride (Cl)	1.8	3.8			
Fluoride (F)	.2	.0			
Nitrate (NO_3)	1.7	1.9			
Dissolved solids	80	79			

[a] Elk River.

FAYETTEVILLE--Continued

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	98	116	72	7.5	7.6	7.0	87	110	60	93	2000	25
Finished water	70	91	40	6.9	7.6	6.2	78	98	44	0	0	0

[b] Elk River water; May 10-Dec. 31, 1950.

JACKSON
(Population, 30,207)

Ownership: Municipal. Population supplied outside the city limits, about 4,900. Total population supplied, about 35,100.
Source: 6 wells located on South Royal Street, 140 to 165 ft deep. The average yield is reported to be 782 gpm.
Treatment: Aeration (coke trays) and sedimentation.
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 6,000,000 gal.

ANALYSES

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

	Well 10	Well 14	Wells (composite) Raw water	Wells (composite) Finished water
Silica (SiO_2)	13	16	16	16
Iron (Fe)	.05	.02	.42	.10
Manganese (Mn)	.0	.0	.04	.0
Calcium (Ca)	9.6	18	12	12
Magnesium (Mg)	3.3	7.2	4.5	4.7
Sodium (Na)	7.3	14	9.9	11
Potassium (K)	1.1	3.0	1.0	1.2
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	23	22	18	20
Sulfate (SO_4)	16	52	29	29
Chloride (Cl)	8.5	16	11	13
Fluoride (F)	.0	.1	.0	.1
Nitrate (NO_3)	8.6	12	12	8.8
Dissolved solids	86	166	104	109
Hardness as $CaCO_3$:				
Total	38	74	48	49
Noncarbonate	19	56	34	33
Color	5	10	4	5
pH	6.0	6.0	6.5	6.3
Specific conductance (micromhos at 25 C.)	124	245	158	169
Turbidity	1	2	0	2
Temperature (F.)	63	62	62	61
Date of collection	June 28, 1951	June 28, 1951	June 28, 1951	June 28, 1951
Depth (feet)	144	148	--	--
Diameter (inches)	12	10	--	--
Date drilled	1940	1947	--	--
Percent of supply	--	--	--	--

JOHNSON CITY
(Population, 27,864)

Ownership: Municipal. Population supplied outside the city limits, about 7,200. Total population supplied, about 35,100.
Source: 3 springs and Indian Creek. The springs furnish about 90 percent of the supply.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and lime for adjustment of pH.
Rated capacity of treatment plant: 5,200,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,925,000 gal.

The treatment plant is about 5 miles southeast of Johnson City near Unicoi, Tenn.

ANALYSES

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

	Indian Creek (raw water)	Springs (composite) Raw water	Springs (composite) Finished water
Silica (SiO_2)	4.5	8.8	7.2
Iron (Fe)	.02	.04	.07
Manganese (Mn)	.0	.0	.0
Calcium (Ca)	4.2	12	13
Magnesium (Mg)	2.0	7.6	6.9
Sodium (Na)	1.6	.9	1.2
Potassium (K)	.6	.5	.9
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	19	70	70
Sulfate (SO_4)	3.2	3.3	3.3
Chloride (Cl)	1.0	1.2	1.8
Fluoride (F)	.2	.1	.0
Nitrate (NO_3)	1.4	1.5	1.4
Dissolved solids	38	71	70
Hardness as $CaCO_3$:			
Total	19	61	61
Noncarbonate	3	4	3
Color	22	4	3
pH	7.0	7.8	7.8
Specific conductance (micromhos at 25 C.)	42.9	117	122
Turbidity	7	2	1
Temperature (F.)	51	54	60
Date of collection	Mar. 29, 1951	Mar. 29, 1951	Mar. 29, 1951

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	28	37	10	7.0	7.0	6.9	--	--	--	5.1	48	2.8
Finished water	46	54	35	8.5	8.1	7.0	--	--	--	0	0	0

KINGSPORT
(Population, 19,571)

Ownership: Municipal. Population supplied outside of city limits, about 2,400. Total population supplied, about 22,000.
Source: South Fork Holston River, regular supply; a mountain reservoir (an impounded supply), auxiliary or emergency supply.
Treatment: Aeration, prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH.
Rated capacity of treatment plant: 4,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,000,000 gal.

The treatment plant is 1 mile southwest of Kingsport.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.5	4.4	Hardness as $CaCO_3$:		
Iron (Fe)	.10	.08	Total	131	109
Manganese (Mn)	.0	.0	Noncarbonate	29	25
Calcium (Ca)	36	32			
Magnesium (Mg)	10	7.1	Color	20	12
Sodium (Na)	16	14	pH	7.0	7.7
Potassium (K)	4.0	2.3	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	312	292
Bicarbonate (HCO_3)	124	102	Turbidity	1	1
Sulfate (SO_4)	41	49	Temperature (F.)	55	54
Chloride (Cl)	7.5	5.5	Date of collection	Mar. 28, 1951	Mar. 28, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	15	5.6			
Dissolved solids	199	171			

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	74	115	38	7.5	8.2	6.9	89	128	46	53	650	8
Finished water	80	121	41	8.1	9.0	6.9	102	144	52	0	0	0

KNOXVILLE
(Population, 124,769)

Ownership: Municipal. Population supplied outside the city limits, about 40,800. Total population supplied, about 165,600.
Source: Tennessee River.
Treatment: Prechlorination, ammoniation, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH.
Rated capacity of treatment plant: 25,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 12,900,000 gal.

KNOXVILLE--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	4.4	4.2	Hardness as $CaCO_3$:		
Iron (Fe)	.09	.17	Total	84	116
Manganese (Mn)	.0	.0	Noncarbonate	14	46
Calcium (Ca)	26	38			
Magnesium (Mg)	4.6	5.2	Color	25	4
Sodium (Na)	5.6	7.7	pH	7.5	7.6
Potassium (K)	.8	2.4	Specific conductance (micromhos at 25 C.)	187	275
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	85	86	Turbidity	19	2
Sulfate (SO_4)	10	27	Temperature (F.)	54	55
Chloride (Cl)	9.5	24	Date of collection	Mar. 29, 1951	Mar. 29, 1951
Fluoride (F)	.1	.0			
Nitrate (NO_3)	1.0	1.7			
Dissolved solids	127	188			

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	71	94	51	7.8	8.0	7.6	98	137	56	24	350	7
Finished water	71	92	53	7.8	8.0	7.4	112	154	71	.59	.89	.16

MEMPHIS

(Population, 396,000)

Ownership: Municipal--Memphis Light, Gas and Water Division.

Source: 86 wells, 51 in Parkway Well Field and 35 in Sheahan Well Field (another well field is being developed). Fifty-four of the eighty-six wells range in depth from 400 to 600 ft and 19 from 1,300 to 1,400 ft. Of the remaining wells 10 are between 300 and 400 ft deep. The yield of most of the wells, all depths, is reported to be from 400 to 500 gpm.

Treatment: Aeration (limestone trays) and rapid sand filtration, for the removal of iron and hydrogen sulfide.

Rated capacity of treatment plant; 55,000,000 gpd.

Raw-water storage: 2,000,000 gal.

Finished-water storage: 43,000,000 gal.

MEMPHIS--Continued

ANALYSES

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

	Well 2A Parkway Field	Well 23 Parkway Field	Well 38 Parkway Field	Well 47 Parkway Field	Well 59 Sheahan Field
Silica (SiO_2)	13	13	10	12	13
Iron (Fe)	.44	.41	.69	.37	.21
Manganese (Mn)	.0	.0	.0	.0	.0
Calcium (Ca)	10	11	3.8	13	6.7
Magnesium (Mg)	5.5	5.6	.7	6.5	3.6
Sodium (Na)	8.2	9.2	40	8.3	12
Potassium (K)	1.3	.9	3.0	.6	.6
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	72	78	112	86	51
Sulfate (SO_4)	3.2	3.1	5.3	3.8	5.8
Chloride (Cl)	3.0	3.0	1.8	3.2	6.0
Fluoride (F)	.0	.1	.1	.1	.1
Nitrate (NO_3)	.4	.3	.9	.3	1.1
Dissolved solids	81	85	122	90	76
Hardness as $CaCO_3$:					
Total	48	50	12	59	32
Noncarbonate	0	0	0	0	0
Color	6	18	9	7	9
pH	7.0	6.9	7.5	6.5	6.9
Specific conductance (micromhos at 25 C.)	123	128	173	144	108
Turbidity	2	2	2	2	2
Temperature (F.)	62	62	71	63	61
Date of collection	Apr. 2, 1951	Apr. 2, 1951	Apr. 2, 1951	Apr. 2, 1951	Apr. 2, 1951
Depth (feet)	567	493	1,376	638	366
Diameter (inches)	10	8	8	--	10
Date drilled	1943	1924	1941	1948	1935
Percent of supply	--	--	--	--	--

	Well 65 Sheahan Field	Wells Parkway Field[a]	Wells Sheahan Field[a]	Wells Parkway Field[b]	Wells Sheahan Field[b]
Silica (SiO_2)	12	13	14	14	14
Iron (Fe)	.60	.43	.34	.07	.08
Manganese (Mn)	.0	.0	.0	.0	.0
Calcium (Ca)	2.7	8.2	8.2	9.4	7.9
Magnesium (Mg)	1.3	4.6	3.8	4.6	3.1
Sodium (Na)	35	17	13	16	15
Potassium (K)	2.5	1.7	.7	2.4	1.8
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	101	85	65	84	65
Sulfate (SO_4)	5.1	3.7	4.6	4.0	4.5
Chloride (Cl)	2.0	2.5	4.2	4.2	4.5
Fluoride (F)	.1	.1	.1	.0	.0
Nitrate (NO_3)	.5	.4	.3	.6	.9
Dissolved solids	112	94	81	98	84
Hardness as $CaCO_3$:					
Total	12	39	36	42	32
Noncarbonate	0	0	0	0	0

[a] Raw water (composite). [b] Finished water (composite).

MEMPHIS, Analyses--Continued

	Well 65 Sheahan Field	Wells Parkway Field [a]	Wells Sheahan Field [a]	Wells Parkway Field [b]	Wells Sheahan Field [b]
Color	17	7	4	3	3
pH	7.7	6.9	6.8	7.4	7.4
Specific conductance (micromhos at 25 C.)	160	137	120	145	119
Turbidity	2	2	3	1	1
Temperature (F.)	70	--	63	70	71
Date of collection	Apr. 2, 1951	Apr. 2, 1951	Apr. 2, 1951	Apr. 2, 1951	Apr. 2, 1951
Depth (feet)	1,305	--	--	--	--
Diameter (inches)	8	--	--	--	--
Date drilled	1941	--	--	--	--
Percent of supply	--	--	--	--	--

[a] Raw water (composite). [b] Finished water (composite).

MORRISTOWN
(Population, 13,019)

Ownership: Municipal.
Source: Havely Spring furnishes 65 percent of supply; Cherokee Lake 20 percent; and 1 well, 214 ft deep, 15 per cent.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 2,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,083,000 gal.

The treatment plant is about 2 miles northwest of Morristown.

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

	Raw water [a]	Finished water [a]		Raw water [a]	Finished water [a]
Silica (SiO_2)	7.5	7.2	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.07	Total	157	161
Manganese (Mn)	.0	.0	Noncarbonate	5	13
Calcium (Ca)	35	38			
Magnesium (Mg)	17	16	Color	6	2
Sodium (Na)	1.2	1.1	pH	7.6	7.6
Potassium (K)	1.0	1.9	Specific conductance (micromhos at 25 C.)	287	291
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	186	180			
Sulfate (SO_4)	2.5	4.4	Turbidity	2	2
Chloride (Cl)	2.0	4.0	Temperature (F.)	58	59
Fluoride (F)	.1	.0	Date of collection	Mar. 29, 1951	Mar. 29, 1951
Nitrate (NO_3)	6.6	5.6			
Dissolved solids	165	168			

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	145	173	106	7.3	7.6	7.1	161	202	84	--	--	--
Finished water	135	168	98	7.1	7.5	6.9	152	194	82	--	--	--

[a] Havely Spring.

MURFREESBORO
(Population, 13,052)

Ownership: Municipal. Population supplied outside of the city limits, about 3,000. Total population supplied, about 16,100.
Source: Springs furnish 80 percent of the supply and Stone River 20 percent. One well 346 ft deep and with a reported yield of 1,120 gpm, auxiliary supply. The Stone River supply is used only during the dry season.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,500,000 gal.

The treatment plant is about 1 mile southwest of Murfreesboro.

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	6.4	4.6	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.05	Total	135	140
Manganese (Mn)	.0	.0	Noncarbonate	9	14
Calcium (Ca)	48	52			
Magnesium (Mg)	3.7	2.4	Color	13	2
Sodium (Na)	2.0	2.0	pH	7.6	7.8
Potassium (K)	.9	1.5	Specific conductance (micromhos at 25 C.)	257	282
Carbonate (CO_3)	0	0	Turbidity	4	1
Bicarbonate (HCO_3)	154	153	Temperature (F.)	57	56
Sulfate (SO_4)	6.7	11	Date of collection	Mar. 27, 1951	Mar. 27, 1951
Chloride (Cl)	3.0	5.2			
Fluoride (F)	.1	.0			
Nitrate (NO_3)	6.0	6.0			
Dissolved solids	156	166			

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	152	195	82	7.3	7.7	7.0	160	220	92	11	125	2.4
Finished water	157	205	88	7.6	8.1	6.9	177	244	112	0	0	0

[a] Springs only.

NASHVILLE
(Population, 174,307)

Ownership: Municipal; also supplies a large population in the suburban areas and a number of other places. Total population supplied, about 259,000.
Source: Cumberland River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, and ammoniation.
Rated capacity of treatment plant: 42,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 58,000,000 gal.

NASHVILLE--Continued

ANALYSES

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

	Finished water	Raw water [a]	Finished water [a]
Silica (SiO_2)	4.7	10	8.2
Iron (Fe)	.15	[b] 1.8	[b] .95
Manganese (Mn)	.0	--	--
Calcium (Ca)	39	25	25
Magnesium (Mg)	4.2	5.0	4.2
Sodium (Na)	2.6	5.5	6.0
Potassium (K)	.7		
Carbonate (CO_3)	0	--	--
Bicarbonate (HCO_3)	80	81	73
Sulfate (SO_4)	24	19	28
Chloride (Cl)	3.5	2.0	3.6
Fluoride (F)	.1	--	--
Nitrate (NO_3)	2.1	--	--
Dissolved solids	113	110	130
Hardness as $CaCO_3$:			
Total	90	84	80
Noncarbonate	24	18	21
Color	3	--	--
pH	7.5	7.5	7.1
Specific conductance (micromhos at 25 C.)	184	--	--
Turbidity	2	76	--
Temperature (F.)	53	--	--
Date of collection	Mar. 27, 1951	--	--

Regular determinations at treatment plant, 19--

	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	72	124	34	7.5	8.3	7.2	76	122	41	77	722	6
Finished water	64	120	29	7.1	7.3	6.8	80	124	49	0	0	0

[a] Average of analyses of monthly composites of daily samples Aug. 1949-July 1950. Analyzed by the Nashville Waterworks Department.

[b] Iron and aluminum oxides.

OAK RIDGE
(Population, 30,229)

Ownership: Municipal--U. S. Government. (Remaining data confidential; available for consultation in the offices of the U. S. Geological Survey, Washington, D. C.)

SHELBYVILLE
(Population, 9,456)

Ownership: Municipal; also supplies about 2,550 people outside the city limits. Total population supplied, about 12,000.
Source: Duck River.
Treatment: Prechlorination, coagulation with lime and alum, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 860,000 gal.

The treatment plant is located one block south of City square.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.0	4.5	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.04	Total	61	53
Manganese (Mn)	.0	.0	Noncarbonate	11	27
Calcium (Ca)	20	17			
Magnesium (Mg)	2.8	2.6	Color	26	7
Sodium (Na)	1.3	3.0	pH	7.1	6.5
Potassium (K)	1.0	1.1	Specific conductance (micromhos at 25 C.)	122	126
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	62	32	Turbidity	6	2
Sulfate (SO_4)	4.8	26	Temperature (F.)	53	54
Chloride (Cl)	3.0	4.2	Date of collection	Mar. 31, 1951	Mar. 31, 1951
Fluoride (F)	.2	.1			
Nitrate (NO_3)	1.8	1.9			
Dissolved solids	91	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	75	103	30	7.5	7.6	7.2	--	--	--	79	1150	10
Finished water	61	95	10	6.8	7.3	6.0	--	--	--	0	0	0

UNION CITY
(Population, 7,665)

Ownership: Municipal; also supplies about 4,400 people outside the city limits. Total population supplied, about 12,100.
Source: 3 wells (1 to 3) 554, 550, and 568 ft deep; yield reported to be 1,100, 750-800, and 1,000 gpm, respectively. The wells are about 200 ft apart and are pumped one at a time to storage.
Treatment: None.
Storage: 275,000 gal.

ANALYSIS

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

	Well 1		Well 1
Silica (SiO_2)	14	Hardness as $CaCO_3$:	
Iron (Fe)	1.7	Total	65
Manganese (Mn)	.0	Noncarbonate	0
Calcium (Ca)	14		
Magnesium (Mg)	7.4	Color	12
Sodium (Na)	7.7	pH	6.9
Potassium (K)	1.9	Specific conductance (micromhos at 25 C.)	149
Carbonate (CO_3)	0	Turbidity	1
Bicarbonate (HCO_3)	91	Temperature (F.)	64
Sulfate (SO_4)	3.5	Date of collection	Aug. 15, 1951
Chloride (Cl)	2.5		
Fluoride (F)	.1		
Nitrate (NO_3)	.5		
Dissolved solids	97		

Depth (feet)	554
Diameter (inches)	12
Date drilled	1950
Percent of supply	--

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	0.9
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.

BENNINGTON--Continued

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		
Bicarbonate (HCO_3)	16	Turbidity	1.9
Sulfate (SO_4)	3.2	Temperature (F.)	--
Chloride (Cl)	.8	Date of collection	Aug. 13, 1951
Fluoride (F)	.0		
Nitrate (NO_3)	1.0		
Dissolved solids	27		

[a] Sample collected from village reservoir.

BRATTLEBORO
(Population, 9,606)

Ownership: Municipal. Total population supplied, about 14,000.
Source: Sunset Lake, surface water and spring (North Pond).
Treatment: Copper sulfate and chlorination ("HTH").
Raw-water storage: 165,000,000 gal.
Finished-water storage: 3,500,000 gal.

A gravity system of supply.

ANALYSIS

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

	North Pond (finished water)		North Pond (finished water)
Silica (SiO_2)	4.4	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	20
Manganese (Mn)	.06	Noncarbonate	3
Calcium (Ca)	6.3		
Magnesium (Mg)	.6	Color	13
Sodium (Na)	1.1	pH	6.8
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	48.5
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	21	Turbidity	1.4
Sulfate (SO_4)	7.2	Temperature (F.)	62
Chloride (Cl)	.2	Date of collection	Sept. 29, 1953
Fluoride (F)	.1		
Nitrate (NO_3)	.2		
Dissolved solids	38		

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_2)	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.

MONTPELIER--Continued
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		

NEWPORT
(Population, 5,217)

Ownership: Municipal.
Source: Derby Pond about 84 percent of supply; 1 well 50 ft deep, 16 percent.
Treatment: Chlorination; copper sulfate to pond for the control of microorganisms.
Raw-water storage: --
Finished-water storage: Reservoir, 1,000,000 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)	4.5	Hardness as $CaCO_3$:	
Iron (Fe)	.02	Total	115
Manganese (Mn)	.00	Noncarbonate	1
Calcium (Ca)	39		
Magnesium (Mg)	4.2	Color	5
Sodium (Na)	4.6	pH	7.6
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	247
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	138	Turbidity	0.8
Sulfate (SO_4)	6.0	Temperature (F.)	45
Chloride (Cl)	6.9	Date of collection	Aug. 10, 1951
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	140		

[a] Mixed sample (pond and well).

RUTLAND
(Population, 17,659)

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

RUTLAND--Continued

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	0.9
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: --

ST. JOHNSBURY--Continued

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	0.8
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		

WINOOSKI

(Population, 6,734)

Ownership: Municipal; also supplies about 100 people outside the city limits. Total population supplied, about 6,850.

Source: Wells (2, 3, and 4) 453, 374, and 600 ft deep, and reported to yield 70, 45, and 40 gpm. Auxiliary or emergency supply, water purchased from Fort Ethan Allen.

Treatment: Coagulation with alum, some carbon, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: 16,000,000 gal.

Finished-water storage: 36,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.7	Hardness as $CaCO_3$:	
Iron (Fe)	.01	Total	102
Manganese (Mn)	.00	Noncarbonate	33
Calcium (Ca)	27		
Magnesium (Mg)	8.5	Color	2
Sodium (Na)	16	pH	7.2
Potassium (K)	1.4	Specific conductance (micromhos at 25 C.)	292
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	84	Turbidity	1.4
Sulfate (SO_4)	42	Temperature (F.)	--
Chloride (Cl)	18	Date of collection	Aug. 14, 1951
Fluoride (F)	.1		
Nitrate (NO_3)	1.6		
Dissolved solids	168		

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	--	--	--	7.2	7.4	7.3	--	128	114	--	--	--
Finished water	--	--	--	--	--	--	--	--	--	--	1	--

ALEXANDRIA
(Population, 61,787)

Ownership: Alexandria Water Co. and Virginia Water Co., which distributes water in Fairfax County (both controlled by the American Water Works Co. Inc., Philadelphia, Pa.). Supplies also suburban districts and communities in Fairfax County. Total population supplied, about 76,000.

Source: Occoquan Creek impounded. Auxiliary supply, 3 wells of total capacity of 1,000,000 gpd. The well supply is used during summer months.

Treatment: Prechlorination, coagulation with alum and lime, activated carbon as required, sedimentation, rapid sand filtration, postchlorination as required, and adjustment of pH.

Rated capacity of treatment plant: 8,800,000 gpd.

Raw-water storage: 1,750,000,000 gal.

Finished-water storage: Clear wells, 400,000 gal; underground reservoir, 700,000 gal; open reservoir, 16,000,000 gal; other facilities, 3,300,000 gal.

The intake dam on Occoquan Creek and the treatment plant are about 20 miles south of the city. This dam which is about 1,800 ft upstream from tidewater impounds about 55,000,000 gal. Another impounding dam about 7 miles above tidewater impounds an estimated 1.5 to 2.0 billion gal. The raw water is pumped through a 30 in. main to the treatment plant about ½ mile distant on a hill at an elevation of about 245 ft. Finished water is pumped through high service pumps to Alexandria, the intervening area, distribution, and storage.

The water of Occoquan Creek is subject to rather sudden changes in quality. At times of heavy rains, turbidity changes are rapid and large. Color removal is always a problem.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	9.5	Hardness as $CaCO_3$:	
Iron (Fe)	.09	Total	43
Manganese (Mn)	.19	Noncarbonate	17
Calcium (Ca)	14		
Magnesium (Mg)	2.4	Color	2
Sodium (Na)	4.0	pH	7.9
Potassium (K)	.9	Specific conductance (micromhos at 25 C.)	121
Carbonate (CO_3)	0	Turbidity	0.6
Bicarbonate (HCO_3)	34	Temperature (F.)	--
Sulfate (SO_4)	19	Date of collection	May 18, 1951
Chloride (Cl)	4.2		
Fluoride (F)	.0		
Nitrate (NO_3)	.6		
Dissolved solids	74		

Regular determinations at treatment plant, Jan. 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	26	22	7.1	7.3	7.0	--	--	--	29	50	16
Finished water	29	32	22	8.4	8.7	7.9	--	--	--	--	--	--

ARLINGTON COUNTY
(Population, 135,449)

Ownership: The distribution system is owned and operated by Arlington County. Finished water is purchased from Washington, D. C. Supplies also the city of Falls Church, and areas in Fairfax County through Falls Church. Total population supplied, about 158,000.
Source: Potomac River. Finished water from the Dalecarlia treatment plant. (See Washington, D. C.)
Finished-water storage: 3 ground reservoirs, 4 elevated tanks; total, 10,500,000 gal.

BRISTOL
(Population, 15,954)

Ownership: Municipal; also supplies suburban population of about 500. Total population supplied, about 16,500.
Source: Clear Creek (50 percent of supply); Preston Spring (35 percent of supply); and Mumpower Springs (15 percent of supply).
Treatment: Partial softening with lime, coagulation with copperas (and alum at times of high turbidity), sedimentation, rapid sand filtration, and chlorination. Spring supplies: chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 5,000,000 gal.
Finished-water storage: 1,000,000 gal.

The city of Bristol is served by two supply systems. Clear Creek and Preston Spring supply one system (low service) and Mumpower Springs the other (high service). Preston Spring is about 6.5 miles northwest of the city. Water from Preston Spring is diverted to the treatment plant for the creek supply which is located near the spring. Chlorinated water from the spring and finished water from the treatment plant flow by gravity in a single pipeline to the city to low service lines. Mumpower Springs (several springs) are about 4 miles north of the city. Water from the springs is collected in an open reservoir about $\frac{1}{4}$ mile below the springs, from which it flows by gravity to the city to high service lines. Chlorine is applied in the gravity line a short distance below the reservoir.
There is an 8 in. pipeline connecting the water supply system of Bristol, Tennessee with the supply system of Bristol, Virginia which can be used in emergencies.

BRISTOL--Continued

ANALYSES

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

	Clear Creek (raw water)	Preston Spring (raw water)	Finished water [a]	Finished water [b]
Silica (SiO_2)	3.6	1.8	4.0	2.0
Iron (Fe)	.06	.02	.02	.02
Manganese (Mn)	--	--	--	--
Calcium (Ca)	50	57	33	40
Magnesium (Mg)	21	22	21	19
Sodium (Na)	.7	.8	.7	.6
Potassium (K)	1.2	1.5	1.4	1.3
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	233	245	166	208
Sulfate (SO_4)	21	30	26	6.5
Chloride (Cl)	1.0	1.4	2.4	2.8
Fluoride (F)	.2	.2	.2	.2
Nitrate (NO_3)	2.9	6.6	4.5	.8
Dissolved solids	235	271	198	194
Hardness as $CaCO_3$:				
Total	211	233	169	178
Noncarbonate	20	32	33	7
Color	0	0	0	0
pH	8.3	8.0	8.0	8.2
Specific conductance (micromhos at 25 C.)	384	430	310	321
Turbidity	10	0	0.5	0
Temperature (F.)	65	63	65	61
Date of collection	Sept. 12, 1951	Sept. 12, 1951	Sept. 12, 1951	Sept. 12, 1951

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	150	196	44	8.2	8.4	8.0	230	244	218	55	68	32
Finished water	41	58	15	9.2	9.6	8.9	120	170	82	--	--	--

[a] Clear Creek and Preston Spring.

[b] Mumpower Springs.

CHARLOTTESVILLE
(Population, 25,969)

Ownership: Municipal; also supplies about 2,600 people outside the city limits. Total population supplied, about 28,600.

Source: Moormans River 90 percent of supply; Ragged Mt. reservoir 10 percent of supply.

Treatment: Prechlorination, coagulation with alum and lime, sedimentation, slow sand filtration, postchlorination, addition of sodium phosphate, and fluoridation with sodium silicofluoride. Copper sulfate for the control of algae.

Rated capacity of treatment plant: 3,500,000 gpd.

Raw-water storage: 1,000,000,000 gal.

Finished-water storage: 3,000,000 gal.

The filter plant is located in Charlottesville, on Reservoir Mt., western edge of town. Water is piped from Moormans River Dam to the filter plant. The pipeline passes Ragged Mt. Reservoir and excess water from Moormans River is diverted, and stored in the Ragged Mt. Reservoir which also receives water from Ragged Mt. watershed. Water from Ragged Mt. Reservoir is used to balance the water needs.

ANALYSES

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

	Ragged Mt. Reservoir (raw water)	Moormans River (raw water)	Moormans River (raw water)	Finished water
Silica (SiO_2)	7.8	10	8.3	7.8
Iron (Fe)	.02	.05	.28	.20
Manganese (Mn)	--	--	--	--
Calcium (Ca)	3.4	3.5	2.1	2.6
Magnesium (Mg)	1.1	1.5	1.0	.9
Sodium (Na)	3.1	1.8	2.9	3.0
Potassium (K)				
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	18	19	12	11
Sulfate (SO_4)	1.9	2.2	2.7	3.0
Chloride (Cl)	1.8	.5	1.9	3.0
Fluoride (F)	.1	.1	.1	[a]1.0
Nitrate (NO_3)	.1	.1	.1	.1
Dissolved solids	29	34	24	22
Hardness as $CaCO_3$:				
Total	13	15	9	10
Noncarbonate	0	0	0	1
Color	5	5	17	4
pH	6.4	6.5	7.2	6.9
Specific conductance (micromhos at 25 C.)	52.8	55.2	25.7	27.3
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Aug. 27, 1948	Aug. 27, 1948	Mar. 22, 1951	Mar. 22, 1951

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	18	4	6.3	6.3	6.2	8	10	6	18	20	10
Finished water	14	16	12	6.6	7.0	6.5	15	16	14	3	.5	1

[a] Average of several determinations, 1952.

COVINGTON
(Population, 5,860)

Ownership: Municipal; also supplies a suburban population of about 6,800. Total population supplied, about 12,700.
Source: Horse Mountain Spring 50 percent of supply; Jackson River 50 percent of supply.
Treatment: Water from Horse Mt. Spring: chlorination. Water from Jackson River: coagulation with alum, activated carbon, sedimentation, slow sand filtration, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 5,580,000 gal.

One section of the city is supplied with water from Horse Mt. Spring; another section with water from Jackson River; and the third section with mixed water from both sources.

ANALYSES

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

	Horse Mt. Spring (raw water)	Jackson River (raw water)	Finished water (city tap)
Silica (SiO_2)	7.4	4.8	8.8
Iron (Fe)	.01	.02	.01
Manganese (Mn)	--	--	--
Calcium (Ca)	19	40	19
Magnesium (Mg)	3.2	6.8	3.3
Sodium (Na)	.5	1.6	.6
Potassium (K)	.4	1.6	.4
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	72	112	70
Sulfate (SO_4)	2.8	36	3.1
Chloride (Cl)	1.0	1.8	1.8
Fluoride (F)	.1	.1	.0
Nitrate (NO_3)	.1	.2	.1
Dissolved solids	70	171	74
Hardness as $CaCO_3$:			
Total	61	128	61
Noncarbonate	2	36	4
Color	5	6	5
pH	7.7	7.7	7.5
Specific conductance (micromhos at 25 C.)	116	250	117
Turbidity	2.0	8.0	1.0
Temperature (F.)	55	73	69
Date of collection	Sept. 10, 1951	Sept. 10, 1951	Sept. 10, 1951

DANVILLE
(Population, 35,066)

Ownership: Municipal; also supplies suburban population of about 800. Total population supplied, about 35,900.
Source: Dan River.
Treatment: Coagulation with alum and lime, activated carbon, aeration (spray), chlorination, sedimentation, rapid sand filtration, postchlorination, ammoniation, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 3,000,000,000 gal.
Finished-water storage: 9,000,000 gal.

The treatment plant is on the north edge of the city near the cotton mills. The intake is in the reservoir about 100 yards above the impounding dam of the Riverside and Dan River Cotton Mills.

ANALYSES

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

	Raw water	Raw water	Finished water
Silica (SiO_2)	13	12	13
Iron (Fe)	.01	--	.02
Manganese (Mn)	--	--	--
Calcium (Ca)	4.0	--	11
Magnesium (Mg)	1.6	--	2.0
Sodium (Na)	4.5	2.7	4.2
Potassium (K)		1.3	1.4
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	23	31	37
Sulfate (SO_4)	4.0	3	8.6
Chloride (Cl)	2.0	2.1	5.2
Fluoride (F)	.1	.1	.1
Nitrate (NO_3)	.4	.6	.2
Dissolved solids	47	--	69
Hardness as $CaCO_3$:			
Total	17	23	36
Noncarbonate	0	0	5
Color	4	25	0
pH	7.0	7.3	7.7
Specific conductance (micromhos at 25 C.)	--	60.3	97.0
Turbidity	--	4.0	0.5
Temperature (F.)	--	75	73
Date of collection	July 21, 1947	Sept. 11, 1951	Sept. 11, 1951

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	22	30	12	7.0	7.3	6.6	--	--	--	1.2	4.0	.2
Finished water	30	40	21	8.7	9.4	8.3	--	--	--	.3	1.8	.1

FALLS CHURCH
(Population, 7,535)

Ownership: Distribution system, municipal. The city purchases its water from Arlington County. Supplies about 15,000 people in Fairfax County. Total population supplied, about 22,500.
Source: Potomac River. Finished water from Dalecarlia treatment plant, Washington, D. C. through Arlington County. Emergency supply: 2 wells (4, 6) 430 and 748 ft deep; yield reported to be 40 and 35 gpm respectively; two standby 6 in. connections to Arlington County distribution system in case of interruption of service in main line. (See Washington, D. C.)
Finished-water storage: 2 elevated tanks; 2 standpipes. Total, 2,000,000 gal.

FREDRICKSBURG
(Population, 12,158)

Ownership: Municipal; also supplies a suburban population of about 2,000. Total population supplied, about 14,200.
Source: Rappahannock River.
Treatment: Primary sedimentation with alum, breakpoint chlorination, coagulation with alum, sedimentation, rapid (anthrafilt) filtration, and adjustment of pH with soda ash.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 24,000,000 gal.
Finished-water storage: 3,500,000 gal.

Raw water is obtained from a canal that runs by the treatment plant. This canal, and the dam that partially impounds the Rappahannock River, is owned by the Va. Electric & Power Co. Water from the canal is run into the storage basin and from there is pumped to the treatment plant.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	7.8	8.2	Hardness as $CaCO_3$:		
Iron (Fe)	.12	.05	Total	20	20
Manganese (Mn)	--	--	Noncarbonate	0	0
Calcium (Ca)	5.0	5.1			
Magnesium (Mg)	1.8	1.7	Color	6	1
Sodium (Na)	3.4	17	pH	6.8	7.6
Potassium (K)	1.1	1.1	Specific conductance (micromhos at 25 C.)	56.9	116
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	27	53	Turbidity	25	1.0
Sulfate (SO_4)	2.4	7.7	Temperature (F.)	76	75
Chloride (Cl)	2.5	4.9	Date of collection	Sept. 13, 1951	Sept. 13, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.3	.1			
Dissolved solids	40	75			

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	25	28	12	7.0	7.3	6.4	--	--	--	64	300	15
Finished water	36	50	29	6.7	8.9	6.4	--	--	--	.7	1.5	.5

FRONT ROYAL
(Population, 8,115)

Ownership: Municipal.
Source: Happy Creek 50 percent of supply; Harmony Hollow Creek 50 percent of supply. Auxiliary or emergency supply, South Fork Shenandoah River.
Treatment: Copper sulfate around edge of raw water storage basin, coagulation with alum, activated carbon, sedimentation, rapid (anthrafilt) filtration, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 12,000,000 gal.
Finished-water storage: 750,000 gal.

Water from Happy Creek and Harmony Hollow Creek in about equal quantities is piped to and stored in a reservoir just above the filter plant, prior to any treatment. Water from South Fork Shenandoah River is used only when the supply from the two creeks is inadequate. It is then pumped from the river at a point 1.6 miles west of the treatment plant to the raw water reservoir. The treatment plant is on a hill 1 mile southeast of town. Distribution of the finished water is by gravity.

ANALYSES

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

	Happy Creek (raw water)	Raw water[a]	Raw water[b]	Finished water
Silica (SiO_2)	21	16	1.8	3.1
Iron (Fe)	.06	.08	.08	.06
Manganese (Mn)	--	--	--	--
Calcium (Ca)	10	6.6	32	23
Magnesium (Mg)	4.2	3.0	13	8.6
Sodium (Na)	4.9	3.6	5.8	5.0
Potassium (K)	.4	.7	1.3	.9
Carbonate (CO_3)	0	0	6.0	0
Bicarbonate (HCO_3)	56	39	143	108
Sulfate (SO_4)	1.8	1.9	14	11
Chloride (Cl)	3.2	2.0	6.0	5.2
Fluoride (F)	.1	.1	.0	.0
Nitrate (NO_3)	1.4	.6	.3	.3
Dissolved solids	78	58	160	114
Hardness as $CaCO_3$:				
Total	42	29	133	93
Noncarbonate	0	0	6	4
Color	10	9	13	7
pH	7.1	7.1	8.6	7.8
Specific conductance (micromhos at 25 C.)	104	71.4	267	202
Turbidity	15	40	5.0	1.0
Temperature (F.)	85	79	76	72
Date of collection	Sept. 12, 1951	Sept. 12, 1951	Sept. 12, 1951	Sept. 12, 1951

[a] Harmony Hollow Creek.
[b] South Fork Shenandoah River.

HARRISONBURG
(Population, 10,810)

Ownership: Municipal; also supplies about 1,000 people outside the city limits. Total population supplied, about 11,800.
Source: Riven Rock Spring (natural flow of Dry River and underflow of Dry River).
Treatment: Chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 21,000,000 gal.

The basin of Dry River is in the George Washington National Forest. The intake works are about 13 miles west of the city. The underflow in the valley of the river is trapped in a gallery by extending the intake dam underground across the valley floor for a distance of 900 ft to a rock cliff on one side of the valley. The underground dam rests on bedrock. Water from the intake works is conducted through a 14 in. pipeline to the chlorinating plant about $\frac{1}{4}$ mile below the intake dam. The chlorinated water is piped to the distribution system and concrete storage reservoirs in the city through two interconnected parallel pipe lines. The supply is by gravity throughout.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.3	6.0	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.05	Total	7	8
Manganese (Mn)	--	--	Noncarbonate	1	2
Calcium (Ca)	1.4	1.4			
Magnesium (Mg)	.9	1.0	Color	10	5
Sodium (Na)	1.0	1.0	pH	6.5	6.4
Potassium (K)	.6	.7	Specific conductance (micromhos at 25 C.)	23.6	25.0
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	8	7			
Sulfate (SO_4)	3.6	3.7	Turbidity	0	0
Chloride (Cl)	1.0	1.8	Temperature (F.)	61	61
Fluoride (F)	.0	.0	Date of collection	Sept. 12, 1951	Sept. 12, 1951
Nitrate (NO_3)	.1	.1			
Dissolved solids	18	18			

HOPEWELL
(Population, 10,219)

Ownership: Old Dominion Water Corp; also supplies about 5,000 people outside the city limits, and the population in Camp Lee, Prison Camp, and Bland sanitary Dist. Total known population supplied, about 15,200.
Source: Appomattox River.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 30,000,000 gpd.
Raw-water storage: --
Finished-water storage: 3,000,000,000 gal.

HOPEWELL--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.5	5.7	Hardness as $CaCO_3$:		
Iron (Fe)	.23	.05	Total	56	65
Manganese (Mn)	--	--	Noncarbonate	17	29
Calcium (Ca)	16	20			
Magnesium (Mg)	4.0	3.7	Color	25	3
Sodium (Na)	21	17	pH	7.1	7.4
Potassium (K)	1.8	1.8	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	213	217
Bicarbonate (HCO_3)	48	44	Turbidity	25	1.0
Sulfate (SO_4)	47	52	Temperature (F.)	--	--
Chloride (Cl)	8.6	9.4	Date of collection	Sept. 7, 1951	Sept. 7, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.5	1.1			
Dissolved solids	138	140			

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	--	35	18	--	--	--	--	--	--	--	350	30
Finished water	--	35	24	--	7.4	7.0	--	60	30	--	--	--

LYNCHBURG
(Population, 47,727)

Ownership: Municipal; also supplies a population of about 7,000 people outside the city limits, including Madison Heights Sanitary District in Amherst County. Total population supplied, about 55,000.

Source: Pedlar River impounded in Pedlar Lake about 23 miles northwest of the city. Auxiliary or emergency supply, James River.

Treatment: Coagulation with alum, sedimentation, sand filtration, chlorination, and fluoridation.

Rated capacity of treatment plant: 8,000,000 gpd.

Raw-water storage: 600,000,000 gal.

Finished-water storage: 9,000,000 gal.

Water from Pedlar Lake flows by gravity through a 36 in. cast iron pipe to the treatment plant in the southwest section of the city. Finished water is stored in College Hill reservoir, Clay Street reservoir, and Fort Hill standpipe. Distribution is by gravity flow.

LYNCHBURG--Continued

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	13	13	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.05	Total	14	15
Manganese (Mn)	--	--	Noncarbonate	0	2
Calcium (Ca)	3.1	2.9			
Magnesium (Mg)	1.5	1.9	Color	6	3
Sodium (Na)	2.2	3.2	pH	7.0	7.4
Potassium (K)	.8	.8	Specific conductance (micromhos at 25 C.)	36.7	43.4
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	19	16	Turbidity	7.0	0
Sulfate (SO_4)	1.4	5.2	Temperature (F.)	66	66
Chloride (Cl)	1.2	1.8	Date of collection	Sept. 11, 1951	Sept. 11, 1951
Fluoride (F)	.1	.6			
Nitrate (NO_3)	.6	.3			
Dissolved solids	36	39			

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	14	9	6.5	6.9	6.2	--	--	--	9	32	5
Finished water	9	10	8	6.3	6.6	6.0	--	--	--	0	0	0

MARION

(Population, 6,982)

Ownership: Municipal; also supplies about 600 people outside the city limits. Total population supplied, about 7,600.

Source: Springs.

Treatment: Chlorination.

Rated capacity of treatment plant: 1,500,000 gpd.

Raw-water storage: None.

Finished-water storage: 75,000 gal. Emergency use only (Hospital), 500,000 gal.

The chlorinating plant is a few miles east of the city. Four springs empty into an underground channel that surfaces under the chlorinating plant.

ANALYSES

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

	Raw water	Finished water (city tap)		Raw water	Finished water (city tap)
Silica (SiO_2)	9.4	8.8	Hardness as $CaCO_3$:		
Iron (Fe)	.01	.05	Total	64	64
Manganese (Mn)	--	--	Noncarbonate	0	0
Calcium (Ca)	13	13			
Magnesium (Mg)	7.6	7.6	Color	1	1
Sodium (Na)	.6	.7	pH	7.9	7.8
Potassium (K)	.4	1.3	Specific conductance (micromhos at 25 C.)	117	123
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	78	80	Turbidity	0	0
Sulfate (SO_4)	2.8	1.1	Temperature (F.)	54	62
Chloride (Cl)	.4	1.1	Date of collection	Oct. 20, 1951	Sept. 12, 1951
Fluoride (F)	.1	.0			
Nitrate (NO_3)	.2	.1			
Dissolved solids	67	67			

MARTINSVILLE
(Population, 17,251)

Ownership: Municipal; also supplies about 1,000 people in suburban areas. Total population supplied, about 18,300.
Source: Beaver Creek 60 percent of supply; Jones Creek 40 percent of supply.
Treatment: Prechlorination, coagulation with lime and alum, activated carbon, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: 500,000 gal.
Finished-water storage: 2,000,000 gal.

ANALYSES

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

	Beaver Creek (raw water)	Jones Creek (raw water)	Finished water
Silica (SiO_2)	20	19	18
Iron (Fe)	.82	.46	.13
Manganese (Mn)	--	--	--
Calcium (Ca)	5.5	6.0	12
Magnesium (Mg)	2.5	1.7	2.5
Sodium (Na)	3.5	3.2	3.5
Potassium (K)	1.3	1.0	1.1
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	34	28	42
Sulfate (SO_4)	1.4	3.5	9.7
Chloride (Cl)	2.9	1.4	3.0
Fluoride (F)	.2	.1	.1
Nitrate (NO_3)	.3	.3	.1
Dissolved solids	66	55	76
Hardness as $CaCO_3$:			
Total	24	22	40
Noncarbonate	0	0	6
Color	35	30	0
pH	6.9	7.3	8.2
Specific conductance (micromhos at 25 C.)	65.7	49.8	98.4
Turbidity	5.0	15	0.5
Temperature (F.)	65	64	68
Date of collection	Sept. 11, 1951	Sept. 11, 1951	Sept. 11, 1951

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	29	11	6.9	7.1	6.6	--	--	--	70	2000	20
Finished water	19	27	11	6.7	6.9	6.0	--	--	--	0.5	0.5	0.5

NEWPORT NEWS
(Population, 42,358)

Ownership: Municipal; also supplies Hampton, Hilton, Phoebus, and other communities in Elizabeth City, Warwick and York Counties. Total population supplied, about 150,000.
Source: Chickahominy River 42 percent of supply; Lee Hall and Harwood Mill reservoirs 58 percent of supply. Skiffs Creek can be used in emergencies.
Treatment: Prechlorination, aeration, coagulation with alum, addition of carbon, chlorination, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.
Rated capacity of treatment plants: 2 Lee Hall Reservoir plants: 8,000,000 gpd, and 6,000,000 mgd. Harwood Mill Reservoir plant: 6,000,000 mgd.
Raw-water storage: 1,754,000,000 gal.
Finished-water storage: Lee Hall underground reservoir, 3,500,000 gal; concrete reservoir (in Newport News), 3,500,000 gal; 2 elevated tanks, 1,000,000 and 100,000 gal.

Lee Hall and Harwood Mill reservoirs store the headwaters of Warwick and Poquoson rivers, respectively. Water from the Chickahominy River is discharged from a 32 mile 18 in. pipeline into Harwood Mill reservoir. Combined waters from the Harwood Mill Reservoir are discharged into the Lee Hall Reservoir.

ANALYSES

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

	Raw water [a]	Raw water [b]	Lee Hall Reservoir (raw water)	Finished water [c]
Silica (SiO_2)	2.1	6.1	12	4.7
Iron (Fe)	--	--	.04	.02
Manganese (Mn)	--	--	--	--
Calcium (Ca)	--	--	33	25
Magnesium (Mg)	--	--	1.3	1.4
Sodium (Na)	3.8	3.7	4.7	4.3
Potassium (K)	1.1	1.1	.9	1.0
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	21	54	104	59
Sulfate (SO_4)	11	6	2.1	15
Chloride (Cl)	4.6	5.4	8.0	12
Fluoride (F)	.2	.2	.1	.1
Nitrate (NO_3)	.8	.6	1.3	.1
Dissolved solids	--	--	129	110
Hardness as $CaCO_3$:				
Total	23	53	88	68
Noncarbonate	6	9	2	20
Color	15	10	10	5
pH	6.9	7.1	7.2	7.5
Specific conductance (micromhos at 25 C.)	66.9	173	191	164
Turbidity	3.0	2.5	2.5	0.5
Temperature (F.)	74	77	78	78
Date of collection	Sept. 5, 1951	Sept. 5, 1951	Sept. 4, 1951	Sept. 4, 1951

[a] Chickahominy River.
[b] Harwood Mill Reservoir.
[c] Supply System.

NEWPORT NEWS--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.....	57	63	52	7.6	7.7	7.5	--	--	--	2.2	2.3	2.0
Finished water...	53	59	49	8.0	8.0	7.9	93	113	73	.5	.5	.5

NORFOLK
(Population, 213,513)

Ownership: Municipal; also supplies Portlock, South Norfolk, Virginia Beach, other communities, suburban areas, and an unknown number of Army and Navy personnel. Total population supplied, about 300,000.

Source: Two systems of impounding reservoirs (lakes): Lake Smith system comprised of a chain of reservoirs known as Lake Wright, Lake Taylor, Little Creek, Lake Lawson, Lake Smith and North Landing Lake about 5 miles northeast of the city, and for the most part in Princess Anne County; and Lake Prince system comprised of Lake Prince on Exchange Creek and Lake Burnt Mills, a subsidiary reservoir, in Nansemond County about 18 miles from the city. Auxiliary or emergency supply, Nottoway and Blackwater Rivers.

Treatment: (Both plants) prechlorination, coagulation with alum and lime, addition of activated carbon, bleaching clay when needed, sedimentation, rapid sand filtration, postchlorination, and adjustment of pH with lime.

Rated capacity of treatment plants: Moores Bridges plant, 24,000,000 gpd; 37th Street plant, 24,000,000 gpd.

Raw-water storage: 9,700,000,000 gal.

Finished-water storage: 20,000,000 gal.

Water from the Lake Smith supply system is treated at the Moores Bridges treatment plant located at the southern end of Lake Wright. Water from Lake Prince and Lake Burnt Mills is conducted in two parallel mains, interconnected at intervals, to the 37th Street treatment plant in Norfolk, where it is treated. The two parallel mains are also connected by a 48 in. concrete main to the Moores Bridges treatment plant, so that with this arrangement each of the three mains can deliver water to either plant.

NORFOLK--Continued

ANALYSES

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

	Raw water [a]	Raw water [b]	Raw water [c]	Raw water [d]	Raw water [e]
Silica (SiO_2)	6.0	4.4	4.5	1.5	3.7
Iron (Fe)	--	.02	--	--	.04
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	--	13	--	--	11
Magnesium (Mg)	--	5.3	--	--	1.4
Sodium (Na)	10	18	3.9	3.2	4.1
Potassium (K)	1.8	2.6	1.3	1.2	1.3
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	41	54	40	13	35
Sulfate (SO_4)	26	15	4.0	6.0	4.7
Chloride (Cl)	13	25	6.5	6.9	6.4
Fluoride (F)	.1	.2	.1	.0	.2
Nitrate (NO_3)	3.2	2.5	.6	.4	.8
Dissolved solids	--	129	--	--	60
Hardness as $CaCO_3$:					
Total	49	54	38	16	33
Noncarbonate	15	10	5	5	4
Color	40	7	10	8	8
pH	7.1	6.8	7.4	7.0	6.7
Specific conductance (micromhos at 25 C.)	143	208	96.0	52.5	91.0
Turbidity	--	15	--	--	5.0
Temperature (F.)	--	--	--	--	--
Date of collection	Sept. 6, 1951	Sept. 5, 1951	Sept. 6, 1951	Sept. 6, 1951	Sept. 5, 1951

	Finished water [f]	Finished water [g]
Silica (SiO_2)	3.7	3.9
Iron (Fe)	.03	.02
Manganese (Mn)	--	--
Calcium (Ca)	26	26
Magnesium (Mg)	2.6	1.6
Sodium (Na)	7.7	4.1
Potassium (K)	1.7	1.2
Carbonate (CO_3)	0	0
Bicarbonate (HCO_3)	49	54
Sulfate (SO_4)	22	19
Chloride (Cl)	23	14
Fluoride (F)	.1	.1
Nitrate (NO_3)	.1	.2
Dissolved solids	134	111
Hardness as $CaCO_3$:		
Total	76	71
Noncarbonate	35	27
Color	5	3
pH	7.7	8.1
Specific conductance (micromhos at 25 C.)	205	169
Turbidity	0.5	0.5
Temperature (F.)	72	70
Date of collection	Sept. 5, 1951	Sept. 5, 1951

[a] North Landing Lake.
[b] Smith Lake System.
[c] Lake Prince.
[d] Lake Burnt Mills.
[e] Lake Prince and Lake Burnt Mills.
[f] From Moores Bridges treatment plant.
[g] From 37th Street treatment plant.

NORFOLK--Continued

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 [a]	33	38	22	7.4	8.2	7.1	--	--	--	15	30	11
Finished water [a]	37	44	29	8.0	8.4	6.9	78	94	66	.73	.98	.43
Raw water [b]	27	39	18	6.8	7.2	6.6	33	46	20	6.2	7.9	4.7
Finished water [b]	35	54	25	8.3	8.5	8.2	61	90	46	.5	1.0	.4

[a] Moores Bridges Plant.
[b] 37th Street Plant.

PETERSBURG
(Population, 35,054)

Ownership: Municipal; also supplies suburban areas, other communities, and Fort Lee part of the time. Total population supplied, about 70,000.

Source: Appomattox River (through power canal owned by the Va. Electric & Power Co). Emergency supply, Wilcox Lake (Lieutenant Run impounded).

Treatment: Plain sedimentation, prechlorination, coagulation with alum and lime, sedimentation, addition of carbon, rapid sand filtration, postchlorination, and adjustment of pH with lime.

Rated capacity of treatment plant: 8,000,000 gpd.

Raw-water storage: 5,000,000 gal.

Finished-water storage: 3,240,000 gal.

The intake on the power canal is about 3 miles from the treatment plant, located within the city limits. Under normal operating conditions the flow of the water from the canal to the treatment plant is by gravity, but when the consumption exceeds a specified volume pumping becomes necessary. The city has prior right to 10,000,000 gpd.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	19	15	Hardness as $CaCO_3$:		
Iron (Fe)	.25	.05	Total	22	46
Manganese (Mn)	.00	.00	Noncarbonate	0	17
Calcium (Ca)	4.9	14			
Magnesium (Mg)	2.4	2.6	Color	6	5
Sodium (Na)	3.7	3.2	pH	7.0	8.0
Potassium (K)	1.7	1.6	Specific conductance (micromhos at 25 C.)	62.7	115
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	27	35			
Sulfate (SO_4)	4.2	19	Turbidity	5.0	1.0
Chloride (Cl)	3.1	5.5	Temperature (F.)	--	--
Fluoride (F)	.1	.1	Date of collection	Sept. 7, 1951	Sept. 7, 1951
Nitrate (NO_3)	.2	.1			
Dissolved solids	66	85			

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	33	23	7.1	7.3	7.1	--	--	--	28	35	6
Finished water	27	37	26	8.8	9.0	8.7	44	48	42	2	3	1

PORTSMOUTH
(Population, 80,039)

Ownership: Municipal; also supplies a population of about 50,000 in Norfolk Co., and 20,000 in the city of Suffolk and Nansemond Co. Total population supplied, about 150,000.
Source: Lake Kilby 66 percent of supply; Lake Cahoon 34 percent of supply. Emergency supply, Nottoway River.
Treatment: Prechlorination, coagulation with lime and alum, sedimentation, activated carbon, rapid sand filtration, and addition of polyphosphate (Calgon) for corrosion control.
Rated capacity of treatment plant: 20,000,000 gpd.
Raw-water storage: 2,450,000,000 gal.
Finished-water storage: 11,000,000 gal.

Lake Kilby is located just west of the corporate limits of Suffolk; Lake Cahoon is about 2 miles north of Lake Kilby in Nansemond County. Water is piped from Lake Cahoon to the treatment plant at the eastern end of Lake Kilby where the water from both sources is treated.

ANALYSES

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

	Lake Kilby (raw water)	Lake Cahoon (raw water)	Finished water
Silica (SiO_2)	4.0	3.7	3.4
Iron (Fe)	.14	.04	.03
Manganese (Mn)	--	--	--
Calcium (Ca)	5.9	5.2	14
Magnesium (Mg)	1.7	1.7	1.4
Sodium (Na)	6.1	4.7	5.3
Potassium (K)	1.2	1.0	1.1
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	17	18	22
Sulfate (SO_4)	7.0	5.2	15
Chloride (Cl)	10	7.5	14
Fluoride (F)	.3	.3	.0
Nitrate (NO_3)	.7	.4	.1
Dissolved solids	60	49	80
Hardness as $CaCO_3$:			
Total	22	20	41
Noncarbonate	8	5	23
Color	33	15	3
pH	6.3	6.7	7.1
Specific conductance (micromhos at 25 C.)	77.7	64.5	118
Turbidity	10	15	1.0
Temperature (F.)	69	71	71
Date of collection	Sept. 6, 1951	Sept. 6, 1951	Sept. 6, 1951

Regular determinations at treatment plant, 1949

	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	6	6.1	6.4	6.0	--	--	--	9	29	3
Finished water	16	24	10	7.1	8.4	6.5	28	32	25	0	0	0

PULASKI
(Population, 9,202)

Ownership: Municipal; also supplies about 1,000 people outside the city limits. Total population supplied, about 10,200.
Source: Lake (impounded mountain stream) 97 percent of supply; Wardens Spring 3 percent of supply.
Treatment: Filtration and chlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: 304,000,000 gal.
Finished-water storage: 1,500,000 gal.

The Lake is about 5 miles west of town; Wardens Spring is about 1½ miles east of town.

ANALYSES

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

	Lake (raw water)	Finished water (city tap)		Lake (raw water)	Finished water (city tap)
Silica (SiO_2)	4.8	5.8	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.27	Total	15	16
Manganese (Mn)	--	--	Noncarbonate	3	4
Calcium (Ca)	3.3	3.4			
Magnesium (Mg)	1.6	1.8	Color	2	18
Sodium (Na)	1.3	1.4	pH	6.9	6.8
Potassium (K)	.9	.7	Specific conductance (micromhos at 25 C.)	39.4	37.5
Carbonate (CO_3)	0	0	Turbidity	10	1.0
Bicarbonate (HCO_3)	15	15	Temperature (F.)	68	65
Sulfate (SO_4)	4.2	3.9	Date of collection	Sept. 12, 1951	Sept. 12, 1951
Chloride (Cl)	1.5	2.5			
Fluoride (F)	.0	.0			
Nitrate (NO_3)	1.3	.1			
Dissolved solids	30	30			

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	8	9	7	6.3	6.7	6.3	12	12	11	2	2	1
Finished water	15	15	15	8.6	8.8	8.6	22	22	22	0	0	0

RADFORD
(Population, 9,026)

Ownership: Municipal; also supplies about 500 people outside the city limits. Total population supplied, about 9,500.
Source: New River.
Treatment: Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, and adjustment of pH with lime.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,600,000 gal.

The treatment plant is at the south edge of Radford, east of the river.

ANALYSES

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

	Raw water [a]	Finished water		Raw water [a]	Finished water
Silica (SiO_2)	9.8	7.7	Hardness as $CaCO_3$:		
Iron (Fe)	.13	.05	Total	37	49
Manganese (Mn)	--	--	Noncarbonate	3	12
Calcium (Ca)	8.9	12			
Magnesium (Mg)	3.6	4.6	Color	8	0
Sodium (Na)	2.4	2.0	pH	7.3	7.6
Potassium (K)		1.3	Specific conductance (micromhos at 25 C.)	81.0	109
Carbonate (CO_3)	0	0	Turbidity	--	0.5
Bicarbonate (HCO_3)	41	45	Temperature (F.)	--	--
Sulfate (SO_4)	5.0	11	Date of collection	Sept. 11-20, 1950	Sept. 12, 1951
Chloride (Cl)	1.4	2.8			
Fluoride (F)	.2	.2			
Nitrate (NO_3)	1.2	.7			
Dissolved solids	55	74			

[a] Composite of 10 daily samples from the New River at Radford from Sept. 11 through 20, 1950.

RICHMOND
(Population, 230,310)

Ownership: Municipal; also supplies a population of about 20,000 outside the city limits. Total population supplied, about 250,000.
Source: James River. Gravity flow.
Treatment: Prechlorination, coagulation with alum (in summer) or ferrous sulfate (in winter), sedimentation, activated carbon, rapid sand filtration, post-chlorination, ammoniation, adjustment of pH with lime, and addition of copper sulfate.
Rated capacity of treatment plant: 66,000,000 gpd.
Raw-water storage: 170,000,000 gal.
Finished-water storage: 58,000,000 gal.

The treatment plant is on Douglasdale Road on the southwest edge of the city.

RICHMOND--Continued

ANALYSES

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

	James River at Richmond				Finished water
	Raw water [a]	Raw water [b]	Raw Average [c]	Raw water [d]	
Silica (SiO_2)	7.1	10	10	7.5	8.5
Iron (Fe)	.10	.06	.17	.03	.02
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	20	10	15	21	23
Magnesium (Mg)	4.9	2.7	3.8	5.1	4.6
Sodium (Na)	9.2	4.4	5.7	12	9.9
Potassium (K)				1.8	1.6
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	56	36	49	58	36
Sulfate (SO_4)	30	11	18	37	48
Chloride (Cl)	8.4	2.5	4.6	10	14
Fluoride (F)	.1	.1	.1	.1	.1
Nitrate (NO_3)	.8	1.1	.6	.6	.1
Dissolved solids	127	63	87	133	137
Hardness as $CaCO_3$:					
Total	70	36	54	73	76
Noncarbonate	24	7	14	26	47
Color	15	23	--	20	3
pH	7.1	7.5	--	7.2	8.1
Specific conductance (micromhos at 25 C.)	189	93.0	132	202	215
Turbidity	--	--	--	--	0.5
Temperature (F.)	--	--	--	Avg. 73	77
Date of collection	Sept. 1-10, 1950	May 21-31, 1950	1950	Sept. 1-30, 1951	Sept. 3, 1951

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	39	60	15	7.5	8.2	6.7	--	--	--	30	250	5
Finished water	30	48	12	8.8	9.3	8.4	65	80	50	.1	.2	.1

[a] Analysis of 10-day composite of daily samples with the maximum dissolved solids for the water year 1950.

[b] Analysis of 11-day composite of daily samples with the minimum dissolved solids for the water year 1950.

[c] Average of analyses of 10-day composites of daily samples for the water year 1950.

[d] Analysis of monthly composite of daily samples.

ROANOKE
(Population, 91,921)

Ownership: Municipal; also supplies about 300 people outside the city limits. Total population supplied, about 92,200.

Source: Impounding reservoirs (Carvin's Cove 40 percent, Beaver Creek and Falling Creek 15 percent), 55 percent of supply; Crystal Springs, 45 percent of supply.

Treatment: Carvin's Cove plant: Coagulation with ferric sulfate, aeration, lime, sedimentation, rapid sand filtration, chlorination, and ammoniation. Falling Creek plant: coagulation with alum, sedimentation, pressure filtration, addition of lime and polyphosphate (Calgon). Crystal Springs water: chlorination.

Rated capacity of treatment plant: Carvin's Cove plant, 6,000,000 gpd; Falling Creek plant, 1,500,000 gpd.

Raw-water storage: Carvin's Cove reservoir, 6,470,000,000 gal; Beaver Creek and Falling Creek reservoirs, 550,000,000 gal.

Finished-water storage: Carvin's Cove clear wells, 2,000,000 gal; Mill Mt. reservoir, 2,000,000 gal; City Farm reservoir, 2,000,000 gal; Carroll Avenue standpipe, 2,000,000 gal; smaller elevated tanks and reservoirs, 3,000,000 gal.

Crystal Springs is within the city limits on the western slope of Mill Mountain, about $1\frac{1}{2}$ miles from the center of the city. Carvin's Cove Reservoir is about 8 miles north of the city; Beaver Creek and Falling Creek reservoirs are about 7 miles northeast of the city.

Carvin's Cove treatment plant is about 3,000 ft south of the impounding dam and the water flows to the treatment plant by gravity. Falling Creek treatment plant which treats water from both Beaver Creek and Falling Creek reservoirs is a short distance below Falling Creek dam.

The four principal finished-water storage reservoirs are strategically located in four sections of the city to aid in correcting unequal pressures due to over 200 ft differences in elevations in different sections of the city. Finished water from Carvin's Cove plant is conducted to both Mill Mt. reservoir which floats on the system and to other storage reservoirs in the city. Finished water from Falling Creek plant is served principally in the southeastern part of the city.

ROANOKE--Continued

ANALYSES

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

	Crystal Springs (raw water)	Carvin's Cove and Falling Cr. (raw water)	Finished water (composite)
Silica (SiO_2)	11	5.4	10
Iron (Fe)	.02	.04	.04
Manganese (Mn)	--	--	--
Calcium (Ca)	27	3.7	15
Magnesium (Mg)	15	1.9	7.6
Sodium (Na)	1.2	1.0	1.9
Potassium (K)	.5	.5	.4
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	151	18	82
Sulfate (SO_4)	2.5	3.0	3.0
Chloride (Cl)	1.0	1.5	2.2
Fluoride (F)	.0	.1	.1
Nitrate (NO_3)	1.3	.8	.6
Dissolved solids	127	28	86
Hardness as $CaCO_3$:			
Total	129	17	69
Noncarbonate	5	2	2
Color	1	3	2
pH	7.7	6.9	7.7
Specific conductance (micromhos at 25 C.)	228	39.4	139
Turbidity	--	--	--
Temperature (F.)	62	57	--
Date of collection	Sept. 13, 1951	Sept. 13, 1951	Sept. 13, 1951

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[a]	130	133	125	7.5	7.6	7.4	133	137	128	.3	.4	.2
Finished water[a]	130	133	125	7.5	7.6	7.4	133	137	128	.3	.4	.2
Raw water[b]	16	18	10	6.3	6.7	5.9	15	20	13	2.2	6.0	1.0
Finished water[b]	12	15	9	9.5	9.6	9.1	42	45	35	.2	.5	.1
Raw water[c]	14	16	13	7.2	7.3	7.1	17	18	16	2.2	6.0	1.0
Finished water[c]	14	17	13	7.0	7.1	6.9	18	20	17	.7	1.2	.6

[a] Crystal Springs.
[b] Carvin's Cove.
[c] Falling Creek.

SALEM
(Population, 6,823)

Ownership: Municipal; also supplies South Salem. Total population supplied, about 7,800.
Source: Roanoke River 91 percent of supply; City well 784 ft deep, 5.7 percent of supply; South Salem spring 3.3 percent of supply. Emergency supply, small lake (spring-fed) near treatment plant.
Treatment: Roanoke River water: Prechlorination, coagulation with alum, carbon, sedimentation, rapid sand filtration, postchlorination, and addition of phosphate. City well water: Chlorination and addition of phosphate. South Salem spring water: Chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 500,000 gal.

The city of Salem, north of the Roanoke River, is supplied by water from the Roanoke River and the City well in one system. South Salem, that section on the south side of the Roanoke River, is supplied by water from a spring in a separate system. The City well is on the treatment plant grounds. Water from the river is pumped to the treatment plant on West Main St. on the western edge of the city.

ANALYSES

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

	Roanoke River (raw water)	City well (raw water)	Finished water (city tap)	Finished water [a]
Silica (SiO_2)	5.5	8.0	6.5	15
Iron (Fe)	.02	.02	.02	.02
Manganese (Mn)	--	--	--	--
Calcium (Ca)	42	31	40	26
Magnesium (Mg)	22	13	21	15
Sodium (Na)	2.4	1.6	2.7	1.3
Potassium (K)	.6	.3	.6	.8
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	201	138	75	147
Sulfate (SO_4)	20	12	30	4.5
Chloride (Cl)	3.4	2.0	4.6	1.2
Fluoride (F)	.1	.1	.1	.1
Nitrate (NO_3)	1.0	2.5	1.0	.3
Dissolved solids	209	138	200	131
Hardness as $CaCO_3$:				
Total	195	131	186	127
Noncarbonate	31	18	43	6
Color	4	1	2	2
pH	8.2	7.9	7.9	8.1
Specific conductance (micromhos at 25 C.)	347	235	329	222
Turbidity	10	0	1.0	0
Temperature (F.)	--	63	--	62
Date of collection	Sept. 13, 1951	Sept. 13, 1951	Sept. 18, 1951	Sept. 13, 1951

[a] South Salem.

SALEM--Continued

Regular determinations at treatment plant, July, 1950--July, 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	121	162	59	8.0	8.4	7.3	136	180	46	27	1600	1.0
Finished water	106	166	33	7.5	7.9	6.8	129	176	78	1.6	4.0	.2

SOUTH BOSTON
(Population, 6,057)

Ownership: Municipal.
Source: Dan River.
Treatment: Prechlorination, coagulation with soda ash and alum, sedimentation, rapid sand filtration, postchlorination, and addition of lime for corrosion control.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,000,000 gal.

ANALYSES

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

	Raw water[a]	Finished water		Raw water[a]	Finished water
Silica (SiO_2)	12	7.3	Hardness as $CaCO_3$:		
Iron (Fe)	.07	.01	Total	26	53
Manganese (Mn)	--	--	Noncarbonate	0	3
Calcium (Ca)	6.3	16			
Magnesium (Mg)	2.4	3.3	Color	9	0
Sodium (Na)	15	20	pH	7.2	7.9
Potassium (K)	1.5	1.8	Specific conductance (micromhos at 25 C.)	119	196
Carbonate (CO_3)	0	0	Turbidity	--	0.5
Bicarbonate (HCO_3)	52	62	Temperature (F.)	--	78
Sulfate (SO_4)	5.3	39	Date of collection	Sept. 11-20, 1951	Sept. 11, 1951
Chloride (Cl)	6.9	4.8			
Fluoride (F)	.2	.1			
Nitrate (NO_3)	.8	.1			
Dissolved solids	77	123			

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	33	26	6.9	7.0	6.7	--	--	--	140	422	29
Finished water	56	61	51	8.6	8.7	8.0	--	--	--	--	--	--

[a] Composite of daily samples taken from the Dan River Sept. 11 through 20, 1951.

SOUTH NORFOLK
(Population, 10,434)

Ownership: Supplied by Norfolk. (See Norfolk.)

STAUNTON
(Population, 19,927)

Ownership: Municipal; also supplies about 300 people outside the city limits. Total population supplied, about 20,200.
Source: North River impounded. Auxiliary or emergency supply, Gardner's Spring about 3 miles west of the city.
Treatment: Prechlorination and addition of lime at N. River intake; coagulation with alum and silica (silicate + sulfuric acid), lime, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw-water storage: 125,000,000 gal.
Finished-water storage: 7,000,000 gal.

The North River is impounded near Stokesville, about 35 miles northwest of Staunton. The water from the reservoir flows through a cast-iron pipe to the treatment plant, on Two-mile Hill about 2 miles west of the city. Finished water flows into the distribution system and to storage in the city.

ANALYSES

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

	Gardner's Spring (raw water)	North River (raw water)	Finished water
Silica (SiO_2)	--	4.1	5.4
Iron (Fe)	--	.04	.02
Manganese (Mn)	--	--	--
Calcium (Ca)	--	1.6	10
Magnesium (Mg)	--	.9	.9
Sodium (Na)	--	.8	1.7
Potassium (K)	--	.6	.7
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	294	8.0	25
Sulfate (SO_4)	4	2.8	12
Chloride (Cl)	--	.8	1.2
Fluoride (F)	--	.0	.0
Nitrate (NO_3)	2.8	.2	.1
Dissolved solids	--	20	52
Hardness as $CaCO_3$:			
Total	270	8	29
Noncarbonate	29	1	8
Color	--	7	3
pH	7.4	6.5	7.4
Specific conductance (micromhos at 25 C.)	428	21.1	71.3
Turbidity	--	4	0.5
Temperature (F.)	65	72	69
Date of collection	Sept. 11, 1951	Sept. 11, 1951	Sept. 11, 1951

STAUNTON--Continued

Regular determinations at treatment plant, Feb. to July, 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	14	28	0	7.8	8.2	7.4	16	20	10	3.2	6.9	1.1
Finished water	22	28	10	8.4	9.0	7.6	28	32	22	.6	1.1	.2

SUFFOLK
(Population, 12,339)

Ownership: Supplied by Portsmouth. (See Portsmouth.)

WAYNESBORO
(Population, 12,357)

Ownership: Municipal; also supplies a small number of people outside the city limits. Total population supplied, about 12,400.
Source: Coyners Spring about 3 miles west of the city.
Treatment: Chlorination at the spring.
Rated capacity of treatment plant: 3,600,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,000,000 gal.

The chlorinated water is pumped from the pump house adjacent to the spring basin to a 2,000,000 gal underground concrete reservoir, about 3/4 mile southwest of the city, from which distribution to the city mains is by gravity.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	10	10	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.04	Total	86	86
Manganese (Mn)	--	--	Noncarbonate	8	8
Calcium (Ca)	19	19			
Magnesium (Mg)	9.5	9.5	Color	5	2
Sodium (Na)	.7	.7	pH	7.6	7.6
Potassium (K)	1.2	1.2	Specific conductance (micromhos at 25 C.)	170	170
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	96	96			
Sulfate (SO_4)	9.5	9.4	Turbidity	0	0
Chloride (Cl)	.6	1.0	Temperature (F.)	57	57
Fluoride (F)	.1	.1	Date of collection	Sept.11, 1951	Sept.11, 1951
Nitrate (NO_3)	.7	.9			
Dissolved solids	96	96			

WILLIAMSBURG
(Population, 6,735)

Ownership: Municipal; also supplies a population of about 600 people outside the city limits. Total population supplied, about 7,300.
Source: Waller Pond (impounded supply). Emergency supply (formerly used as regular supply) 2 wells 442 ft deep (William and Mary College well) and 417 ft deep (Eastern State Hospital well).
Treatment: Prechlorination, softening with lime, coagulation with ferrous sulfate, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 1,500,000 gpd.
Raw-water storage: 2,650,000,000 gal.
Finished-water storage: 7,500,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	5.5	4.7	Hardness as $CaCO_3$:		
Iron (Fe)	.02	.40	Total	73	40
Manganese (Mn)	--	--	Noncarbonate	1	9
Calcium (Ca)	27	14			
Magnesium (Mg)	1.3	1.2	Color	6	1.0
Sodium (Na)	3.4	3.4	pH	7.6	7.3
Potassium (K)	.6	.7	Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	155	95.1
Bicarbonate (HCO_3)	88	38	Turbidity	1.0	0.5
Sulfate (SO_4)	2.0	3.6	Temperature (F.)	82	84
Chloride (Cl)	5.0	8.8	Date of collection	Sept. 4, 1951	Sept. 4, 1951
Fluoride (F)	.0	.1			
Nitrate (NO_3)	.2	.1			
Dissolved solids	94	65			

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	97	--	--	8.0	8.2	7.8	87	--	--	.33	.88	0
Finished water	48	--	--	8.9	8.9	8.9	40	--	--	.01	.5	0

WINCHESTER
(Population, 13,841)

Ownership: Municipal; also supplies about 3,000 people outside the city limits. Total population supplied, about 15,800.

Source: Four limestone springs: Shawnee, Rouss, Fay's, and Old Town. Shawnee Spring is in the southeast part of the city; Rouss Spring, the main source of supply, about 1 mile southeast of the center of the city; Fay's Spring, 3 miles northeast of the city; and Old Town Spring, at the northwest side of the city.

Treatment: Superchlorination and dechlorination. Shawnee Spring water: coagulation with alum, sedimentation, rapid sand filtration, and chlorination.

Rated capacity of treatment plant: (Shawnee Spring plant only) 1,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 3,200,00 gal.

Finished water from the spring basins is pumped into the distribution system and to storage.

ANALYSES

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

	Shawnee Spring (raw water)	Rouss Spring (raw water)	Fay's Spring (raw water)	Old Town Spring (raw water)	Finished water (city hall tap)
Silica (SiO_2)	--	--	--	--	11
Iron (Fe)	--	--	--	--	.04
Manganese (Mn)	--	--	--	--	--
Calcium (Ca)	--	--	--	--	87
Magnesium (Mg)	--	--	--	--	19
Sodium (Na)	--	--	--	--	3.4
Potassium (K)	--	--	--	--	1.9
Carbonate (CO_3)	0	0	0	0	6
Bicarbonate (HCO_3)	387	368	322	272	310
Sulfate (SO_4)	34	15	18	14	22
Chloride (Cl)	--	--	--	--	6.5
Fluoride (F)	--	--	--	--	.1
Nitrate (NO_3)	8.8	8.6	8.6	6.3	9.8
Dissolved solids	--	--	--	--	358
Hardness as $CaCO_3$:					
Total	424	332	328	316	295
Noncarbonate	107	30	62	93	31
Color	--	--	--	--	4
pH	7.3	7.5	7.5	7.3	7.3
Specific conductance (micromhos at 25 C.)	770	534	534	501	541
Turbidity	--	--	--	--	1.0
Temperature (F.)	58	58	61	57	66
Date of collection	Sept. 12, 1951	Sept. 12, 1951	Sept. 12, 1951	Sept. 12, 1951	Sept. 12, 1951

BECKLEY
(Population, 19,397)

Ownership: Municipal; supplies also Mabscott, Sophia, and about 11,800 people outside the city limits. Total population supplied, about 34,300.
Source: Glade Creek, impounded.
Treatment: Aeration, prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, postchlorination, ammoniation, addition of Calgon for corrosion control.
Rated capacity of treatment plant: 2,300,000 gpd.
Raw-water storage: 565,000,000 gal.
Finished-water storage: 3,835,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.3	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	30
Manganese (Mn)	.00	Noncarbonate	22
Calcium (Ca)	8.6		
Magnesium (Mg)	2.1	Color	2
Sodium (Na)	1.3	pH	6.8
Potassium (K)	1.6	Specific conductance (micromhos at 25 C.)	83.5
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	10	Temperature (F.)	--
Sulfate (SO_4)	19	Date of collection	Nov. 28, 1951
Chloride (Cl)	5.2		
Fluoride (F)	.4		
Nitrate (NO_3)	.3		
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	8	14	3	6.3	7.1	6.1	16	22	8	--	60	0.1
Finished water	12	20	5	7.4	9.6	5.9	34	48	14	--	0	0

BLUEFIELD
(Population, 21,506)

Ownership: West Virginia Water Service Company; supplies also about 2,000 people outside the city limits. Total population supplied, about 23,500.
Source: 22 springs and surface run-off feeding 2 reservoirs impounded by Ada Dam and Horton Dam. Auxiliary supply from Beaver Pond and Bailey Springs.
Treatment: Coagulation with alum, sedimentation, rapid sand filtration, and chlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: 200,000,000 gal.
Finished-water storage: 2,000,000 gal.

BLUEFIELD--Continued

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	6.6	Hardness as $CaCO_3$:	
Iron (Fe)	.42	Total	112
Manganese (Mn)	.00	Noncarbonate	5
Calcium (Ca)	31		
Magnesium (Mg)	8.2	Color	2
Sodium (Na)	1.7	pH	7.6
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	217
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	129	Temperature (F.)	--
Sulfate (SO_4)	7.2	Date of collection	Nov. 30, 1951
Chloride (Cl)	2.5		
Fluoride (F)	.2		
Nitrate (NO_3)	1.4		
Dissolved solids	124		

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	105	114	14	7.4	7.5	7.2	102	130	80	<1	50	0
Finished water	95	110	76	7.1	7.3	7.0	97	124	74	0	0	0

[a] All sources.

CHARLESTON

(Population, 73,501)

Ownership: West Virginia Water Service Company; supplies also South Charleston, and about 13,900 people outside the city limits. The system is interconnected with Belle, Nitro, and St. Albans. Total population supplied, about 104,000.

Source: Elk River.

Treatment: Anhydrous ammonia, carbon, coagulation with alum and at times lime, aeration at times by air diffusion, chlorination beyond break-point, sedimentation, rapid sand filtration, and final adjustment of pH with lime.

Rated capacity of treatment plant: 20,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 8,850,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	4.4	Hardness as $CaCO_3$:	
Iron (Fe)	.10	Total	32
Manganese (Mn)	.00	Noncarbonate	17
Calcium (Ca)	9.6		
Magnesium (Mg)	2.0	Color	0
Sodium (Na)	2.3	pH	7.4
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	89.4
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	19	Temperature (F.)	--
Sulfate (SO_4)	15	Date of collection	Dec. 27, 1951
Chloride (Cl)	6.2		
Fluoride (F)	.0		
Nitrate (NO_3)	1.8		
Dissolved solids	52		

CHARLESTON--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.....	14	25	8	6.5	6.9	6.1	23	42	14	56	1000	1
Finished water...	21	36	13	9.0	9.6	8.4	37	60	22	>0	0	>0

CLARKSBURG
(Population, 32,014)

Ownership: Municipal; supplies also Nutter Fort, Stonewood, Summit Park, and about 1,490 people outside the city limits. Total population supplied, about 38,400.

Source: West Fork River impounded by a series of low dams.

Treatment: Coagulation with alum and lime, activated carbon, adjustment of pH to about 8.3 with lime, sedimentation, rapid sand filtration, postchlorination at times, softening by cation exchange at times.

Rated capacity of treatment plant: 9,000,000 gpd.

Raw-water storage: 440,000,000 gal

Finished-water storage: 3,064,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	4.1	Hardness as $CaCO_3$:	
Iron (Fe)	.20	Total	140
Manganese (Mn)	.00	Noncarbonate	116
Calcium (Ca)	44		
Magnesium (Mg)	7.5	Color	2
Sodium (Na)	4.0	pH	7.6
Potassium (K)	3.0	Specific conductance (micromhos at 25 C.)	316
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	30	Temperature (F.)	--
Sulfate (SO_4)	119	Date of collection	Dec. 31, 1951
Chloride (Cl)	3.2		
Fluoride (F)	.0		
Nitrate (NO_3)	2.4		
Dissolved solids	210		

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	41	5	6.7	7.2	6.5	87	265	47	71	1900	5
Finished water...	31	48	28	8.2	9.1	6.7	98	208	38	0	0	0

DUNBAR
(Population, 8,032)

Ownership: West Virginia Water Service Company. (See Nitro and St. Albans.)

ELKINS
(Population, 9,121)

Ownership: Municipal; supplies also about 500 people outside the city limits. Total population supplied, about 9,600.
Source: Tygart River.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon at times, sedimentation, rapid sand filtration, postchlorination, and final adjustment of pH with lime.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,350,000 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)	.03	Total	45
Manganese (Mn)	.00	Noncarbonate	19
Calcium (Ca)	14		
Magnesium (Mg)	2.2	Color	1
Sodium (Na)	1.5	pH	7.1
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	108
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	30	Temperature (F.)	--
Sulfate (SO_4)	22	Date of collection	Nov. 23, 1951
Chloride (Cl)	2.8		
Fluoride (F)	.1		
Nitrate (NO_3)	.9		
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	20	24	14	7.1	7.3	6.8	--	--	--	--	--	--
Finished water	29	30	26	8.2	8.3	8.2	--	--	--	--	--	--

FAIRMONT
(Population, 29,346)

Ownership: Municipal; supplies also Barrackville, Rivesville, and about 2,000 people outside the city limits. Total population supplied, about 33,700.
Source: Tygart River.
Treatment: Coagulation with alum and soda ash, prechlorination, sedimentation, rapid sand filtration, postchlorination, and addition of Calgon for corrosion control.
Rated capacity of treatment plant: 6,000,000 gpd.
Raw-water storage: 17,000,000 gal.
Finished-water storage: 3,500,000 gal.

FAIRMONT--Continued

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

	Finished water		Finished water
Silica (SiO_2)	3.9	Hardness as $CaCO_3$:	
Iron (Fe)	.20	Total	23
Manganese (Mn)	.14	Noncarbonate	12
Calcium (Ca)	7.2		
Magnesium (Mg)	1.2	Color	2
Sodium (Na)	7.9	pH	7.3
Potassium (K)	2.0	Specific conductance (micromhos at 25 C.)	96.6
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	13	Temperature (F.)	--
Sulfate (SO_4)	27	Date of collection	Dec. 27, 1951
Chloride (Cl)	1.5		
Fluoride (F)	.0		
Nitrate (NO_3)	1.9		
Dissolved solids	58		

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	1.7	3.0	[a]18	6.0	6.6	4.9	30	80	18	27	160	4
Finished water	9.9	24	6.0	7.1	8.5	6.9	30	78	18	0	0	0

[a] Acidic.

GRAFTON
(Population, 7,365)

Ownership: Municipal; supplies also about 2,000 people outside the city limits. Total population supplied, about 9,400.
Source: Tygart Lake.
Treatment: Coagulation with alum and lime, prechlorination, sedimentation, rapid sand filtration; adjustment of pH with lime at filters, and postchlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,500,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	3.8	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	36
Manganese (Mn)	.05	Noncarbonate	25
Calcium (Ca)	12		
Magnesium (Mg)	1.7	Color	1
Sodium (Na)	1.6	pH	7.6
Potassium (K)	1.6	Specific conductance (micromhos at 25 C.)	92.8
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	15	Temperature (F.)	--
Sulfate (SO_4)	24	Date of collection	Dec. 13, 1951
Chloride (Cl)	2.5		
Fluoride (F)	.0		
Nitrate (NO_3)	1.5		
Dissolved solids	58		

GRAFTON--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.....	7	8	6	6.2	6.4	5.6	24	28	18	50	100	30
Finished water...	14	16	12	9.0	8.8	8.8	36	50	30	0	0	0

HUNTINGTON
(Population, 86,353)

Ownership: Huntington Water Corporation; supplies also Barboursville, Chesapeake (Ohio), and about 30,000 people outside the city limits. Total population supplied, about 120,000.
Source: Ohio River.
Treatment: Aeration, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, adjustment of pH with lime, and chlorination.
Rated capacity of treatment plant: 15,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,250,000 gal.

ANALYSES

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

	Finished water[a]	Finished water		Finished water[a]	Finished water
Silica (SiO_2)	4.9	5.0	Hardness as $CaCO_3$:		
Iron (Fe)	.13	.12	Total	188	72
Manganese (Mn)	.91	.00	Noncarbonate.....	152	50
Calcium (Ca)	56	22			
Magnesium (Mg).....	12	3.9	Color.....	1	0
Sodium (Na)	38	5.8	pH.....	7.5	9.2
Potassium (K)	3.6	1.3	Specific conductance (micromhos at		
Carbonate (CO_3)	0	5	25 C.).....	558	200
Bicarbonate (HCO_3)	45	15	Turbidity.....	--	--
Sulfate (SO_4)	160	53	Temperature (F.)...	--	--
Chloride (Cl)	52	10	Date of collection...	Nov. 27, 1951	Mar. 27, 1952
Fluoride (F)	.4	.1			
Nitrate (NO_3)	3.4	2.2			
Dissolved solids.....	362	116			

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.....	25	53	13	7.1	7.4	6.5	--	--	--	--	600	15
Finished water...	30	50	20	8.4	8.4	7.9	70	134	28	--	0	0

[a] River at low stage at time of collection of sample.

MARTINSBURG
(Population, 15,621)

Ownership: Municipal; supplies also about 100 people outside the city limits. Total population supplied, about 15,700.
Source: Limestone spring. Auxiliary supply from spring-fed limestone quarry.
Treatment: Chlorination.
Raw-water storage: 200,000,000 gal (auxiliary supply).
Finished-water storage: 3,750,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	11	Hardness as $CaCO_3$:	
Iron (Fe)	.19	Total	264
Manganese (Mn)	.00	Noncarbonate	31
Calcium (Ca)	80		
Magnesium (Mg)	16	Color	0
Sodium (Na)	1.6	pH	7.5
Potassium (K)	1.8	Specific conductance (micromhos at 25 C.)	468
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	286	Turbidity	--
Sulfate (SO_4)	18	Temperature (F.)	--
Chloride (Cl)	3.5	Date of collection	Feb. 27, 1952
Fluoride (F)	.1		
Nitrate (NO_3)	14		
Dissolved solids	279		

MORGANTOWN
(Population, 25,525)

Ownership: Municipal; supplies also Star City, Westover, and about 8,000 people outside the city limits. Total population supplied, about 39,000.
Source: Monongahela River, 75 percent of supply; Tibbs Run, impounded, 25 percent of supply.
Treatment: Monongahela River supply: coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, zeolite softening, and chlorination. Tibbs Run supply: addition of lime, and chlorination.
Rated capacity of treatment plant: 3,800,000 gpd.
Raw-water storage: 35,000,000 gal.
Finished-water storage: 2,600,000 gal.

ANALYSES

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

	Finished water (Monongahela River)	Finished water (Tibbs Run, impounded)	Filter effluent (Monongahela River)
Silica (SiO_2)	3.7	4.1	3.7
Iron (Fe)	.12	.13	.12
Manganese (Mn)	.00	.00	.04
Calcium (Ca)	30	7.0	41
Magnesium (Mg)	4.9	1.2	7.1
Sodium (Na)	33	1.2	10
Potassium (K)	2.0	1.7	2.2
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	19	13	17
Sulfate (SO_4)	140	13	135
Chloride (Cl)	7.5	2.5	3.2
Fluoride (F)	.1	.1	.1
Nitrate (NO_3)	2.4	.4	2.4
Dissolved solids	237	39	222
Hardness as $CaCO_3$:			
Total	94	22	132
Noncarbonate	79	12	118
Color	0	5	1
pH	8.5	7.2	8.1
Specific conductance (micromhos at 25 C.)	371	60.1	339
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	Jan. 1, 1952	Jan. 1, 1952	Jan. 1, 1952

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	-13	--	--	--	92	205	42	40	400	5
Finished water [a]	12	16	10	9.0	9.4	8.8	64	166	42	0	5	0
Finished water [b]	13	20	9	9.0	9.4	8.8	28	34	24	0	0	0

[a] Monongahela River.
[b] Tibbs Run.

MOUNDSVILLE
(Population, 14,772)

Ownership: Municipal.
Source: 3 wells (4 to 6), 69, 69, and 70 ft deep, yield reported to be 400, 400, and 725 gpm. Emergency supply from Well 3.
Treatment: Chlorination. Emergency supply treated with polyphosphate (Calgon) for manganese control.
Raw-water storage: None.
Finished-water storage: 2,000,000 gal.

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	11	Hardness as $CaCO_3$:	
Iron (Fe)	.12	Total	274
Manganese (Mn)	.02	Noncarbonate	197
Calcium (Ca)	87		
Magnesium (Mg)	14	Color	0
Sodium (Na)	23	pH	7.3
Potassium (K)	2.6	Specific conductance (micromhos at 25 C.)	611
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	95	Temperature (F.)	--
Sulfate (SO_4)	213	Date of collection	Dec. 11, 1951
Chloride (Cl)	21		
Fluoride (F)	.1		
Nitrate (NO_3)	2.2		
Dissolved solids	445		

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	82	100	66	7.2	7.3	7.0	227	276	168	--	--	--

[a] Composite, wells 5 and 6.

NITRO
(Population, 3,314)

Ownership: West Virginia Water Service Company; supplies also Dunbar, and about 11,500 people outside the city limits. The system is interconnected with Belle, Charleston, and St. Albans. Total population supplied, about 22,800.
Source: Kanawha River.
Treatment: Aeration, prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, adjustment of pH with lime, and post-chlorination.
Rated capacity of treatment plant: 36,000,000 gpd
Raw-water storage: None.
Finished-water storage: 1,800,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	5.6	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	50
Manganese (Mn)	.00	Noncarbonate	31
Calcium (Ca)	16		
Magnesium (Mg)	2.7	Color	0
Sodium (Na)	3.7	pH	7.3
Potassium (K)	1.7	Specific conductance (micromhos at 25 C.)	137
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	24	Temperature (F.)	--
Sulfate (SO_4)	25	Date of collection	Dec. 27, 1951
Chloride (Cl)	9.0		
Fluoride (F)	.0		
Nitrate (NO_3)	2.2		
Dissolved solids	80		

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	34	66	15	7.2	7.6	6.3	55	112	24	27	180	5
Finished water	30	55	14	9.0	9.2	8.5	68	128	36	--	--	--

PARKERSBURG
(Population, 40,492)

Ownership: Municipal; supplies also about 5,000 people outside the city limits. Total population supplied, about 45,500.
Source: 3 wells (Ranney collectors 1 to 3), 57, 56, and 54 ft deep, yield reported to be 2,500, 2,000, and 2,500 gpm. Emergency supply from Ohio River.
Treatment: Prechlorination, aeration, coagulation with lime, sedimentation, rapid sand filtration, addition of polyphosphate (Calgon), and postchlorination.
Rated capacity of treatment plant:. 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 7,500,000 gal.

ANALYSIS

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

	Finished water [a]		Finished water [a]
Silica (SiO_2)	13	Hardness as $CaCO_3$:	
Iron (Fe)	.04	Total	216
Manganese (Mn)	.12	Noncarbonate	142
Calcium (Ca)	64		
Magnesium (Mg)	14	Color	0
Sodium (Na)	29	pH	8.1
Potassium (K)	1.3	Specific conductance (micromhos at 25 C.)	554
Carbonate (CO_3)	7	Turbidity	--
Bicarbonate (HCO_3)	78	Temperature (F.)	--
Sulfate (SO_4)	145	Date of collection	Jan. 7, 1952
Chloride (Cl)	39		
Fluoride (F)	.2		
Nitrate (NO_3)	2.4		
Dissolved solids	366		

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	71	75	69	6.6	6.7	6.5	159	173	151	--	--	--
Finished water	82	86	81	8.4	8.6	8.2	167	178	157	--	--	--

[a] Composite, collectors 1 and 3.

PRINCETON
(Population, 8,279)

Ownership: West Virginia Water Service Company; supplies also about 3,000 people outside the city limits. Total population supplied, about 11,300.
Source: 3 wells (2, 3, and 8), 446, 445, and 247 ft deep; yield reported to be 300, 325, and 300 gpm (80 percent of supply); Brush Creek (20 percent of supply).
Treatment: Aeration, prechlorination, softening with hydrated lime and suspension catalyzer, and rapid sand filtration.
Rated capacity of treatment plant: 1,008,000 gpd.
Raw-water storage: 50,000 gal.
Finished-water storage: 318,000 gal.

ANALYSES

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

	Raw water[a]	Finished water[a]		Raw water[a]	Finished water[a]
Silica (SiO_2)	14	13	Hardness as $CaCO_3$:		
Iron (Fe)	.97	.40	Total	118	58
Manganese (Mn)	.00	.00	Noncarbonate	0	0
Calcium (Ca)	36	12			
Magnesium (Mg)	6.8	6.8	Color	3	1
Sodium (Na)	25	26	pH	7.4	7.7
Potassium (K)	1.5	1.6	Specific conductance (micromhos at 25 C.)	321	229
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	167	91	Turbidity	--	--
Sulfate (SO_4)	22	18	Temperature (F.)	--	--
Chloride (Cl)	10	15	Date of collection	Nov. 30, 1951	Nov. 20, 1951
Fluoride (F)	.1	.1			
Nitrate (NO_3)	1.6	.9			
Dissolved solids	200	140			

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	214	240	160	6.9	6.9	6.8	204	230	160	0	0	0
Finished water	60	80	52	8.3	8.6	8.0	76	86	62	0	0	0

[a] Wells 3 and 8, 80 percent; Brush Creek 20 percent.

ST. ALBANS
(Population, 9,870)

Ownership: West Virginia Water Service Company; supplies also about 8,500 people outside St. Albans. The system is interconnected with Belle, Charleston, and Nitro. Total population supplied, about 18,400.
Source: Coal River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, adjustment of pH with lime, postchlorination. Aeration and activated carbon at times.
Rated capacity of treatment plant: 1,600,000 gpd.
Raw-water storage: None.
Finished-water storage: 300,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	6.6	Hardness as $CaCO_3$:	
Iron (Fe)	.05	Total	51
Manganese (Mn)	.00	Noncarbonate	37
Calcium (Ca)	14		
Magnesium (Mg)	3.9	Color	0
Sodium (Na)	4.5	pH	7.4
Potassium (K)	2.6	Specific conductance (micromhos at 25 C.)	147
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	17	Temperature (F.)	--
Sulfate (SO_4)	40	Date of collection	Dec. 27, 1951
Chloride (Cl)	4.8		
Fluoride (F)	.0		
Nitrate (NO_3)	1.9		
Dissolved solids	86		

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	20	58	10	6.8	7.3	6.3	50	100	24	61	1200	.8
Finished water	25	62	15	9.0	9.4	8.2	62	110	32	0	0	0

SOUTH CHARLESTON
(Population, 16,686)

Ownership: West Virginia Water Service Company.
Source: From Nitro and Charleston.
Treatment: (See Nitro and Charleston.)

WEIRTON
(Population, 24,005)

Ownership: Municipal.
Source: Ohio River.
Treatment: Aeration, coagulation with lime and ferrous sulfate at times, superchlorination, activated carbon at times, fluoridation with sodium silicofluoride, sedimentation, rapid sand filtration, and chlorine dioxide.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,720,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	4.4	Hardness as $CaCO_3$:	
Iron (Fe)	.21	Total	100
Manganese (Mn)	.00	Noncarbonate	81
Calcium (Ca)	33		
Magnesium (Mg)	4.4	Color	0
Sodium (Na)	14	pH	8.6
Potassium (K)	2.6	Specific conductance (micromhos at 25 C.)	289
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	24	Temperature (F.)	--
Sulfate (SO_4)	77	Date of collection	Dec. 12, 1951
Chloride (Cl)	22		
Fluoride (F)	1.6		
Nitrate (NO_3)	2.0		
Dissolved solids	180		

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	8	22	0	6.7	7.2	5.3	112	205	60	120	1100	30
Finished water	26	32	12	9.5	9.6	9.2	125	188	68	0	0	0

WESTON
(Population 8,945)

Ownership: West Virginia Water Service Company; supplies also about 100 people outside the city limits. Total population supplied, about 9,000.
Source: West Fork River, impounded.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon at times, sedimentation, rapid sand filtration, adjustment of pH with lime, post-chlorination, and ammoniation.
Rated capacity of treatment plant: 1,000,000 gpd.
Raw-water storage: 100,000,000 gal.
Finished-water storage: 500,000 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)	.03	Total	50
Manganese (Mn)	.00	Noncarbonate	34
Calcium (Ca)	18		
Magnesium (Mg)	1.5	Color	3
Sodium (Na)	1.7	pH	7.8
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	128
Carbonate (CO_3)	0		
Bicarbonate (HCO_3)	21	Turbidity	--
Sulfate (SO_4)	28	Temperature (F.)	--
Chloride (Cl)	6.2	Date of collection	Jan. 11, 1952
Fluoride (F)	.0		
Nitrate (NO_3)	2.4		
Dissolved solids	71		

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	18	36	6	6.5	7.6	6.4	31	54	16	43	320	25
Finished water	23	40	14	8.5	9.2	8.3	54	74	41	0	0	0

WHEELING
(Population, 58,891)

Ownership: Municipal; supplies also Bethlehem, Triadelphia, and about 3,600 people outside the city limits. Total population supplied, about 64,400.
Source: Ohio River.
Treatment: Aeration, superchlorination, coagulation with alum and ferrous sulfate, sedimentation, rapid sand filtration, chlorination, chlorine dioxide, adjustment of pH with caustic soda, and fluoridation with sodium silicofluoride.
Rated capacity of treatment plant: 20,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 11,500,000 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)	.06	Total	128
Manganese (Mn)	.00	Noncarbonate	105
Calcium (Ca)	40		
Magnesium (Mg)	7.0	Color	1
Sodium (Na)	14	pH	7.8
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	345
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	29	Temperature (F.)	--
Sulfate (SO_4)	104	Date of collection	Dec. 11, 1951
Chloride (Cl)	22		
Fluoride (F)	.6		
Nitrate (NO_3)	1.9		
Dissolved solids	224		

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	24	4	6.6	7.5	5.5	111	192	52	80	800	20
Finished water	22	43	14	9.0	9.8	8.1	141	228	84	0	0	0

WILLIAMSON
(Population, 8,624)

Ownership: Municipal; supplies also the towns of Aflex and New Camp in Kentucky, and about 2,500 people outside the city limits. Total population supplied, about 11,500.
Source: Tug Fork River.
Treatment: Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 2,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 650,000 gal.

ANALYSIS

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

	Finished water (city tap)		Finished water (city tap)
Silica (SiO_2)	4.9	Hardness as $CaCO_3$:	
Iron (Fe)	.11	Total	100
Manganese (Mn)	.00	Noncarbonate	59
Calcium (Ca)	28		
Magnesium (Mg)	7.3	Color	2
Sodium (Na)	12	pH	7.9
Potassium (K)	2.4	Specific conductance (micromhos at 25 C.)	264
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	50	Temperature (F.)	--
Sulfate (SO_4)	76	Date of collection	Nov. 28, 1951
Chloride (Cl)	6.6		
Fluoride (F)	.2		
Nitrate (NO_3)	3.2		
Dissolved solids	170		

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	145	185	45	8.2	8.7	7.8	145	185	45	--	5000	25
Finished water	175	225	75	8.4	8.4	8.4	175	225	75	0	0	0

APPLETON, WISCONSIN
(Population, 34,010)

Ownership: Municipal; supplies also about 800 people outside the city limits. Total population supplied, about 34,800.
Source: Fox River.
Treatment: Prechlorination, coagulation with alum, softening with lime, aeration during summer months, activated carbon, sedimentation, recarbonation, rapid sand filtration, postchlorination, and fluoridation.
Rated capacity of treatment plant: 8,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 4,250,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	2.5	2.7	Hardness as $CaCO_3$:		
Iron (Fe)	.10	.22	Total	169	81
Manganese (Mn)	.00	.03	Noncarbonate	21	29
Calcium (Ca)	38	20			
Magnesium (Mg)	18	7.5	Color	10	5
Sodium (Na)	4.5	5.2	pH	7.9	9.0
Potassium (K)	1.7	2.0	Specific conductance (micromhos at 25 C.)	319	190
Carbonate (CO_3)	0	6	Turbidity	--	--
Bicarbonate (HCO_3)	180	51	Temperature (F.)	--	--
Sulfate (SO_4)	20	30	Date of collection	Jan. 16, 1952	Jan. 16, 1952
Chloride (Cl)	7.0	8.0			
Fluoride (F)	.1	1.2			
Nitrate (NO_3)	.5	.4			
Dissolved solids	200	112			

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	144	168	110	8.0	8.7	7.4	168	196	144	4.2	57	1.5
Finished water	37	57	20	9.2	10.2	8.6	72	98	60	.8	6.6	.2

BELOIT
(Population, 29,590)

Ownership: Wisconsin Power and Light Company; supplies also South Beloit, and about 100 people outside the city limits. Total population supplied, about 32,900.
Source: 4 drilled wells (3, 4, 5, 8), 1,160, 967, 1,225, and 140 ft deep, respectively. Well 3 furnishes 12 percent of supply; well 4, 15 percent; well 5, 13 percent; well 8, 59 percent. Auxiliary supply, wells 1, 6, and 2 (1 percent of supply).
Treatment: Fluoridation and chlorination.
Raw-water storage: 1,550,000 gal.
Finished-water storage: 1,200,000 gal.

BELOIT--Continued

ANALYSES

(Analyses, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Well 3	Well 4	Well 5	Well 8
Silica (SiO_2)	8.9	9.5	9.3	18
Iron (Fe)	.1	.00	.00	.00
Manganese (Mn)	.00	.00	.00	.00
Calcium (Ca)	56	59	51	71
Magnesium (Mg)	36	37	35	31
Sodium (Na)	1.8	1.0	1.9	2.2
Potassium (K)	2.0	1.6	1.6	.0
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	344	354	317	325
Sulfate (SO_4)	8.5	10	10	30
Chloride (Cl)	3.0	2.0	2.5	5.5
Fluoride (F)	.0	.0	.0	.9
Nitrate (NO_3)	.0	.4	.3	2.0
Dissolved solids	288	302	262	320
Hardness as $CaCO_3$:				
Total	288	299	271	305
Noncarbonate	6	9	11	38
Color	5	2	2	2
pH	7.7	7.4	7.6	7.7
Specific conductance (micromhos at 25 C.)	--	--	--	--
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	May 27, 1952	May 27, 1952	May 27, 1952	May 27, 1952
Depth (feet)	1,160	967	1,225	140
Diameter (inches)	12	12	12	30
Date drilled	1937	1926	1927	1947
Percent of supply	12	15	13	59

EAU CLAIRE
(Population, 36,058)

Ownership: Municipal.
Source: 11 drilled wells, from 75 to 105 ft deep. The yield of the wells is reported to be from 1,420 to 2,120 gpm, and to average 1,786 gpm.
Treatment: Chlorination and fluoridation.
Raw-water storage: None.
Finished-water storage: 3,500,000 gal.

EAU CLAIRE--Continued

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	19	Hardness as $CaCO_3$:	
Iron (Fe)	.09	Total	54
Manganese (Mn)	.00	Noncarbonate	7
Calcium (Ca)	12		
Magnesium (Mg)	5.8	Color	5
Sodium (Na)	4.0	pH	7.4
Potassium (K)	.7	Specific conductance (micromhos at 25 C.)	122
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	57	Temperature (F.)	--
Sulfate (SO_4)	6.7	Date of collection	Nov. 20, 1951
Chloride (Cl)	3.2		
Fluoride (F)	1.0		
Nitrate (NO_3)	2.2		
Dissolved solids	86		

FOND DU LAC
(Population, 29,936)

Ownership: Municipal; supplies also about 90 people outside the city limits.
Total population supplied, about 30,000.
Source: 11 drilled wells (2 to 6, 8 to 13) 480 to 885 ft deep.
Treatment: Chlorination, and fluoridation.
Raw-water storage: 2,000,000 gal.
Finished-water storage: 500,000 gal.

ANALYSIS

(Analysis, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Finished water		Finished water
Silica (SiO_2)	17	Hardness as $CaCO_3$:	
Iron (Fe)	.1	Total	401
Manganese (Mn)	.0	Noncarbonate	196
Calcium (Ca)	103		
Magnesium (Mg)	35	Color	3
Sodium (Na)	38	pH	7.4
Potassium (K)	4.4	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	251	Temperature (F.)	--
Sulfate (SO_4)	185	Date of collection	Feb. 13, 1952
Chloride (Cl)	88		
Fluoride (F)	1.2		
Nitrate (NO_3)	.0		
Dissolved solids	628		

GREEN BAY
(Population, 52,735)

Ownership: Municipal.
Source: 9 drilled wells (1 to 9) 804 to 956 ft deep, located, respectively, within the city limits as follows: Cass Street, Farlin Avenue, Shawano Avenue, Boland Road, James Church, 9th Street, Mason Street, Gray Street, and Military.
Treatment: Chlorination.
Raw-water storage: None.
Finished-water storage: 4,000,000 gal.

The analyses selected show the approximate range of dissolved solids and hardness in the water furnished by the wells. Complete analyses of samples from the other wells indicate that the water furnished by them is very similar in chemical character to that from the wells for which analyses are given.

ANALYSES

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

	Cass St. well (raw water)	Farlin Ave. well (raw water)	James Church well[a]	Gray St. well (raw water)	Military well (raw water)
Silica (SiO_2)	6.5	7.3	7.5	7.4	7.5
Iron (Fe)	.44	.79	.49	.58	.23
Manganese (Mn)	.00	.00	.00	.00	.00
Calcium (Ca)	50	57	60	56	58
Magnesium (Mg)	20	22	29	22	24
Sodium (Na)	23	40	35	15	13
Potassium (K)	6.0	6.0	4.5	4.9	4.2
Carbonate (CO_3)	0	0	0	6	0
Bicarbonate (HCO_3)	210	194	265	246	274
Sulfate (SO_4)	65	110	51	40	40
Chloride (Cl)	17	43	58	10	9.5
Fluoride (F)	2.4	2.4	1.6	1.3	1.1
Nitrate (NO_3)	.2	.0	.0	.2	.2
Dissolved solids	296	395	385	282	288
Hardness as $CaCO_3$:					
Total	208	234	272	232	245
Noncarbonate	35	74	52	29	19
Color	3	2	3	3	0
pH	7.8	7.8	7.7	8.1	7.7
Specific conductance (micromhos at 25 C.)	492	615	645	473	484
Turbidity	--	--	--	--	--
Temperature (F.)	53	53	--	53	53
Date of collection	Jan. 10, 1952	Jan. 10, 1952	Jan. 10, 1952	Feb. 26, 1952	Feb. 26, 1952
Depth (feet)	918	956	860	804	816
Diameter (inches)	15	15	15	15	19
Date drilled	1936	1930	1941	1913	1951
Percent of supply	11	11	9	7	15

[a] Raw water.

JANESVILLE
(Population, 24,899)

Ownership: Municipal; supplies also about 200 people outside the city limits. Total population supplied, about 25,100.
Source: 2 drilled wells (1, 3). Well 1 furnishes 74 percent of supply; well 3, 25 percent of supply. Auxiliary supply, well 2 (1 percent of supply).
Treatment: Fluoridation.
Storage: 9,000,000 gal.

ANALYSES
(Analyses, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Main pumping station	Pumping station No. 3		Main pumping station	Pumping station No. 3
Silica (SiO_2)	22	18	Hardness as $CaCO_3$:		
Iron (Fe)	.00	.00	Total	321	314
Manganese (Mn)	.00	.00	Noncarbonate	42	33
Calcium (Ca)	71	70			
Magnesium (Mg)	35	34	Color	2	2
Sodium (Na)	.0	2.2	pH	7.5	7.5
Potassium (K)	.0	.0	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	340	344	Temperature (F.)	--	--
Sulfate (SO_4)	18	20	Date of collection	May 27, 1952	May 27, 1952
Chloride (Cl)	4.5	4.0			
Fluoride (F)	.1	1.8			
Nitrate (NO_3)	3.8	3.6			
Dissolved solids	334	330			

KENOSHA
(Population, 54,368)

Ownership: Municipal; supplies also about 1,000 people outside the city limits. Total population supplied, about 55,400.
Source: Lake Michigan.
Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 14,000,000 gpd.
Raw-water storage: 1,500,000 gal.
Finished-water storage: 6,000,000 gal.

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

	Finished water		Finished water
Silica (SiO_2)	3.3	Hardness as $CaCO_3$:	
Iron (Fe)	.07	Total	132
Manganese (Mn)	.00	Noncarbonate	26
Calcium (Ca)	34		
Magnesium (Mg)	12	Color	2
Sodium (Na)	3.4	pH	7.7
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	274
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	132	Temperature (F.)	--
Sulfate (SO_4)	23	Date of collection	Apr. 30, 1952
Chloride (Cl)	6.0		
Fluoride (F)	.0		
Nitrate (NO_3)	1.1		
Dissolved solids	158		

KENOSHA--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	118	122	117	8.0	8.2	7.9	128	132	127	80	300	5
Finished water	113	115	110	7.6	7.7	7.5	128	132	127	0	0	0

LA CROSSE

(Population, 47,535)

Ownership: Municipal; supplies also about 100 people outside the city limits. Total population supplied, about 47,600.

Source: Drilled wells in several groups: group 1 (16.4 percent of supply); group 3 (14.7 percent of supply); group 4 (9.4 percent of supply); group 6 (2.8 percent of supply); Hood St. well (10.4 percent of supply); Sill St. well (2.6 percent of supply); Myrick Park well 7 (15.2 percent of supply); Myrick Park well 8 (7.8 percent of supply); Myrick Park well 9 (19.8 percent of supply); Losey Boulevard well 2 (0.9 percent of supply). Auxiliary supply, well groups 2 and 5, and Losey Boulevard well 1.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 6,000,000 gal.

ANALYSES

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

	Wells, Group 1[a]	Wells, Group 4[a]	Wells, Group 6[a]	Hood Street well[a]
Silica (SiO_2)	19	19	21	--
Iron (Fe)	3.8	.18	4.7	.07
Manganese (Mn)	1.1	.00	.00	.00
Calcium (Ca)	61	74	62	66
Magnesium (Mg)	25	38	28	24
Sodium (Na)	2.5	2.9	3.5	14
Potassium (K)	2.2	1.4	1.8	2.5
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	269	354	288	231
Sulfate (SO_4)	36	51	37	50
Chloride (Cl)	3.0	4.5	3.0	15
Fluoride (F)	.1	.1	.1	.1
Nitrate (NO_3)	.2	.9	.2	49
Dissolved solids	290	362	294	358
Hardness as $CaCO_3$:				
Total	254	338	268	264
Noncarbonate	35	51	34	74
Color	8	3	0	0
pH	7.3	7.5	7.4	7.8
Specific conductance (micromhos at 25 C.)	465	576	474	554
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Dec. 20, 1951	Dec. 20, 1951	Dec. 21, 1951	Dec. 21, 1951
Depth (feet)	115-125	120-131	116-129	151
Diameter (inches)	10	10	10	12
Date drilled	1912	1912	1930	1936
Percent of supply	16.4	9.4	2.8	10.4

[a] Finished water.

LA CROSSE--Continued

ANALYSES

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

	Sill St. well [a]	Myrick Park, well 7 [a]	Myrick Park, well 8 [a]	Myrick Park, well 9 [a]
Silica (SiO_2)	11	18	19	20
Iron (Fe)	.51	.12	.02	.13
Manganese (Mn)	.00	.02	.02	.00
Calcium (Ca)	50	65	61	60
Magnesium (Mg)	27	30	27	27
Sodium (Na)	4.8	5.8	3.5	3.1
Potassium (K)	2.4	1.7	2.5	1.6
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	265	273	251	273
Sulfate (SO_4)	21	48	43	37
Chloride (Cl)	7.8	8.8	6.8	3.0
Fluoride (F)	.0	.1	.1	.1
Nitrate (NO_3)	.1	23	17	8.9
Dissolved solids	253	330	303	292
Hardness as $CaCO_3$:				
Total	236	285	262	260
Noncarbonate	19	62	58	37
Color	2	3	2	1
pH	7.6	7.8	7.5	7.6
Specific conductance (micromhos at 25 C.)	433	525	479	476
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Dec. 21, 1951	Dec. 21, 1951	Dec. 21, 1951	Dec. 20, 1951
Depth (feet)	484	137	150	155
Diameter (inches)	12	20	14	14
Date drilled	1943	1948	1948	1948
Percent of supply	2.6	15.2	7.8	19.8

[a] Finished water.

MADISON
(Population, 96, 056)

Ownership: Municipal; supplies also Maple Bluff, Monona, Shorewood Hills, and about 1, 975 people outside the city limits. Total population supplied, about 103, 500.

Source: 11 drilled wells (1 to 8, Dayton Street, East, and Main Station) 615 to 840 ft deep. The yield of the wells is reported to range from 960 to 2, 540 gpm, and to average 1, 552 gpm.

Treatment: Chlorination, and fluoridation.

Raw-water storage: None.

Finished-water storage: 12, 000, 000 gal.

MADISON--Continued

ANALYSES

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

	Unit well 4 (raw water)	Unit well 1 (finished water)	Unit well 2 (finished water)	Unit well 5 (finished water)	Unit well 8 (finished water)
Silica (SiO_2)	20	--	13	16	15
Iron (Fe)	.53	--	.14	.14	.15
Manganese (Mn)	.00	--	.00	.00	.00
Calcium (Ca)	94	55	63	61	66
Magnesium (Mg)	52	33	42	44	43
Sodium (Na)	10	--	5.7	3.6	6.4
Potassium (K)	1.4	--	1.3	1.6	1.6
Carbonate (CO_3)	0	0	0	0	0
Bicarbonate (HCO_3)	422	335	374	401	372
Sulfate (SO_4)	88	4.0	30	9.7	23
Chloride (Cl)	20	1.4	7.5	2.5	10
Fluoride (F)	.0	--	1.0	.1	.6
Nitrate (NO_3)	14	--	.8	1.4	1.5
Dissolved solids	516	--	350	320	350
Hardness as $CaCO_3$:					
Total	450	272	331	332	340
Noncarbonate	103	0	23	4	37
Color	1	2	3	1	2
pH	7.6	7.6	7.2	7.4	7.4
Specific conductance (micromhos at 25 C.)	810	495	612	584	605
Turbidity	--	--	--	--	--
Temperature (F.)	--	--	--	--	--
Date of collection	Apr. 30, 1952	Apr. 30, 1952	Apr. 30, 1952	May 6, 1952	Apr. 30, 1952
Depth (feet)	737	840	615	828	774
Diameter (inches)	16	12	16	12	16
Date drilled	1930	1923	1924	1926	1945
Percent of supply	--	--	--	--	--

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	--	--	--	7.5	7.7	7.2	300	320	280	0	0	0

MANITOWOC

(Population, 27,598)

Ownership: Municipal; supplies also about 70 people outside the city limits. Total population supplied, about 27,700.

Source: Wells (Ranney collectors), infiltration from Lake Michigan. Auxiliary supply, Lake Michigan.

Treatment: Chlorination.

Raw-water storage: None.

Finished-water storage: 4,500,000 gal.

MANITOWOC--Continued

ANALYSES

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

	Ranney collector "A"	Ranney collector "B"		Ranney collector "A"	Ranney collector "B"
Silica (SiO_2)	6.2	--	Hardness as $CaCO_3$:		
Iron (Fe)	.06	--	Total	166	208
Manganese (Mn)	.00	--	Noncarbonate	33	45
Calcium (Ca)	41	--			
Magnesium (Mg)	16	--	Color	0	5
Sodium (Na)	5.6	--	pH	7.9	8.3
Potassium (K)	1.2	--	Specific conductance (micromhos at 25 C.)	330	402
Carbonate (CO_3)	0	4	Turbidity	--	--
Bicarbonate (HCO_3)	165	187	Temperature (F.)	--	--
Sulfate (SO_4)	31	34	Date of collection	Nov. 2, 1951	Nov. 2, 1951
Chloride (Cl)	8.0	6.0			
Fluoride (F)	.1	--			
Nitrate (NO_3)	1.0	--			
Dissolved solids	194	--			
Depth (feet)				66	86
Diameter (feet)				13	13
Date drilled				June, 1945	Mar., 1945
Percent of supply				--	--

MARINETTE

(Population, 14,178)

Ownership: Municipal.

Source: Green Bay-Lake Michigan. The intake is located 1 mile northeast of the treatment plant.

Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, postchlorination, and fluoridation.

Rated capacity of treatment plant: 3,000,000 gpd.

Raw water storage: None.

Finished water storage: 800,000 gal.

ANALYSES

(Analyses, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	6.5	6.5	Hardness as $CaCO_3$:		
Iron (Fe)	.3	.0	Total	122	118
Manganese (Mn)	--	--	Noncarbonate	16	38
Calcium (Ca)	32	31			
Magnesium (Mg)	10	10	Color	40	10
Sodium (Na)	2.5	3.4	pH	7.6	7.1
Potassium (K)	1.8	1.6	Specific conductance (micromhos at 25 C.)	--	--
Carbonate (CO_3)	0	0	Turbidity	--	--
Bicarbonate (HCO_3)	129	98	Temperature (F.)	--	--
Sulfate (SO_4)	21	40	Date of collection	Jan. 4, 1952	Jan. 4, 1952
Chloride (Cl)	4.0	8.0			
Fluoride (F)	.3	.9			
Nitrate (NO_3)	.2	.1			
Dissolved solids	166	174			

MARINETTE--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.....	112	120	85	7.2	7.3	7.1	--	--	--	35	64	18
Finished water...	94	138	64	7.0	7.1	6.8	--	--	--	10	30	7

MILWAUKEE
(Population, 637,392)

Ownership: Municipal; supplies also Fox Point, Shorewood, West Allis, West Milwaukee, Whitefish Bay, and about 84,700 people outside the city limits. Total population supplied, about 804,000.

Source: Lake Michigan. The intake is located about 5 miles north of Milwaukee Harbor.

Treatment: Prechlorination, coagulation with alum, activated carbon, ammoniation (ammonium sulfate), sedimentation, rapid sand filtration, and post-chlorination.

Rated capacity of treatment plant: 200,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 70,000,000 gal.

ANALYSES

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

	Finished water	Finished water [a]		Finished water	Finished water [a]
Silica (SiO_2)	3.0	3.5	Hardness as $CaCO_3$:		
Iron (Fe)	.03	.01	Total	126	131
Manganese (Mn)	--	.0	Noncarbonate.....	19	28
Calcium (Ca)	32	34			
Magnesium (Mg).....	11	11	Color.....	2	0
Sodium (Na)	4.5	5.3	pH	7.5	7.4
Potassium (K)	.9		Specific conductance (micromhos at		
Carbonate (CO_3)	0	0	25 C.)	265	--
Bicarbonate (HCO_3)	130	126	Turbidity	--	0
Sulfate (SO_4)	21	23	Temperature (F.)...	--	--
Chloride (Cl)	6.8	5.8	Date of collection...	May 2, 1952	1950
Fluoride (F)	.1	.1			
Nitrate (NO_3)	.6	.6			
Dissolved solids.....	145	152			

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.....	111	113	106	8.1	8.5	7.8	129	132	124	1.5	26	0.1
Finished water...	104	106	98	7.5	7.8	7.1	128	130	125	0	0	0

[a] Analyses by Milwaukee Water Department of samples collected during the months March, May, and November, 1950.

NEENAH
(Population, 12,437)

Ownership: Municipal; supplies also about 200 people outside the city limits. Total population supplied, about 12,600.
Source: Lake Winnebago.
Treatment: Prechlorination, coagulation with alum, softening with lime, activated carbon, sedimentation, recarbonation, rapid sand filtration, fluoridation, and postchlorination.
Rated capacity of treatment plant: 3,000,000 gpd.
Raw water storage: 50,000 gal.
Finished water storage: 1,600,000 gal.

ANALYSES

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

	Raw water	Finished water		Raw water	Finished water
Silica (SiO_2)	2.0	2.8	Hardness as $CaCO_3$:		
Iron (Fe)	.04	.06	Total	156	57
Manganese (Mn)	.00	.00	Noncarbonate	9	23
Calcium (Ca)	32	11			
Magnesium (Mg)	18	7.3	Color	17	3
Sodium (Na)	3.6	3.8	pH	8.0	9.0
Potassium (K)	1.6	1.3	Specific conductance (micromhos at		
Carbonate (CO_3)	0	3			
Bicarbonate (HCO_3)	177	36	25 C.)	296	145
Sulfate (SO_4)	14	22	Turbidity	--	--
Chloride (Cl)	3.5	5.5	Temperature (F.)	--	--
Fluoride (F)	.1	1.0	Date of collection	Nov. 5, 1951	Nov. 5, 1951
Nitrate (NO_3)	1.0	.5			
Dissolved solids	177	81			

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	142	167	128	8.4	9.0	8.1	169	206	151	6	25	4
Finished water	44	52	16	9.1	9.4	9.0	66	76	59	.1	.2	0

OSHKOSH
(Population, 41,084)

Ownership: Municipal; supplies also about 160 people outside the city limits. Total population supplied, about 41,200.
Source: Lake Winnebago.
Treatment: Preammoniation, prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, granular carbon filtration, postammoniation, postchlorination, and fluoridation.
Rated capacity of treatment plant: 10,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 2,300,000 gal.

OSHKOSH--Continued

ANALYSIS

(Analysis, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Finished water		Finished water
Silica (SiO_2)	7.6	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	186
Manganese (Mn)	.0	Noncarbonate	32
Calcium (Ca)	41		
Magnesium (Mg)	20	Color	10
Sodium (Na)	2.0	pH	7.2
Potassium (K)	.8	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	188	Temperature (F.)	--
Sulfate (SO_4)	33	Date of collection	Feb. 13, 1952
Chloride (Cl)	8.0		
Fluoride (F)	1.1		
Nitrate (NO_3)	.7		
Dissolved solids	226		

Regular determinations at treatment plant, 1951

	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	160	192	145	8.0	8.2	7.9	176	192	155	--	--	--
Finished water	136	165	122	7.3	7.5	7.2	176	192	155	53	77	39

RACINE

(Population, 71,193)

Ownership: Municipal; supplies also about 2,500 people outside the city limits. Total population supplied, about 73,700.

Source: Lake Michigan.

Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, postchlorination, and fluoridation.

Rated capacity of treatment plant: 20,000,000 gpd.

Raw-water storage: None.

Finished-water storage: 6,350,000 gal.

ANALYSIS

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

	Finished water		Finished water
Silica (SiO_2)	3.4	Hardness as $CaCO_3$:	
Iron (Fe)	.14	Total	130
Manganese (Mn)	.00	Noncarbonate	24
Calcium (Ca)	35		
Magnesium (Mg)	10	Color	2
Sodium (Na)	3.4	pH	7.6
Potassium (K)	1.1	Specific conductance (micromhos at 25 C.)	267
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	127	Temperature (F.)	--
Sulfate (SO_4)	20	Date of collection	Apr. 30, 1952
Chloride (Cl)	6.5		
Fluoride (F)	1.0		
Nitrate (NO_3)	1.2		
Dissolved solids	152		

SHEBOYGAN
(Population, 42,365)

Ownership: Municipal; supplies also Sheboygan Falls, and about 200 people outside the city limits. Total population supplied, about 46,300.
Source: Lake Michigan.
Treatment: Prechlorination, coagulation with alum, activated carbon, sedimentation, rapid sand filtration, fluoridation, and postchlorination at times.
Rated capacity of treatment plant: 18,000,000 gpd.
Raw-water storage: None.
Finished-water storage: Clear well, 2,750,000 gal; elevated, 4,000,000 gal.

ANALYSIS

(Analysis, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Finished water		Finished water
Silica (SiO_2)	3.7	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	132
Manganese (Mn)	.0	Noncarbonate	22
Calcium (Ca)	36		
Magnesium (Mg)	10	Color	1
Sodium (Na)	2.4	pH	7.8
Potassium (K)	1.2	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	134	Temperature (F.)	--
Sulfate (SO_4)	24	Date of collection	Feb. 11, 1952
Chloride (Cl)	8.5		
Fluoride (F)	1.1		
Nitrate (NO_3)	.4		
Dissolved solids	154		

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	115	126	109	8.1	8.4	7.9	--	--	--	4.7	42	2
Finished water	109	119	102	7.6	7.9	7.4	--	135	125	0	0	0

SHOREWOOD
(Population, 16,199)

Ownership: Municipal.
Source: Supplied by Milwaukee. (See Milwaukee.)

SOUTH MILWAUKEE
(Population, 12,855)

Ownership: Municipal.
Source: Lake Michigan.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, sedimentation, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 500,000 gpd.
Raw water storage: 1,200,000 gal.
Finished water storage: 586,000 gal.

SOUTH MILWAUKEE--Continued

ANALYSIS

(Analysis, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Finished water		Finished water
Silica (SiO_2)	2.5	Hardness as $CaCO_3$:	
Iron (Fe)	.0	Total	130
Manganese (Mn)	.0	Noncarbonate	26
Calcium (Ca)	34		
Magnesium (Mg)	11	Color	3
Sodium (Na)	5.0	pH	7.7
Potassium (K)	.6	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_2)	0	Turbidity	--
Bicarbonate (HCO_3)	127	Temperature (F.)	--
Sulfate (SO_4)	26	Date of collection	May 23, 1952
Chloride (Cl)	10		
Fluoride (F)	.0		
Nitrate (NO_3)	.2		
Dissolved solids	174		

STEVENS POINT
(Population, 16,564)

Ownership: Municipal; supplies also about 200 people outside the city limits. Total population supplied, about 16,800.
Source: 3 wells (1 to 3) 30, 52, and 52 ft deep, 1 mile east of the city limits. In 1950 well 1 supplied 79 percent of the supply; well 2, 10 percent; well 3, 11 percent.
Treatment: Chlorination (emergency only).
Raw-water storage: None.
Finished-water storage: 340,000 gal.

ANALYSES

(Analyses, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Well 1	Well 2	Well 3
Silica (SiO_2)	12	10	11
Iron (Fe)	.10	.10	.30
Manganese (Mn)	.12	.12	.56
Calcium (Ca)	23	32	32
Magnesium (Mg)	9.4	15	15
Sodium (Na)	2.0	2.0	.0
Potassium (K)	1.1	1.1	1.2
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	105	159	173
Sulfate (SO_4)	13	10	8.5
Chloride (Cl)	4.0	3.0	2.5
Fluoride (F)	.2	.2	.2
Nitrate (NO_3)	1.0	1.1	.1
Dissolved solids	122	[a]153	154
Hardness as $CaCO_3$:			
Total	96	142	142
Noncarbonate	10	12	0

[a] Sum of determined constituents.

STEVENS POINT, Analyses--Continued

	Well 1	Well 2	Well 3
Color	10	10	10
pH	7.4	7.6	7.5
Specific conductance (micromhos at 25 C.)	--	--	--
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	Dec. 19, 1951	Dec. 19, 1951	Dec. 19, 1951
Depth (feet)	30	52	52
Diameter (inches)	360	20	24
Date drilled	1922	1930	1938
Percent of supply	--	--	--

SUPERIOR
(Population, 35,325)

Ownership: Superior Water, Light and Power Company; supplies also about 250 people outside the city limits. Total population supplied, about 35,600.
Source: Infiltration wells both vertical and horizontal (Lake Superior).
Treatment: Prechlorination, aeration, slow sand filtration, and postchlorination.
Rated capacity of treatment plant: 7,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 1,300,000 gal.

ANALYSIS

(Analysis, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Finished water		Finished water
Silica (SiO_2)	4.0	Hardness as $CaCO_3$:	
Iron (Fe)	.7	Total	50
Manganese (Mn)	.0	Noncarbonate	2
Calcium (Ca)	16		
Magnesium (Mg)	2.6	Color	15
Sodium (Na)	1.2	pH	7.2
Potassium (K)	.0	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	59	Temperature (F.)	38
Sulfate (SO_4)	3.0	Date of collection	Mar. 19, 1952
Chloride (Cl)	4.5		
Fluoride (F)	.2		
Nitrate (NO_3)	.2		
Dissolved solids	68		

Regular determinations at treatment plant, 1951

	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	--	--	--	6.4	6.8	6.4	--	--	--	47	61	37
Finished water	--	--	--	6.8	7.1	6.7	--	--	--	--	--	--

WATERTOWN
(Population, 12,417)

Ownership: Municipal.
Source: 3 drilled wells (1, 3, 4), 1,145, 725, and 725 ft deep; yield reported to be 1,100, 1,000, and 1,600 gpm.
Treatment: Fluoridation.
Raw water storage: None.
Finished water storage: 750,000 gal.

ANALYSIS

(Analysis, in parts per million, by Wisconsin State Laboratory of Hygiene)

	Finished water		Finished water
Silica (SiO_2)	11	Hardness as $CaCO_3$:	
Iron (Fe)	.50	Total	320
Manganese (Mn)	.00	Noncarbonate	15
Calcium (Ca)	69		
Magnesium (Mg)	36	Color	10
Sodium (Na)	4.0	pH	7.5
Potassium (K)	2.0	Specific conductance (micromhos at 25 C.)	--
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	373	Temperature (F.)	--
Sulfate (SO_4)	16	Date of collection	May 25, 1952
Chloride (Cl)	6.0		
Fluoride (F)	1.1		
Nitrate (NO_3)	.0		
Dissolved solids	330		

WAUKESHA
(Population, 21,233)

Ownership: Municipal; supplies also about 300 people outside the city limits. Total population supplied, about 21,500.
Source: 4 drilled wells. North Street well 1,907 ft deep (14 percent of supply); Moreland Avenue well 1,918 ft deep (28 percent of supply); Baxter Street well 1,785 ft deep (28 percent of supply); Newhall Avenue well 1,995 ft deep (30 percent of supply).
Treatment: Aeration.
Raw-water storage: None.
Finished-water storage: 1,891,000 gal.

ANALYSES

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

	Well, North St. (finished water)	Well, Baxter St. (finished water)	Well, Newhall Ave. (finished water)
Silica (SiO_2)	8.7	8.5	8.8
Iron (Fe)	.37	.45	1.8
Manganese (Mn)	.05	.04	.03
Calcium (Ca)	60	53	88
Magnesium (Mg)	31	25	29
Sodium (Na)	12	8.2	8.4
Potassium (K)	4.0	3.2	3.4
Carbonate (CO_3)	0	0	0
Bicarbonate (HCO_3)	285	261	290
Sulfate (SO_4)	111	68	163
Chloride (Cl)	12	5.2	5.2
Fluoride (F)	.5	.5	.5
Nitrate (NO_3)	.8	.4	.3
Dissolved solids	[a]440	[b]336	[c]506
Hardness as $CaCO_3$:			
Total	[d]337	[d]273	[d]387
Noncarbonate	104	59	150
Color	3	1	2
pH	7.6	7.8	7.7
Specific conductance (micromhos at 25 C.)	658	539	728
Turbidity	--	--	--
Temperature (F.)	--	--	--
Date of collection	May 2, 1952	May 2, 1952	May 2, 1952
Depth (feet)	1,907	1,785	1,995
Diameter (inches)	12	12	12
Date drilled	1935	1928	1945
Percent of supply	14	28	30

[a] Includes 52 ppm of strontium (Sr).
[b] Includes 33 ppm of strontium (Sr).
[c] Includes 40 ppm of strontium (Sr).
[d] Includes $CaCO_3$ equivalent to strontium (Sr).

WAUSAU
(Population, 30,414)

Ownership: Municipal.
Source: 8 drilled wells (1 to 8) 96, 93, 96, 96, 78, 100, 100, and 97 ft deep; yield reported to be 1,750, 2,200, 800, 1,750, 500, 3,600, 3,180, and 1,500 gpm.
Treatment: Aeration, coagulation with alum and lime, sedimentation, chlorination, rapid sand filtration, and postchlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw-water storage: None.
Finished-water storage: 3,070,000 gal.

ANALYSES

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

	Well 3 (raw water)	Well 4 (raw water)	Well 5 (raw water)	Finished water
Silica (SiO_2)	--	--	24	25
Iron (Fe)	--	--	.14	.23
Manganese (Mn)	--	--	.00	.00
Calcium (Ca)	25	23	18	33
Magnesium (Mg)	9.2	12	7.3	11
Sodium (Na)	--	--	5.0	4.3
Potassium (K)	--	--	.9	.6
Carbonate (CO_3)	0	0	0	0
Bicarbonate (HCO_3)	97	104	34	126
Sulfate (SO_4)	16	9.7	20	17
Chloride (Cl)	9.0	8.5	12	10
Fluoride (F)	--	--	.0	.0
Nitrate (NO_3)	--	--	25	1.5
Dissolved solids	--	--	134	182
Hardness as $CaCO_3$:				
Total	101	105	74	129
Noncarbonate	21	22	47	24
Color	6	5	0	5
pH	7.2	7.5	7.3	8.0
Specific conductance (micromhos at 25 C.)	217	212	190	260
Turbidity	--	--	--	--
Temperature (F.)	--	--	--	--
Date of collection	Nov. 7, 1951	Nov. 7, 1951	Nov. 7, 1951	Nov. 11, 1951
Depth (feet)	96	96	78	--
Diameter (inches)	24	24	24	--
Date drilled	1940	1943	1945	--
Percent of supply	--	--	--	--

WAUWATOSA
(Population, 33,324)

Ownership: Municipal.
Source: 7 drilled wells (2 to 8) 1,600, 1,703, 1,804, 1,714, 1,660, 1,675, and 1,750 ft deep; yield reported to be 400, 900, 1,250, 1,000, 1,400, 1,400 and 1,450 gpm. Wells 2 and 6 furnish 26 percent of supply; well 3, 3 percent; well 4, 22 percent; well 5, 18 percent; well 7, 29 percent; well 8, 2 percent.
Treatment: Chlorination.
Raw-water storage: 4,450,000 gal.
Finished-water storage: 1,500,000 gal.

ANALYSES

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

	Well 2 (finished water)	Well 6 (finished water)		Well 2 (finished water)	Well 6 (finished water)
Silica (SiO_2)	8.7	8.5	Hardness as $CaCO_3$:		
Iron (Fe)	1.8	.56	Total	530	495
Manganese (Mn)	.00	.03	Noncarbonate	360	323
Calcium (Ca)	161	150			
Magnesium (Mg)	31	29	Color	3	1
Sodium (Na)	14	12	pH	7.5	7.4
Potassium (K)	3.7	3.1	Specific conductance (micromhos at 25 C.)	954	903
Carbonate (CO_3)	0	0			
Bicarbonate (HCO_3)	206	208			
Sulfate (SO_4)	367	334	Turbidity	--	--
Chloride (Cl)	10	10	Temperature (F.)	--	--
Fluoride (F)	.4	.3	Date of collection	May 6, 1952	May 6, 1952
Nitrate (NO_3)	.1	.0			
Dissolved solids	742	699			
Depth (feet)				1,600	1,660
Diameter (inches)				8	12
Date drilled				1897	1930
Percent of supply				--	--

WEST ALLIS
(Population, 42,959)

Ownership: Municipal.
Source: Supplied by Milwaukee. (See Milwaukee.)

WHITEFISH BAY
(Population, 14,665)

Ownership: Municipal.
Source: Supplied by Milwaukee. (See Milwaukee.)

WISCONSIN RAPIDS
(Population, 13,496)

Ownership: Municipal.
Source: 1 collector well, 180 inches diameter, 27 ft deep, located at 16th and Peach Streets (15 percent of supply); 7 drilled wells (A, B, C, D, E, F, G), 57 to 70 ft deep, $1\frac{1}{2}$ miles south of Wisconsin Rapids (85 percent of supply).
Treatment: Coagulation with alum, lime, and silicate, sedimentation, rapid coal filtration, fluoridation, and chlorination.
Rated capacity of treatment plant: 5,000,000 gpd.
Raw water storage: None.
Finished-water storage: 1,200,000 gal.

ANALYSIS

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

	Finished water[a]		Finished water[a]
Silica (SiO_2)	11	Hardness as $CaCO_3$:	
Iron (Fe)	.08	Total	79
Manganese (Mn)	.00	Noncarbonate	21
Calcium (Ca)	26		
Magnesium (Mg)	3.6	Color	10
Sodium (Na)	3.5	pH	7.7
Potassium (K)	1.0	Specific conductance (micromhos at 25 C.)	178
Carbonate (CO_3)	0	Turbidity	--
Bicarbonate (HCO_3)	72	Temperature (F.)	--
Sulfate (SO_4)	21	Date of collection	Feb. 23, 1952
Chloride (Cl)	3.8		
Fluoride (F)	1.3		
Nitrate (NO_3)	2.2		
Dissolved solids	110		

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	66	71	63	8.6	9.1	8.5	92	96	89	.26	.37	.21

[a] Mixed water from collector well and five of the drilled wells.

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