I need to incorporate this information in Water Supply Program

United States Department of the Interior

GEOLOGICAL SURVEY
P. O. Box 2857
Raleigh, NC 27602

August 8, 1978

Mr. John D. Wray, Deputy Chief
Water Resources Planning Section
Division of Environmental
Management, DNR&CD
P. O. Box 27687
Raleigh, NC 27611

Addendum to the following for "Allowable Draft" when not determined due to carryover storage analysis

Dear John:

I have computed the estimated allowable draft for those public water supplies that were not computed during the regular project because a carry-over storage analysis was required. Before the computations were made, I called and/or visited these cities to determine if the source and raw-water storage data were still accurate. The allowable drafts and a summary of new data are listed below.

Part 1 Northern Piedmont

1. Mebane, Alamance County:
   In 1975 Mebane and Graham entered a joint agreement to build a 6 mgd treatment plant on Graham's reservoir. Lake Michael, Mebane's reservoir, is used only when needed. Water released from Lake Michael flows into Graham's City lake. The estimated allowable draft of Lake Michael is 0.8 mgd with a storage of 217 million gallons.

2. Kernersville, Forsyth County:
   Kernersville's New Town Lake on Belews Creek was contaminated by a waste spill. The town has been given permission to use the lake but the City Council voted against returning the lake to service. Currently, the town is using the small standby lake for approximately one half of their needs and purchasing the remainder from Winston-Salem. They plan to eventually purchase all their water from Winston-Salem (May 1978). The estimated allowable draft of New Town Lake is 1.5 mgd with an adjusted storage of 120 million gallons.

3. Roxboro, Person County:
The treatment plant capacity was increased to 8 mgd. A new raw water reservoir is under construction on South Hyco Creek. The new reservoir is located about 1/2 mile upstream from SR 1102, Person County, near the Person-Caswell County line at lat 36°20'53", long 79°09'00". The drainage area at the dam is 27.1 square miles, approximately. Water is released from the dam and flows to a low dam and pumping station at lat 36°23'17", long 79°06'19". The pumping station is about 600' downstream from US 158. The raw water storage capacity of the new reservoir is 2,850 million gallons. The estimated allowable draft of the new reservoir is 11.3 mgd, with a storage of 2,850 million gallons.

The estimated allowable draft of the old lake is 3.3 mgd, with an adjusted storage of 790 million gallons.

4. Asheboro, Randolph County:
No change in source or storage since 1970. Currently planning a new lake on Uwharrie River with a storage capacity of 7420 acre-feet and an expected yield of 15.4 mgd. Estimated allowable draft of Lake Ross, Lake McCrary, and Lake Bunch combined is 1.0 mgd with a storage of 160 million gallons. Estimated allowable draft of Lake Lucas is 6.7 mgd with a storage of 1,250 million gallons.

Part 2 Southern Piedmont

1. Concord, Cabarrus County:
No changes. Estimated allowable draft of Lake Fisher is 7.5 mgd with an adjusted storage of 1,000 million gallons. Estimated allowable draft of Lake Concord is 1.8 mgd with an adjusted storage of 330 million gallons. Estimated allowable draft of Coddle Creek is 2.2 mgd with no storage.

2. Kannapolis, Rowan County:
No changes. Estimated allowable draft of Kannapolis Lake is 4.9 mgd with an adjusted storage of 980 million gallons.

3. Southern Pines, Moore County:
One well, with a reported yield of 110 gpm (0.16 mgd), was drilled and two more are planned in immediate future. A pipe line with a capacity of 0.5 mgd was installed from the Carthage pumping station on Nicks Creek to Southern Pines Lake. Estimated allowable draft of Southern Pines Lake is 1.8 mgd (including the water from Nicks Creek) with an adjusted storage of 200 million gallons.

4. Rockingham, Richmond County:
   Raw water storage data are very questionable and I have been unable to obtain any better values. The storage data are probably low and on the safe side. Estimated allowable draft of City Lake is 1.0 mgd with a storage of 5 million gallons. Estimated allowable draft of Roberdell Lake is 8.2 mgd with a storage of 25 million gallons.

5. Hamlet, Richmond County:
   The dam at the larger city lake has been raised and an additional 15 million gallons storage obtained. In addition, City Lake, which was contaminated in 1972 and not usable, has been cleaned and is available as an emergency supply. The drainage area at the intake was reported as 2.1 square miles in Part 2 and is actually 3.1 square miles. City Lake is also on Marks Creek, downstream of the other two lakes, and has a drainage area of 7.35 square miles. Raw water storage data for City Lake is not available. I estimate the storage as 90-100 million gallons. The estimated allowable draft of the combined system is 2.9 mgd with a storage of 275 million gallons.

Part 3 Mountains and Western Piedmont

1. Kings Mountain, Cleveland County:
   The estimated allowable draft of City Lake is 0.4 mgd with a storage of 96 million gallons. The estimated allowable draft of Davidson Lake is 0.7 mgd with a storage of 180 million gallons. The estimated allowable draft of John Henry Moss Reservoir is 46 mgd with a storage of 12,700 million gallons.

This completes our work on the Public Water Supply project. If you have any questions give me a call.

For the District Chief, Ralph C. Heath.

Sincerely yours,

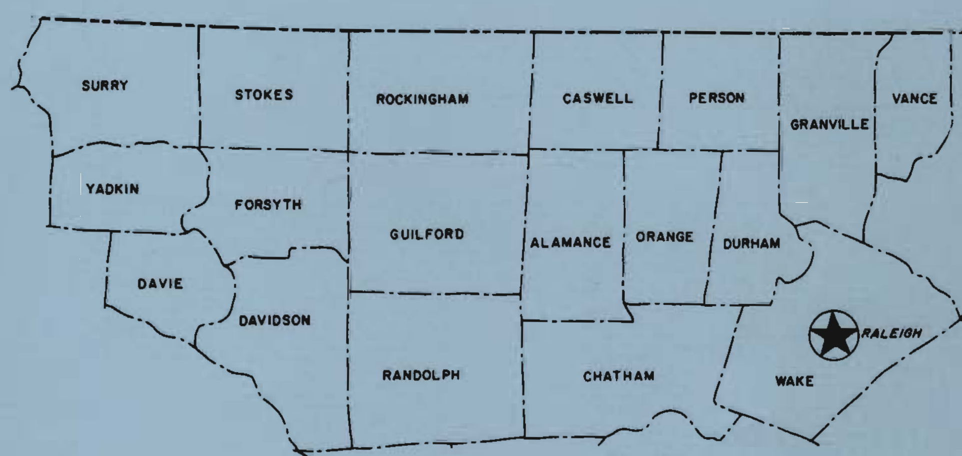
N. M. Jackson, Jr.

N. M. Jackson, Jr.
Hydrologist

NMJ:ceh

STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES
BOARD OF WATER AND AIR RESOURCES
OFFICE OF WATER AND AIR RESOURCES

PUBLIC WATER SUPPLIES OF NORTH CAROLINA



Part I
NORTHERN PIEDMONT

By

N. M. Jackson, Jr.

Prepared by
United States Department of the Interior
Geological Survey
In Cooperation with the
North Carolina Office of Water and Air Resources

Raleigh, N.C.
JULY 1972

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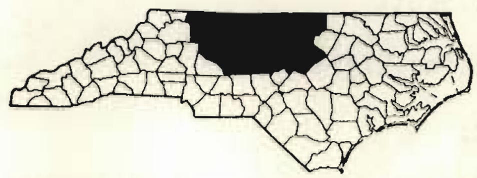

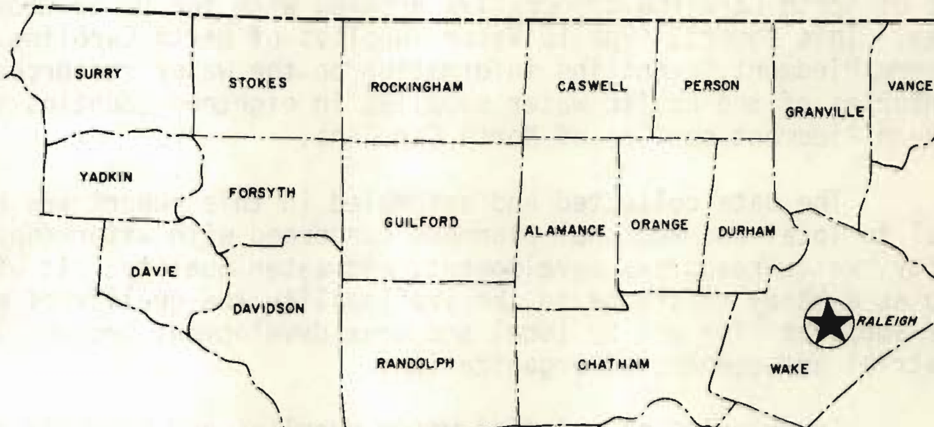

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STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES
Box 27687 Raleigh 27611

CHARLES W. BRADSHAW, JR.
SECRETARY

ROBERT W. SCOTT
GOVERNOR

Office of Water and Air Resources
GEORGE E. PICKETT, DIRECTOR
TELEPHONE 829-3003

In reply refer to:
PL 72 TGH

October 31, 1972

Honorable Robert W. Scott
Governor
Raleigh, North Carolina 27611

Dear Governor Scott:

I am pleased to submit the latest report resulting from the State of North Carolina cooperative program with the U. S. Geological Survey. This report, "Public Water Supplies of North Carolina, Part 1, Northern Piedmont," contains information on the water resources and inventories of the public water supplies in eighteen counties in the Northern Piedmont section of North Carolina.

The data collected and assembled in this report are especially useful to local and regional planners concerned with water-supply availability, water-resources development, and water quality. It will also serve as a handy reference on the availability and quality of municipal water supplies for use by local and area development groups and for industrial and commercial organizations.

Inventories of existing water supplies and assembly of pertinent water resources data are a continuing activity to assure that data needed for planning the utilization of our water resources are available.

Sincerely,

George E. Pickett

George E. Pickett

Attachment

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PREFACE

Interest in data on public water supplies of North Carolina has existed for many years. In 1947 the U. S. Geological Survey prepared Progress Report 1 on public supplies derived from surface-water sources and in 1949 Progress Report No. 2 on the public supplies derived from ground-water sources; both reports resulted from cooperative studies with the N. C. Board of Health. In 1961, Bulletin 2 of the North Carolina Department of Water Resources titled, "Chemical and Physical Character of Municipal Water Supplies in North Carolina" was published. This Bulletin reported the results of chemical analyses and rather brief information on source and pumpage or consumption of the water supplies of 324 cities and towns in North Carolina. The work was done by the U. S. Geological Survey in cooperation with the North Carolina Department of Water Resources. From 1961 to 1965 three supplements to Bulletin 2 were prepared under the continuing cooperative agreement to include new chemical analyses and changes in public water supplies. In 1969 all the data collected between 1960 and 1965 were published in Bulletin 3.

The rather brief information collected under this program was determined to be inadequate to meet long-range planning needs. Accordingly, the program has been enlarged to include a complete inventory and general comments on present and potential development of all public water supplies in North Carolina with 500 or more customers.

The enlarged scope of the program and fund limitations preclude collection and timely release of data on all water supplies in one volume. Therefore, the State has been divided into five areas, with approximately sixty public water systems in each. The division was made along county boundaries and is shown on the map in figure 1.

Inventory data on the public water supplies in each area are to be collected and published, in one volume on each area, at the rate of one volume annually.

This volume contains data on the northern Piedmont, the first area to be studied.

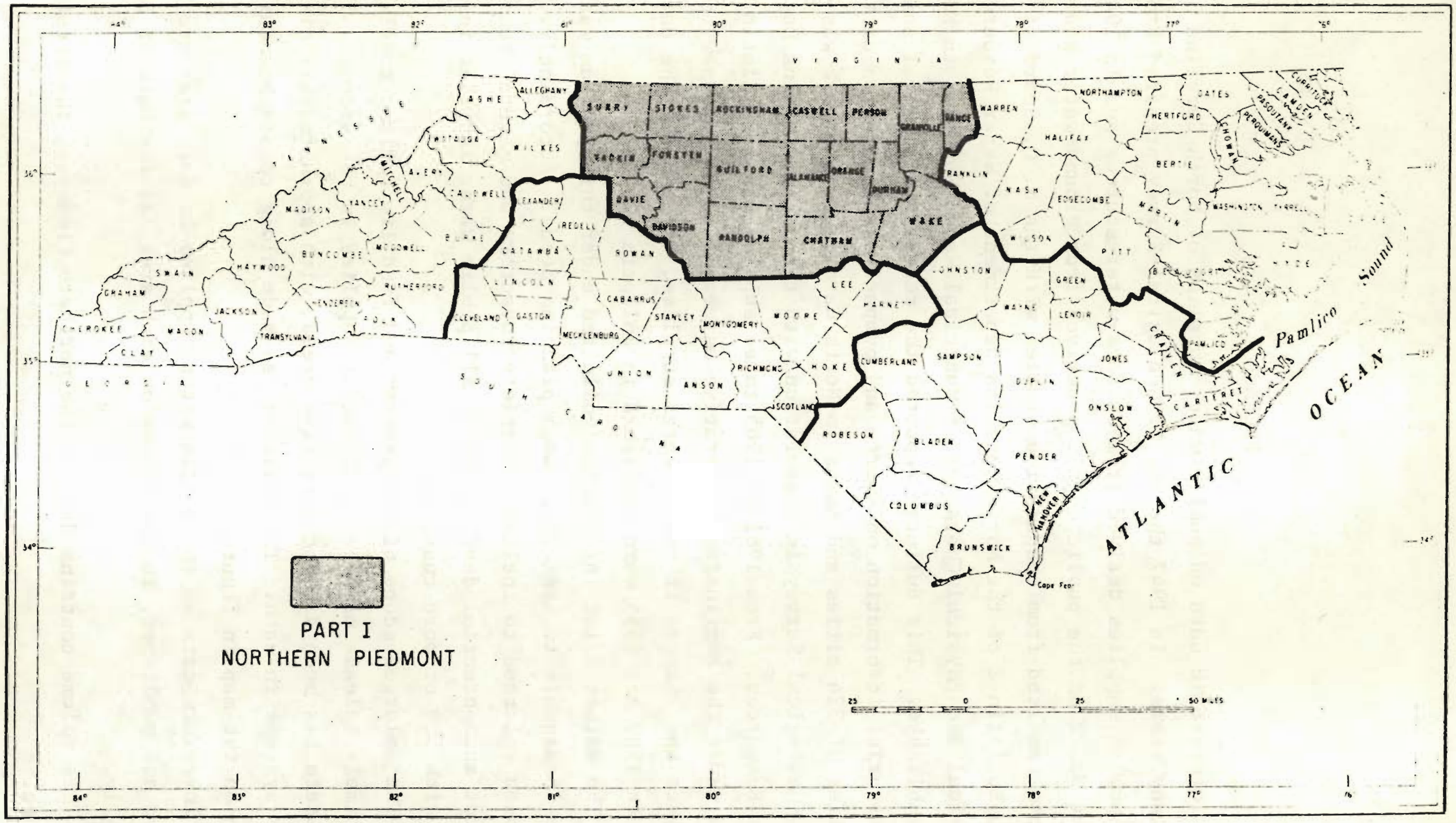

Figure 1.--Map of North Carolina showing subdivision of the State for purpose of the public water-supply inventory.

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ILLUSTRATIONS

PUBLIC WATER SUPPLIES OF NORTH CAROLINA

PART 1

NORTHERN PIEDMONT

By N. M. Jackson, Jr.
U. S. Geological Survey

ABSTRACT

This report contains information on the water resources and inventories of the public water supplies in eighteen counties in the northern Piedmont section of North Carolina useful to planners and water managers concerned with water-supply availability, water-resources development, and water quality.

The report is divided into two sections. The first describes the method of investigation, an explanation of the information reported for each water supply and its significance to planning, a discussion of the chemical analyses included in the report, and a discussion of some of the problems noted during the investigation. The second includes a water-resources appraisal and a map of each county showing the general area served by public water supplies and an inventory of each public supply in the county with 500 or more customers that gives: (a) the population served, (b) the adjacent communities served, (c) the number of metered customers, (d) the source of water, (e) estimated allowable draft, (f) total and industrial water use, (g) raw and finished water storage, (h) raw and finished water-pumping capacity, (i) future plans, (j) a water-resources appraisal in the immediate vicinity of the supply and, (k) the results of chemical analyses of raw and finished water.

INTRODUCTION

An inventory of the municipal water supplies in North Carolina with 500 or more customers was undertaken in 1970 as a part of the cooperative program between the State and the U. S. Geological Survey. The program provides information needed in the planning, development, and utilization of the municipal water supplies in the State. This report is one of a continuing series, each of which will contain information on approximately one-fifth of the municipal water supplies in the State. The information is reported on a county basis, with the number of counties included in each report being controlled by the number of municipal water systems.

The information for each county includes: a general appraisal of the surface-water and ground-water resources, a map showing the approximate area served by municipal systems, an inventory of each municipal system with 500 or more customers, and results of chemical analyses of samples of the raw and finished water from each water system.

The surface-water appraisals contain information on streams draining the county, including estimates of average and minimum flows. The ground-water appraisals include a summary of the ground-water conditions, data on reported well depths and yields, and a general statement on the chemical quality of ground water.

The inventory of the municipal systems in each county includes information on the population served, source of supply, raw and finished water storage, estimated allowable draft, total use, industrial use, pumping capacity, treatment and treatment capacity, and an appraisal of the surface-water and ground-water resources in the immediate vicinity of the municipality.

The results of chemical analyses include an analysis of the chemical constituents most commonly found in water, a "standard complete analysis," and an analysis for a selected group of minor elements.

This report also includes a discussion of the method of investigation, brief descriptions of water-treatment processes, the significance of the data as related to planning, and general comments concerning problems noted.

COOPERATION AND ACKNOWLEDGMENTS

The study of the public water supplies in North Carolina was made by the U. S. Geological Survey, in cooperation with the Office of Water and Air Resources, North Carolina Department of Natural and Economic Resources. The assistance and guidance of Col. Thomas G. Harton, Director, and Mr. John D. Wray, Assistant Director, of the Planning Division, is gratefully acknowledged. Mercury concentrations were determined in the laboratory of the Office of Water and Air Resources under the direction of Mr. Lloyd Tyler. The investigation was made under the supervision of Ralph C. Heath, District Chief.

Needless to say, most of the data contained in this report could not have been collected without the generous cooperation of municipal officials and engineering consultants, who supplied information on the water-supply installations and who collected many of the water samples.

This report is published by the North Carolina Department of Natural and Economic Resources, in the interest of making the information available to all concerned with the development and utilization of municipal water supplies in the State.

METHOD OF INVESTIGATION

Each municipality and rural water system in North Carolina with 500 customers or more was visited by hydrologists of the U. S. Geological Survey. The purpose of these visits was to obtain data on the major components of the water system and to collect water samples for analysis. Where possible, consulting engineers of the individual systems were visited to obtain additional information. Water-system-appraisal reports by consultants were reviewed, if available. The general appraisal of the surface-water and ground-water resources in each county and in the vicinity of each municipality was made largely on the basis of information in published reports or in the files of the Geological Survey.

The collection of streamflow data and the study of streamflow characteristics is a continuing activity of the Geological Survey. Streamflow data in this report were developed from streamflow records collected at more than 2,500 sites in the State. Extensive use was made of a report prepared by Goddard (1963). Goddard presented data on average discharge, flow-duration curves, low-flow frequency, and draft-storage frequency based on streamflow records collected through 1956. The results of similar studies based on additional records collected since the publication of Goddard's report were also used in making the surface-water appraisals.

The appraisals of ground water depend largely on a knowledge of the dominant geologic conditions of the locality. Previous investigators have divided the State into five broad hydrologic areas based on the dominant geologic conditions that affect the occurrence of ground water. These areas and the geologic condition used as a basis for their differentation are:

1. <u>Sand Hills Hydrologic Area</u>.--Productive water-bearing sand at the land surface and overlying, for the most part, nonproductive material.

2. <u>Outer Banks Hydrologic Area</u>.--Productive water-bearing sand at the land surface containing fresh water in contact with sea water.

3. <u>Castle Hayne Limestone Hydrologic Area</u>.--Water-bearing limestone overlain by substantially less productive material.

4. <u>Central Coastal Plain Hydrologic Area</u>.--Numerous thin layers of productive sand complexly interbedded with nonproductive layers.

5. <u>Piedmont and Mountain Hydrologic Area</u>.--Poorly productive surficial granular material overlying relatively more productive fractured rock.

The location of these hydrologic areas is shown in figure 2.

Appraisals of ground-water conditions of counties and municipalities within the five broad areas outlined above were based on reports of reconnaissance ground-water investigations published in a series of bulletins "Geology and Ground Water Conditions in the _____ area North Carolina." Figure 3 is an index map of North Carolina showing locations of reconnaissance ground-water investigations.

The purpose of these investigations was to compile data on the ground-water resources, including data on use, availability, chemical quality, and geologic controls of ground water.

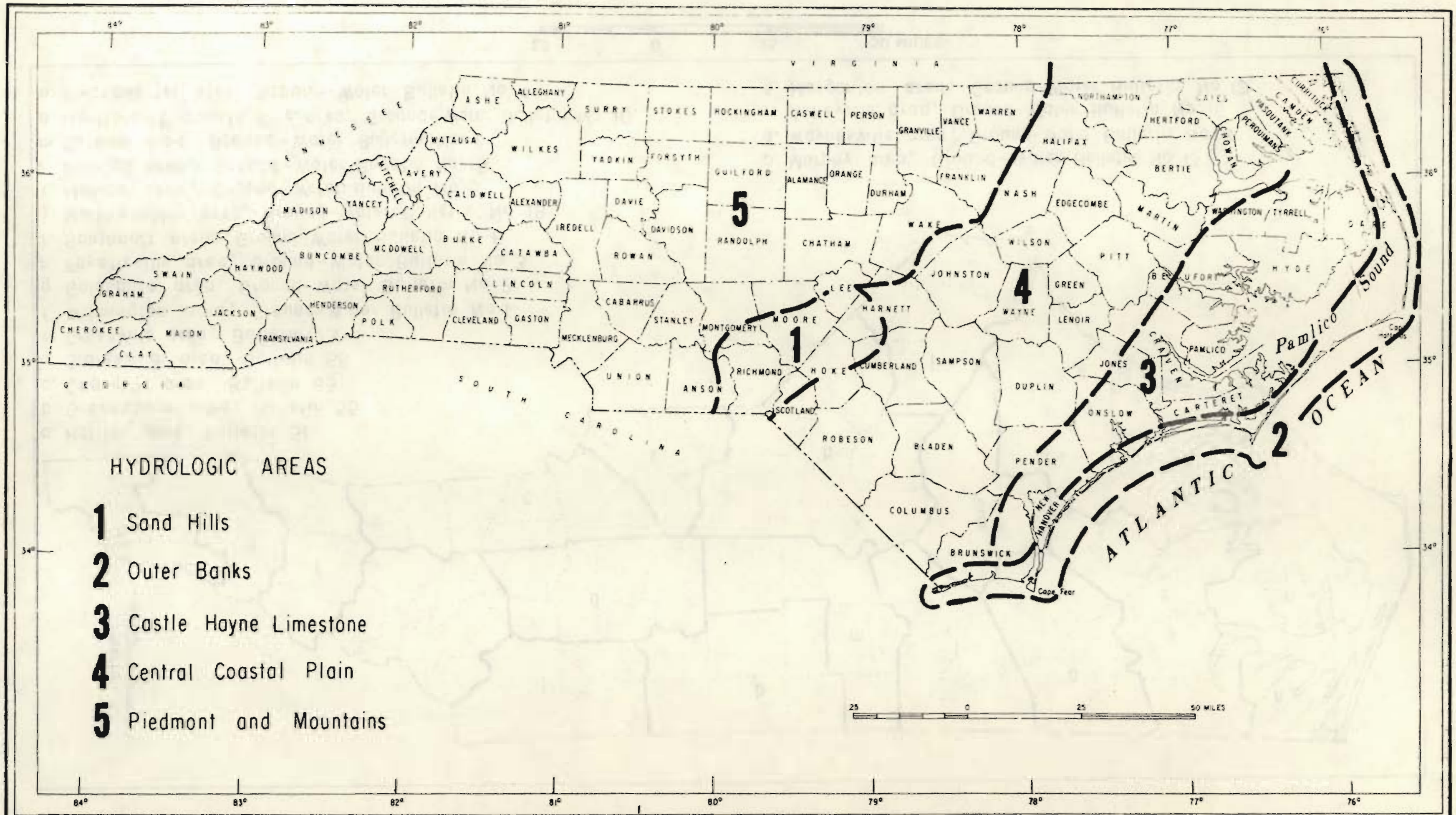

Figure 2.--Map of North Carolina showing the approximate boundaries of the hydrologic areas pertinent to the description of ground-water conditions.

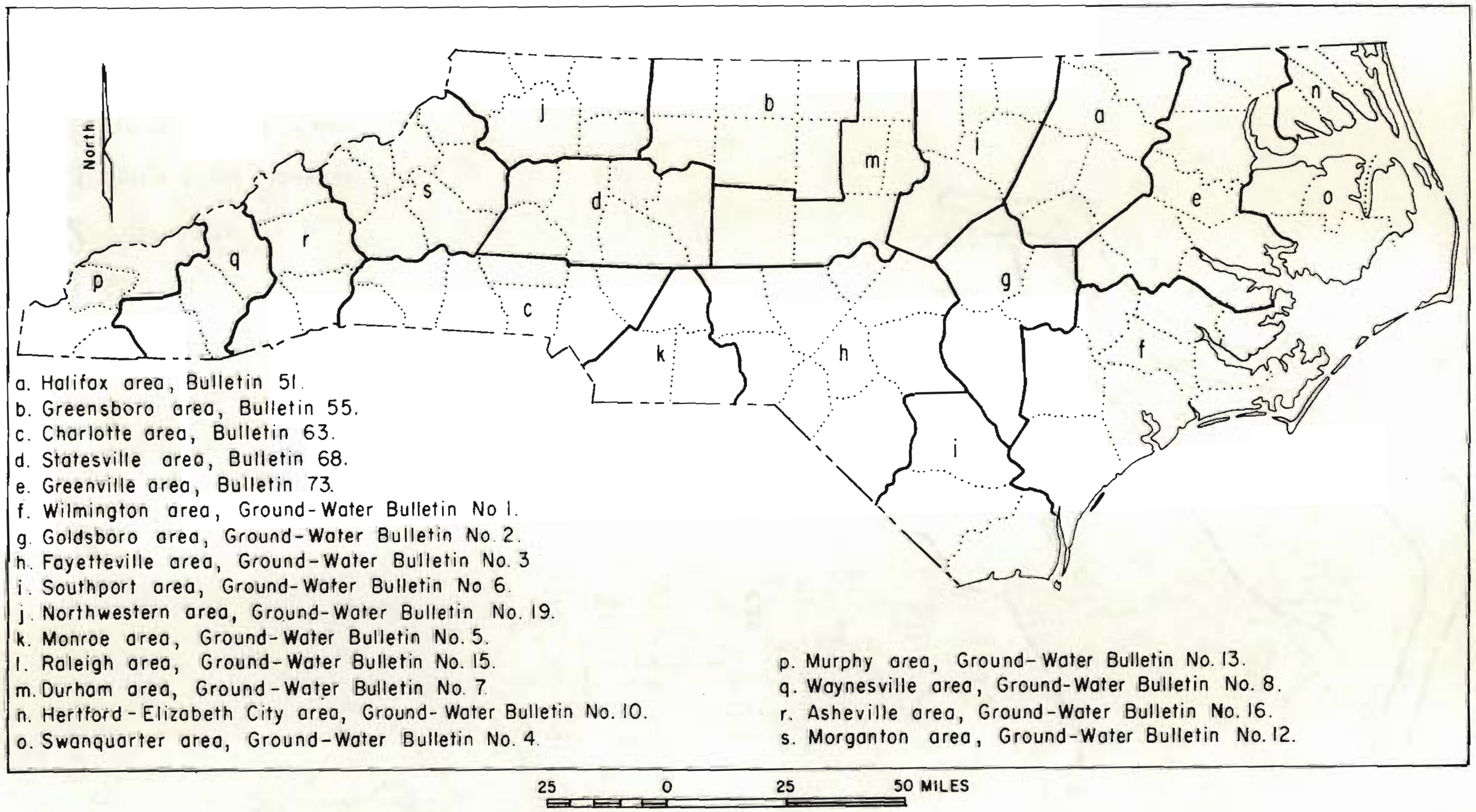

Figure 3.--Index map of North Carolina showing areas covered by reconnaissance ground-water investigations.

EXPLANATION OF INVENTORY DATA

The function of a water-supply system is to produce continuously an adequate supply of water that is wholesome and palatable.

A knowledge of the present and potential capacity of the various components (source, treatment plant, distribution lines) of the water system is required if water managers and planners are to insure that the water-supply systems of North Carolina will fulfill this primary function.

The information collected for each water supply and the purpose or significance of the information, except where self evident, includes:

Ownership

The owner listed is either the municipality, the private individual, or the private company that owns and operates the water-treatment plant. In some cases the treatment plant is privately owned, and the municipality owns the distribution system.

Also included in this section is the approximate population supplied and the number of metered connections inside and outside the corporate limits. The rate of growth in population and water use, in gallons per capita per day, are commonly used by engineers to estimate future water requirements.

Source

The source(s) of the raw water and location of the intake(s) are given for surface-water supplies. For ground-water supplies, the location of the wells and pertinent data on the construction and operation of the wells are given. Well-construction data and well-operation data are generally not available. It is recommended that this information be collected and retained by all systems using wells.

Raw water storage

The amount of raw-water storage listed is the latest figure available. In places where conflicting estimates of storage were obtained, the listed storage is that considered the most reliable.

Minimum flows of all but the largest streams are inadequate to meet the daily demand of most public water supplies, and flood waters must be stored in sufficient volume to assure a continuous supply. Storage reservoirs may be "on river" or "off river." On-river storage is created by construction of a dam on the main channel of the river, whereas off-river storage is a reservoir not on the main channel. Off-river reservoirs are normally filled by pumping water from the stream to the reservoir. Such reservoirs are generally smaller than on-river reservoirs but have an advantage in that the water-plant operator can be selective, from a quality standpoint, in filling the reservoir.

Estimated allowable draft

Allowable draft is the maximum rate at which water can be continuously withdrawn, either from the stream or from storage, without exhausting the supply. Draft estimates were based on minimum flows that can be expected to occur once in 20 years on the average. Thus, the stream or the stream supplemented by storage should provide the estimated draft rate 19 years out of 20, on the average.

All methods used to determine draft rates are based on some record of streamflow. Unfortunately, many reservoirs and water intakes are located on streams where no record of streamflow are available. Therefore, a method for transferring results from a gaged stream to the ungaged stream was used.

The regional relation of the 7-day, 2-year minimum flow to allowable draft shown in figure 4 was used to estimate allowable draft rates for each system.

The relation curves shown in the figure are averages of draft-storage frequency data published in U. S. Geological Survey Water-Supply Paper 1761. (Goddard, 1963). The reliability or accuracy of draft rates computed using figure 4 depends on the scatter of the values used to determine the average curve and the accuracy of the estimate of the 7-day, 2-year minimum flow used to enter the relation. The standard error of estimate (a measure of the scatter of the points used to define the relation curves) of the draft rates shown in figure 4 are as follows:

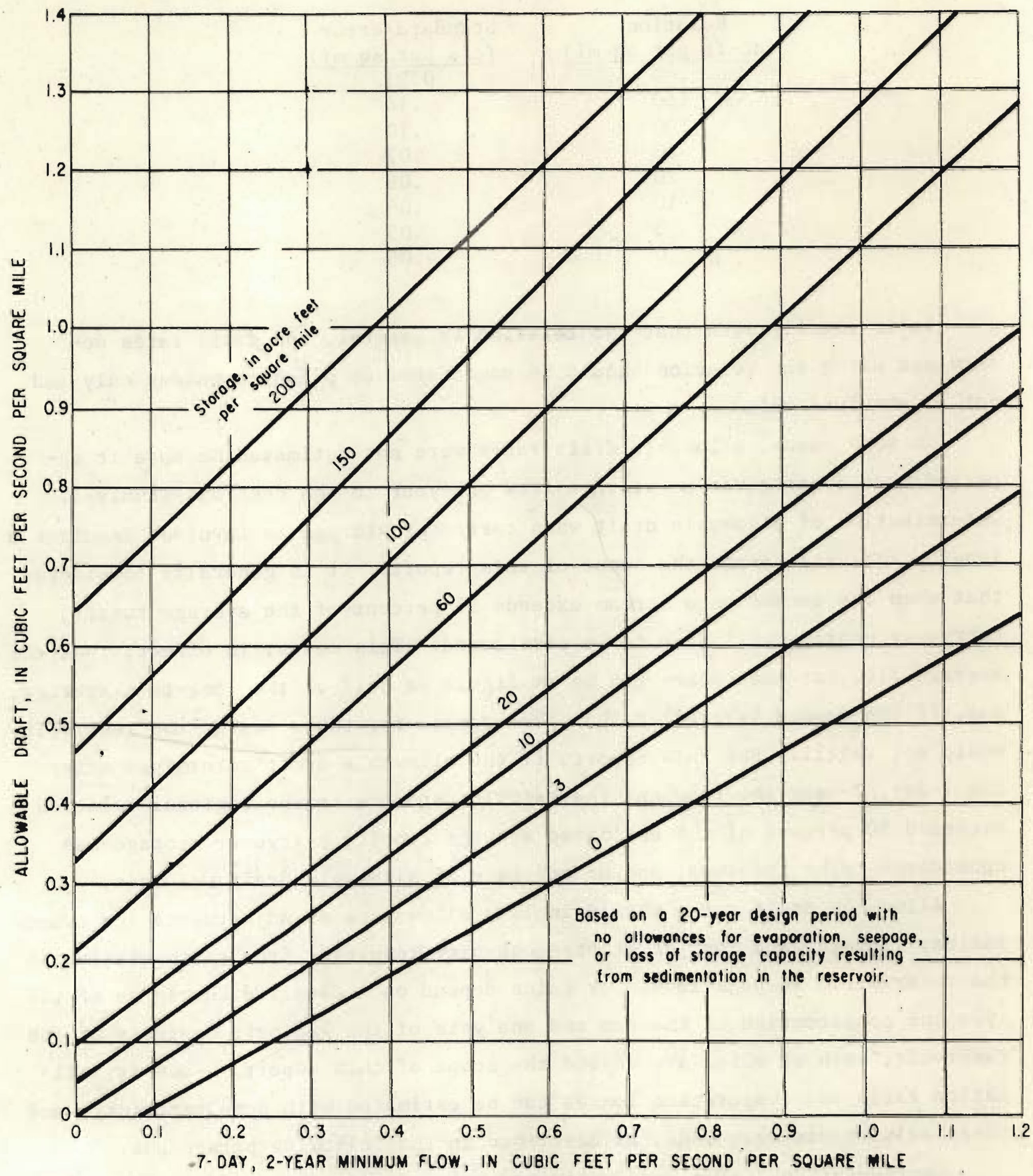

Figure 4.--Relation for estimating the allowable draft of a stream-reservoir using the 7-day, 2-year minimum flow of the stream as an index for entering the graph.

Relation (ac-ft per sq mi)	Standard error (cfs per sq mi)
200	0.21
150	.14
100	.10
60	.07
20	.08
10	.06
3	.05
0	.05

It is readily seen that the relation is general, and draft rates determined using the relation should be considered as planning guides only and not as absolute values.

In some cases, allowable draft rates were not estimated because it appeared that a carryover of storage from one year to the next was involved. Determination of allowable draft when carryover storage is involved requires a lengthy analysis beyond the scope of this report. It is generally considered that when the demand on a stream exceeds 50 percent of the average runoff, carryover storage will have to be considered. This means, in effect, that the average flow for some years can be as little as half of the long-term average, and, if the demand is greater than the average for those years, the reservoir would not refill. For this report, if the allowable draft determined using the 7-day, 2-year low flow and the existing storage in the regional relation exceeded 50 percent of the estimated average runoff, carryover storage was considered to be involved, and no estimate of allowable draft was made.

Allowable draft rates should include allowances or adjustments for evaporation, seepage, and loss of storage capacity resulting from sedimentation in the reservoir. Seepage losses or gains depend on a detailed knowledge of the type and construction of the dam and analysis of the geologic features of the reservoir, both of which are beyond the scope of this report. However, siltation rates and evaporation losses can be estimated with some certainty, and these adjustments were made, as described in the following paragraphs.

Sedimentation losses were estimated using data on annual loss rates for North Carolina reservoirs reported by Dendy and Champion (1969, p. 5, 6). The total sedimentation loss was computed using a loss rate experienced in similar types of basin and the time span from the time of the last reservoir volume determination to 1980. The volume loss thus estimated was subtracted from the reported storage before entering the relation in figure 4.

Minimum flows and maximum water demands generally occur during the summer and early fall in North Carolina. To coincide with this period, estimates of evaporation losses were based on the average daily land-pan evaporation during the months of August, September, and October, adjusted by a coefficient of 0.75. Evaporation data from the pan nearest each reservoir was used. A small amount of lake-evaporation data is available and was used in some evaporation estimates. Evaporation losses constitute a demand or additional draft on the source and were subtracted from the allowable draft obtained from the regional relation.

Total use

Average daily use and maximum daily use are given. Water usage varies from hour to hour, day to day, and season to season. In general, the smaller the community, the greater the variation in its demand for water. Water systems, of course, have to be of sufficient capacity to meet the peaks in demand. The ratio of the maximum daily use versus the average daily use is one design criteria used in sizing the various components of a water system. The rate of increase in usage over a period of years is used to predict future water requirements and to design and schedule construction of the necessary facilities.

Industrial use

The amount of water used by industry, in million gallons per day, was estimated. These estimates were based on actual meterings of the larger users plus an estimated value for smaller industrial users. Where two or more industries use a significant amount of water, these corporations are listed.

Industrial water use often accounts for more than 50 percent of the total demand on a water supply. It is obvious then that a new "wet" industry, an expansion of an existing industry, a change in the manufacturing process that requires more or less water, or the closing of an industry, can greatly affect the water needs of a community. It is also obvious that good planning must include an analysis of present and future industrial water requirements.

Treatment

The treatment given to each water supply is listed in this section. Some raw waters are satisfactory in quality for all municipal uses. Most, however, require disinfection and purification before they can be used. The treatment given varies according to the quality of the raw water being treated. Briefly, some of the processes and their purposes that are used in water-treatment plants are as follows:

Aeration.--is a process in which water is brought in intimate contact with air for the purpose of changing the concentrations of volatile substances contained in the water. It reduces the amount of free carbon dioxide and hydrogen sulfide and supplies oxygen to those waters that are deficient. Aeration is generally associated with taste and odor control.

Prechlorination.--is the application of chlorine at any stage in the treatment prior to filtration. The primary purpose of the application of chlorine to water is to kill pathogenic or disease-producing bacteria. However, prechlorination not only disinfects but also improves coagulation in those waters that contain objectionable amounts of color and iron, retards decomposition of organic matter in the coagulation basin, removes certain tastes and odors by oxidizing organic matter, and controls the growth of plants and microscopic organisms that could produce undesirable tastes and odors and reduce filter-bed efficiency.

Coagulation.--is a process that involves the formation of chemical flocs that adsorb, entrap, or otherwise bring together collodial and other finely-divided matter suspended in the water. These flocs, which resemble cotton candy, slowly settle and drag down the suspended matter.

Sedimentation.--All particles suspended in water tend to move downward under the influence of gravity regardless of size, shape, or weight. Flowing water tends to hold particles in suspension. Sedimentation is a process whereby the sediment-carrying power of flowing water is reduced by slowing the linear velocity of water until suspended matter will settle out. Coarse sediments may settle in hours, whereas fine sediments may require weeks to settle completely. Coagulation, as outlined above, speeds the rate at which fine sediments settle.

Taste and odor control with carbon.--The two major sources of undesirable tastes and odors are: (1) decaying vegetation, live and dead algae, and bacterial slimes and (2) sewage and industrial wastes. Practically all steps in the treatment process combat undesirable tastes and odors. Activated carbon is a chemical added primarily to adsorb taste, odor, and color from water supplies. After adsorbing undesirable tastes, odors, and colors, the carbon is either settled or filtered out.

Filtration.--is the act of passing the water through a porous material in such a manner as to effectively remove suspended matter. A filter is, in essence, a strainer that physically traps the suspended material. The porous material (filter media) consists of layers of gravel, sand, and anthracite. The standard filtration rate per square foot of filter area is 2 gallons per minute.

Corrosion control.--The objectives of corrosion control are: (1) to increase the life of the distribution system, (2) to decrease pumping costs, and (3) to protect the potability of the water. The most popular method of control is the addition of calgon (sodium hexametaphosphate) in the treatment process. It is not entirely clear how calgon or the other poly phosphate conditioners operate, but the current theory is that a film of molecular thickness is deposited over the pipe surface and acts as a protective coating. Calgon also will hold iron and calcium in solution.

Probably the most effective method of controlling corrosion is by physically coating iron pipes with a protective coating, such as cement, or by using nonmetallic pipes, provided other factors such as workability, cost, and strength reduction are not involved.

Adjustment of pH.--pH is a number used to express the free hydrogen ion concentration of a solution. The free hydrogen ion concentration determines whether a solution is acid, neutral, or basic and is one of the most important chemical properties of water. The degree of acidity or basicity of a water frequently determines its suitability for a particular purpose, whether it will be corrosive and whether it will respond to a certain type of treatment. For these reasons, the pH of the water is adjusted in the treatment process.

Post chlorination.--The addition of chlorine at any time after filtration is called postchlorination. Sufficient chlorine is added to the water to ensure that bacterial growth is suppressed from the time the water leaves the treatment plant until it flows from the tap in the home.

Fluoridation.--is the adjustment of the fluoride content of water. Fluoride in water has been shown to reduce dental decay among children significantly. The North Carolina State Board of Health policy states that "Fluoridation of water is approved and recommended for public and institutional supplies serving communities where there is a strong public demand, and where the decision to fluoridate the water supply is concurred in by the local dental society, the local medical society, and the local or district health officer, provided that the required procedures for fluoridation for public and institutional supplies are adhered to."

Rated capacity of treatment plant

The rated capacity of the treatment plant, expressed in million gallons per day, is given. Water treatment may consist of any one of several processes, singly or in various combinations, such as coagulation, sedimentation, filtration, disinfection, etc. Treatment facilities, ideally, are of sufficient size to provide, without interruption, treated water to meet the demands of the system. The link in the system having the least capacity fixes the capacity of the overall system.

Pumping capacity

The raw water and finished water pumping capacities are listed. In relatively new systems or in systems that have recently pumped water at capacity, the pumping capacities listed are accurate. In older systems, where additions or alterations to the system have been made, the pumping capacities listed often are simply the sum of the rated capacities of the pumps. The latter method is not entirely correct because many factors, such as the condition of the pumps and the head on the pumps, control the pumping capacity. In addition, all water systems have standby pumps, which are normally used in case of a pump failure or when performing maintenance on the regular pumps but can be used in conjunction with the regular pump if needed, provided the distribution system can withstand the increased pressure.

Finished water storage

Finished water is stored in distribution reservoirs for the purpose of leveling off peaks in demand. Water usage during some hours of the day greatly exceed the capacity of the treatment plant, and these demands are met with water stored during periods of low demand. Distribution reservoirs are generally classed as elevated storage or ground storage. The amount of storage in each type of reservoir is given.

Future plans

Included in this section are plans for alterations or additions to the major components of the water-supply system. Minor changes in the distribution system are not included.

Water-resources appraisals

The quantity of water available in a particular locality is an important factor in the economic growth of the locality. The selection of a source for water supply, whether surface water or ground water, depends on the quantity available and the economic factors involved in developing the source. The water-resources appraisals are a summary of water-supply characteristics of streams and a summary of available information on ground-water conditions in the immediate vicinity of each municipality, including:

Surface water.--The magnitude and frequency of low flows and the average discharge are indicative of the amount of water available for development. In the water-resources-appraisals, values for the average discharge and the average 7-day, 2-year minimum flows are listed. In addition, references are made in the discussions to "minimum flow" or to the "low-flow yield" of streams. These references to low flows generally refer to the average 7-day, 20-year minimum flows. Each appraisal also includes possible streams for future development or a comment on the possibilities of further development of the present source.

Ground water.--Ground-water appraisals include a general summary of occurrence of ground water, including the types of rocks in which the water occurs, reported well depths and yields, and a general statement of the quality of ground water in the area. The appraisals also include the estimated potential yield of wells drilled in the immediate vicinity.

CHEMICAL ANALYSES

Water is referred to as the universal solvent because it has the capacity to dissolve at least minute amounts of nearly every substance it touches. Some of the substances dissolved in water, if present in sufficient concentrations, affect the use of the water for public supplies and for some industrial processes. Thus, an important segment of a public water supply inventory is the determination of the kinds and amounts of substances dissolved in the water. In the earlier public water supply inventories only a "standard complete" analysis of water samples was made. The "standard complete" analysis included determination of the following constituents and properties of both the raw and finished water:

Silica (SiO_2)	Bicarbonate (HCO_3)	Hardness as $CaCO_3$: Total, Noncarbonate
Aluminum (Al)	Carbonate (CO_3)	Alkalinity as $CaCO_3$
Iron (Fe)	Sulfate (SO_4)	Specific conductance
Manganese (Mn)	Chloride (Cl)	pH
Calcium (Ca)	Fluoride (F)	Color
Magnesium (Mg)	Nitrate (NO_3)	Temperature
Sodium (Na)	Dissolved solids	
Potassium (K)		

Currently, a great deal of research and general interest centers on minor elements and their possible detrimental or beneficial effect on man's health. No one knows when another element will be found to be beneficial, as for example fluoride in reducing dental decay, or when another element will produce the controversy recently raised by the finding of excessive mercury concentrations in water.

At present, there is a small amount of data on minor-element concentrations in the public water supplies of North Carolina. Some State and Federal agencies have recently started making these determinations, and a "base" of information is resulting. The complexity in making the determinations and the sophisticated equipment required almost rules out these determinations in all but the larger municipal water-treatment laboratories. For these reasons, it is apparent that an analysis of selected minor elements would be more valuable at this time than another "standard complete," the only problem being which constituents to look for.

Rather complete minor element analyses on a sample from a surface-water supply, Raleigh, and from a ground-water supply, New Bern, were made to obtain a representative sample of minor elements that might be found in North Carolina waters. With the results of these analyses and a study of reports in various professional journals, the following list was selected:

Surface-Water Source		Ground-Water Source	
Barium	Iron	Barium	Cyanide
Boron	Lead	Boron	Iron
Cadmium	Lithium	Cadmium	Lithium
Chloride	Manganese	Chloride	Manganese
Chromium	Mercury	Chromium	Strontium
Cobalt	Strontium	Cobalt	Zinc
Copper	Zinc	Copper	
Cyanide			

The list will be reviewed as experience is gained and will be changed when considered beneficial.

Although we have added minor elements to the analyses contained in this report, this is not to say that the information contained in the former analyses is not still valuable to water-works operators and planners. It most definitely is, and, therefore, the latest standard complete analysis made by this office and contained in earlier reports, or a new standard complete if the source of water has changed, is included for each water-supply system.

The collection of water samples varied with the municipalities according to the source of supply. For surface supplies, raw-water samples were collected at the impoundment, from the stream, or from the raw-water tap in the plant. Samples of finished water were collected from taps at the plant or in the distribution system. Ground-water samples were collected directly from the wells or, when no outlets were available, from the tap nearest the well. Finished ground-water samples were collected from taps in the plant or in the distribution system. Water samples for minor element analyses were, in most cases, collected only from the principal surface source or a single well.

The analytical data presented are from one sample at one point in time. In the course of a year, many samples are analyzed by water-works personnel and by the State Board of Health to insure that the water is of acceptable chemical and bacteriological quality. Those interested can obtain more complete data from either of these sources.

SUMMARY AND DISCUSSION

North Carolina is a water-rich State. The municipal water systems of the State have done an excellent job of supplying their customers with dependable, safe water. Occasionally, water use has been curtailed during very dry years, but these instances have been relatively rare. To maintain this fine record, local managers must continuously evaluate their water systems, must anticipate future requirements, and must plan and pursue any required expansion. Even though the State is water-rich, the supply is not limitless. Regional planners must insure that the available water resources are properly developed and wisely used.

The inventory of existing water supplies and the summary of pertinent water-resources data contained in this report is an attempt to assemble data that will assist water managers and planners in meeting future needs. Included is information on population served; the major components of the system, source of supply, treatment, pumping capacity, distribution and use; the chemical quality of raw and finished water; and general comments on the present and potential development of each system.

Planning to meet future water requirements is a continuous job and oftentimes a frustrating one. The population growth, industrialization, and water requirements have to be projected into the future. The yield of the source(s) of water must be estimated. From these projections and estimates must come the plans to insure a safe, dependable water supply. Implementation of plans can be frustrated by a lack of financing. Only when water managers do a poor job are they recognized, because no one thinks about water until there is none.

Collecting and summarizing information on anything will undoubtedly uncover weaknesses, and some were noted during the inventory of municipal water supplies. One problem noted, especially in the small plants, is a lack of records. The value of accurate records in a water plant cannot be over emphasized. Accurate and complete records are essential to the efficient operation of the water plant and in making projections for future expansion.

The most common problem is the lack of data concerning the dependability of the source of supply, whether surface water or ground water. For small systems on large rivers, there is little worry that the supply is adequate, but for systems that impound or store water for use during periods of low streamflow, the adequacy of the supply ideally is continuously evaluated. Storage reservoirs continuously lose some of their capacity due to siltation, yet most municipalities list the capacity of their reservoirs as being the same as when they were constructed. Means of estimating the reduction in the storage capacity of reservoirs and for determining the minimum flow of the streams that feed the reservoirs are requisite for municipalities. Only with this information, can a reliable estimate of the safe-yield of the source be made.

Few towns have the experienced persons with diversified knowledge of wells and ground-water conditions so as to provide management comparable in quality to that available to most municipalities with surface-water systems (Le Grand, 1967, p. 10). The absence of well-construction and well-operation data in some municipalities is evidence of this lack of experience. Efficient operation of a ground-water system is not possible without well-operation data.

Collection and maintenance of complete records of well construction and operation are standard procedures for well-run municipal systems using ground water. Analysis of these records can point out potential problems before a failure occurs and will indicate the need for additional wells.

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ALAMANCE COUNTY
WATER-RESOURCES APPRAISAL

Alamance County is in the central part of the Piedmont Province and is drained by the Haw River and its tributaries. The average discharge of the streams is 0.6 mgd per square mile. The low-flow yield of streams is considered small, especially in the northern half of the county, where some streams with less than 45 square miles of drainage area occasionally go dry, while other streams range from 0.003 to 0.01 mgd per square mile. The 7-day, 2-year low flow of all streams averages 0.03 mgd per square mile and ranges from 0.004 to 0.06 mgd per square mile, excluding Haw River. Burlington, Graham, Mebane, and Alamance obtain their raw water from surface-water sources. Other smaller municipalities and communities, including Elon College, and most domestic and industrial water supplies are obtained from ground-water sources.

The municipal systems of Burlington, Graham, Mebane, Haw River Sanitary District, and the Orange County Systems of Hillsborough and Orange-Alamance Water System, Inc., are interconnected. Each could supplement the others if necessary. The Burlington, Graham, and Mebane municipal systems serve a total population of about 49,800. The county's total population in 1970 was 96,362.

The predominant rock types are mafic volcanic rocks, felsic volcanic rocks, granite, and diorite. The mafic volcanic rocks underlie two large areas: one extending nearly across the central part of the county in a northeast direction; the other is in the northwest corner. The felsic volcanic rocks underlie the southeastern third of the county. Irregular shaped bodies of granite are found in the northeastern and southwestern parts. Small bodies of diorite are found in all parts of the county.

Except for the diorite, rocks in Alamance County form some of the best aquifers in the Piedmont. Their fractures and bedding characteristics and ample overlying soil cover are favorable for average to above-average well yields in the province.

In rural areas of the county, most domestic and industrial water supplies are obtained from wells or springs. Two small municipalities and Elon College use ground water exclusively for their supplies.

A few shallow dug or bored wells are used in the rural areas for small domestic or livestock supplies. However, most wells in the county were constructed by drilling into the hard rock and then driving steel casing into the upper few feet of the rock. The following table shows typical yields reported and average depths of drilled wells in the various rock units in the county:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Mafic volcanic rocks	150	21	171
Felsic volcanic rocks	75	16	109
Granite	212	20	158
Diorite	25	7	109

ALAMANCE COUNTY

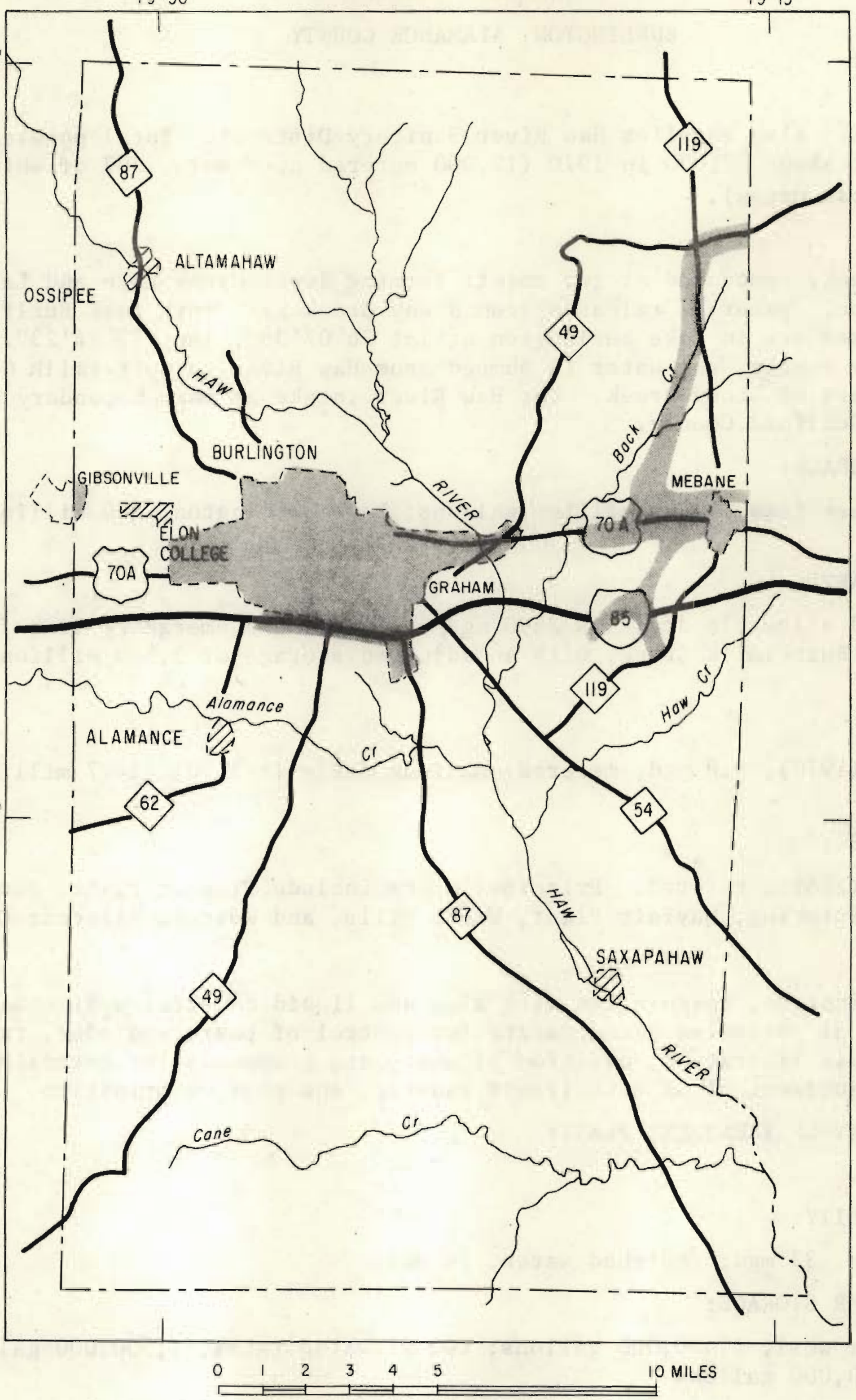
WATER-RESOURCES APPRAISAL

The chemical quality of ground water in all parts of the county is acceptable for most domestic and industrial uses. However, in some localities the concentrations of iron and hardness-causing constituents are higher than desirable. Constituent analyses of raw surface waters used in the Burlington, Graham, and Mebane supplies show acceptable quality for public water supply and no problems that conventional treatment procedures would not correct, except where pollution may be a factor.

Streams with reservoirs to improve their natural yield will continue to be used to meet the water demands of the larger municipalities.

Ground water will continue to be the main source of supply for small municipalities and for industrial and domestic use in the rural areas. Those needing the higher yielding wells must carefully locate drilling sites and regulate pumping rates. Above-average well yields are generally developed where soil cover is thickest and in low, flat areas and draws. It is estimated that 0.1 mgd per square mile can be withdrawn from aquifers in most of the county. In areas underlain by granite, this figure can generally be doubled. The probable yield of continuously pumped wells spaced about one-half mile apart is on the order of 0.05 mgd in the areas underlain by granite and 0.03 mgd in the remainder of the county.

ALAMANCE COUNTY



EXPLANATION

Areas served by municipal water systems in 1970

More than 500 customers

Less than 500 customers

BURLINGTON, ALAMANCE COUNTY

OWNERSHIP:

Municipal. Also supplies Haw River Sanitary District. Total population supplied, about 37,000 in 1970 (12,000 metered customers, 207 of which are in suburban areas).

SOURCE:

Stony Creek, impounded at two points, forming Stony Creek Lake and Lake Burlington. Water is released from Stony Creek Lake into Lake Burlington. The intakes are in Lake Burlington at lat 36°07'39", long 79°24'23". For emergency supply, raw water is pumped from Haw River to Buttermilk Creek, a tributary of Stony Creek. The Haw River intake is near Secondary Road 2712 in Guilford County.

RAW-WATER STORAGE:

Stony Creek Lake, 3,200 million gallons; Lake Burlington, 400 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 25.0 mgd, including the emergency line from Haw River to Buttermilk Creek, with an adjusted storage of 3,500 million gallons.

TOTAL USE:

Average (1970), 9.8 mgd, metered; maximum daily (8-5-70), 14.7 million gallons.

INDUSTRIAL USE:

5.5 mgd (1969), metered. Principal users include Pioneer Plant, Burlington House Finishing, Mayfair Plant, Webco Mills, and Western Electric Company.

TREATMENT:

Prechlorination, coagulation with alum and liquid caustic, sedimentation, addition of potassium permanganate for control of taste and odor, rapid mixed-media filtration, addition of phosphate compounds for corrosion control, adjustment of pH with liquid caustic, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

16.0 mgd.

PUMPING CAPACITY:

Raw water, 32 mgd; finished water, 24 mgd.

FINISHED-WATER STORAGE:

One clear well, 5,400,000 gallons; two elevated tanks, 1,500,000 gallons, and 1,500,000 gallons.

BURLINGTON, ALAMANCE COUNTY

FUTURE PLANS:

The water system is considered adequate for immediate future. An analysis of the system and proposed long-range plans were completed by a consulting firm in November 1970. A new reservoir on Alamance Creek and a new treatment plant were recommended to meet long-range needs.

WATER-RESOURCES APPRAISAL:

Surface water: Burlington is in central Alamance County. The Haw River flows near the north and east borders of the city. However, the river has a D classification from the Burlington emergency intake to Bynum. The south and southwestern sections of the city are drained by tributaries of Alamance Creek. The low-flow yield of the streams ranges from 0 to 0.01 mgd per square mile. The average discharge for all streams is 0.6 mgd per square mile, and the 7-day, 2-year low flow is 0.03 mgd per square mile. Alamance Creek or Haw River above the present emergency intake are possible sources of future water supplies. The Burlington System is connected with the Graham system, and each can supplement the other when necessary.

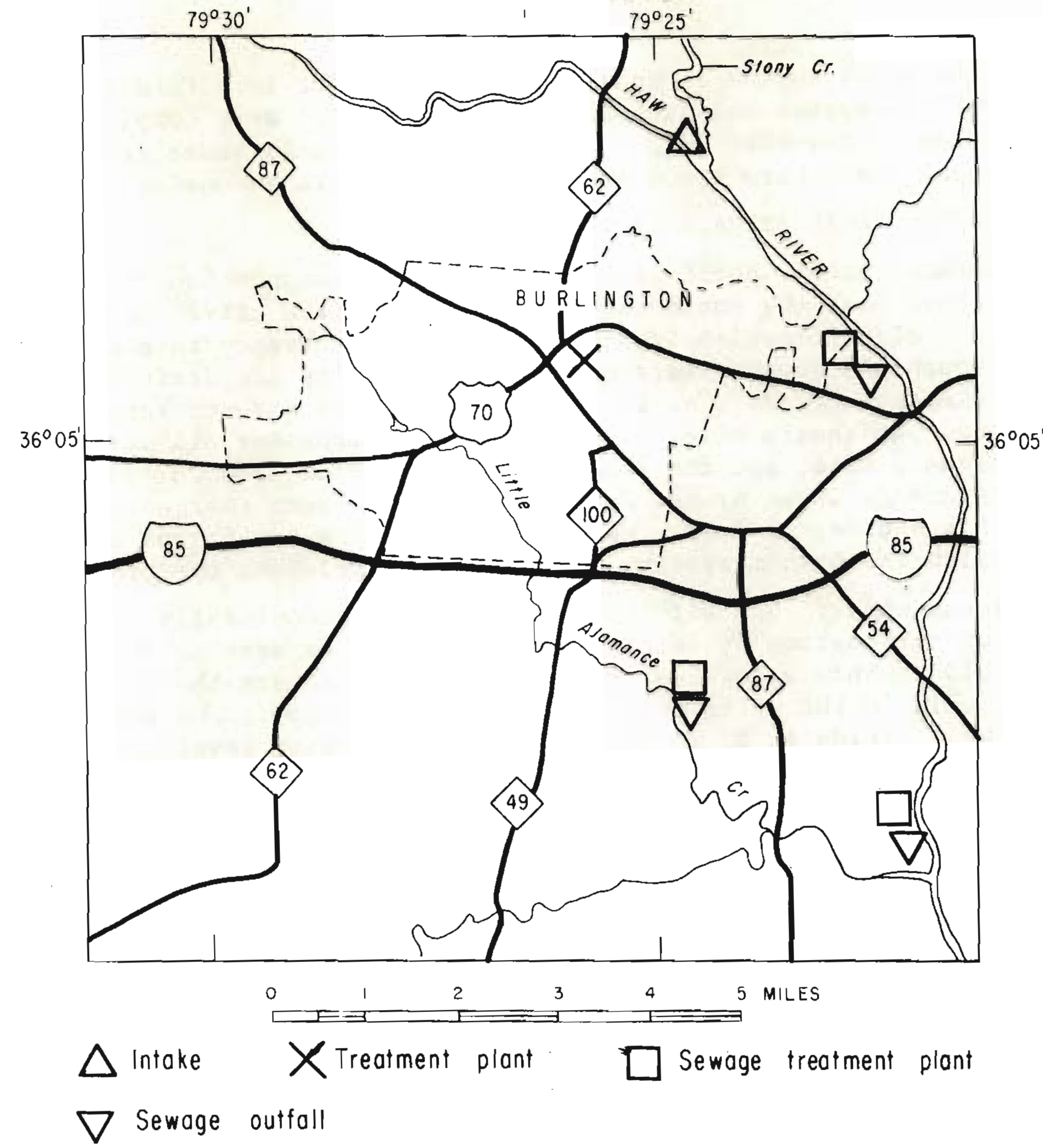
Ground water: The city of Burlington is predominantly underlain by granite and greenstone schist that has weathered as deep as 80 feet, but in many places only a few feet of weathered rock covers the hard rock. Yields of wells in the vicinity range from 0 to 200 gpm. The average of reported well yields is 20 to 30 gpm, and static water levels generally stand about 20 feet below the surface.

Although some industries in or near Burlington obtain all or part of their water supplies from wells, the average ground-water conditions are not conducive to development of large supplies within small areas.

The general chemical quality of ground water is good in the Burlington vicinity, but iron and hardness are excessive in some places.

It does not seem likely that the city or local industries will attempt to use ground water for their main source of water supply. However, the potential exists for development of ground water for supplies of the magnitude of 0.05 mgd per well, or 0.2 mgd per square mile. Supplies of this magnitude are adequate for many needs.

CITY OF BURLINGTON



BURLINGTON, ALAMANCE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.......	3-31-66	3-31-66	11-24-70	11-24-70
Copper (Cu).............	------	-------	0.005	0.000
Cobalt (Co).............	------	-------	.000	.000
Zinc (Zn)...............	------	-------	.048	.110
Chromium (Cr)...........	------	-------	.000	.000
Boron (B)...............	------	-------	.016	.016
Strontium (Sr)..........	------	-------	.030	.055
Barium (Ba).............	------	-------	.000	.000
Mercury (Hq)............	------	-------	<.0005	<.0005
Lead (Pb)...............	------	-------	.000	.000
Lithium (Li)............	------	-------	.000	.000
Cadmium (Cd)............	------	-------	.000	.000
Cyanide (CN)............	------	-------	.00	.00
Chloride (Cl)...........	4.4	8.1	4.4	11
Manganese (Mn)..........	.01	.02	.040	.025
Iron (Fe)...............	.09	.00	.121	.017
Calcium (Ca)............	7.1	14	-------	-------
Magnesium (Mg)..........	2.5	2.7	-------	-------
Sodium (Na).............	4.3	4.4	-------	-------
Potassium (K)...........	1.2	1.0	-------	-------
Fluoride (F)............	.1	.1	-------	-------
Silica (SiO2)...........	13	12	-------	-------
Bicarbonate (HCO3)......	32	34	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)...........	5.4	18	-------	-------
Nitrate (NO3)...........	.5	.1	-------	-------
Dissolved Solids.........	67	82	-------	-------
Hardness as CaCO3:				
Total..................	31	47	-------	-------
Noncarbonate...........	5	19	-------	-------
Alkalinity as CaCO3......	26	28	-------	-------
Specific conductance (micromhos at 25° C)....	82	121	-------	-------
pH.......................	6.7	7.2	-------	-------
Temperature..............	13	-	10	11

GRAHAM, ALAMANCE COUNTY

OWNERSHIP:

Municipal. Also supplies the Green Level Community. Total population supplied, about 10,000 in 1970 (2,892 metered customers, 226 of which are in suburban areas).

SOURCE:

Back Creek impounded in Graham City Lake and Quaker Creek impounded in Quaker Creek Reservoir. Water is released from Quaker Creek Reservoir into Graham City Lake. The intakes are located in Graham City Lake 5 miles northeast of Graham at lat 36°05'42", long 79°20'10".

RAW-WATER STORAGE: 2.3 billion

Graham City Lake, 50 million gallons; Quaker Creek Reservoir, 500 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 6.1 mgd, with a combined adjusted storage of 500 million gallons.

TOTAL USE:

Average (1970) 1.6 mgd, metered; maximum daily (7-16-70) 2.0 million gallons.

INDUSTRIAL USE:

0.2 mgd, estimated. Principal users include Cannon Mills, Rental Uniform Service, and Rental Towel Service.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, addition of carbon for control of taste and odor when necessary, rapid sand filtration, addition of phosphate compounds for corrosion control, and adjustment of pH with lime. Occasionally post-chlorination is necessary.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water, 3.2 mgd; finished water, 3.2 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 100,000 and 500,000 gallons; two elevated tanks, 75,000 and 500,000 gallons.

FUTURE PLANS:

A preliminary survey has been made for expanding the treatment plant. However, there are no definite plans at this time.

GRAHAM, ALAMANCE COUNTY

WATER-RESOURCES APPRAISAL:

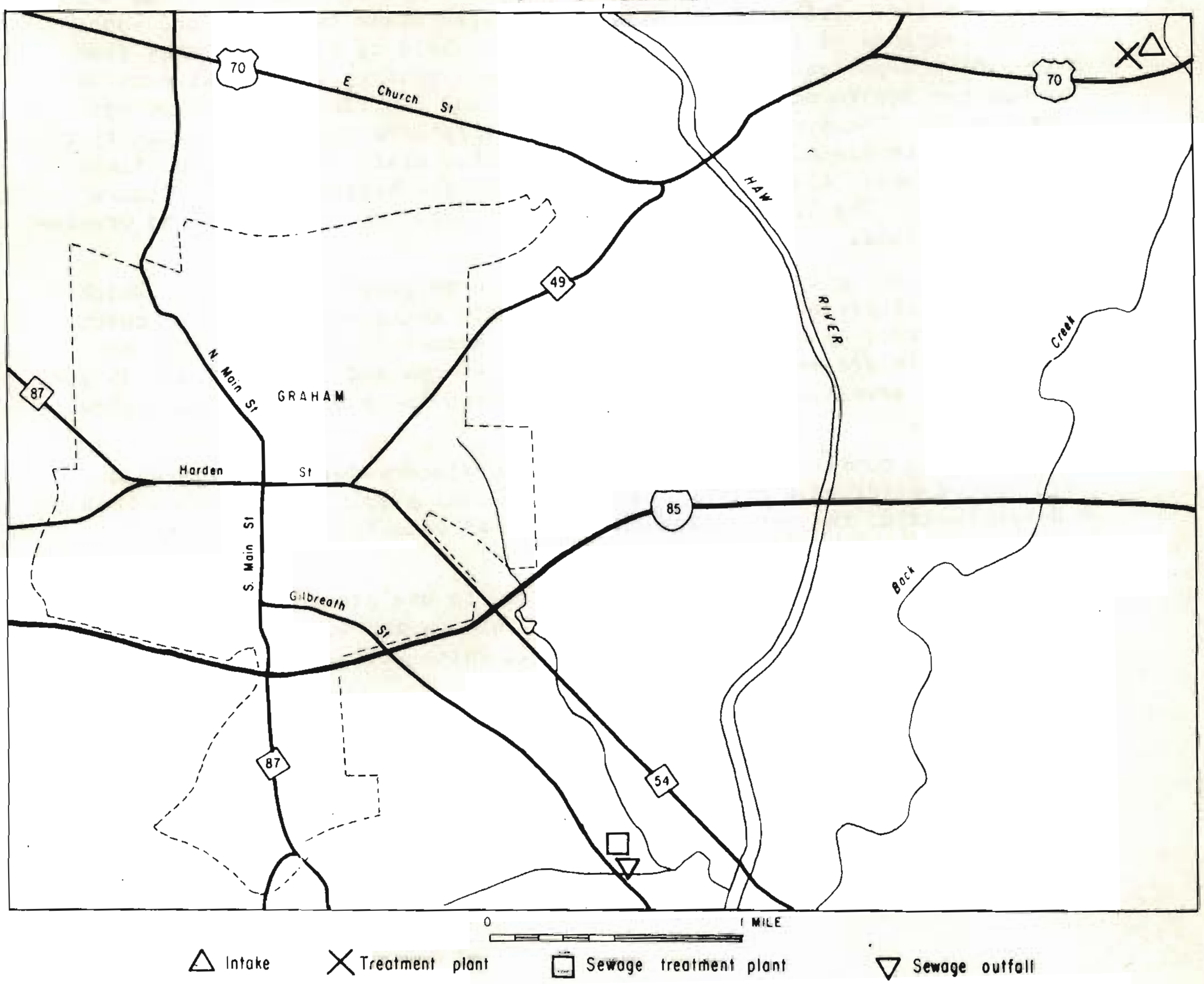
Surface water: Graham is in the central part of Alamance County. The Haw River flows near the eastern boundary of the city, but the river has a D classification. Tributaries of Alamance Creek drain the south and southwestern sections of the city. The low-flow yield of streams ranges from 0 to 0.01 mgd per square mile. The average discharge for all streams is 0.6 mgd per square mile, and the 7-day, 2-year low flow is 0.03 mgd per square mile. The present raw-water reservoirs have sufficient capacity to meet immediate needs. The estimated allowable draft is over three times the present use. Alamance Creek is possibly the best source for future water supply. The Graham system is connected to the Burlington and Orange-Alamance systems.

Ground water: The city of Graham is underlain by greenstone schist, which is composed of green schistose mafic volcanic rocks, with numerous quartz dikes. The rock generally is weathered to depths of 45 to 120 feet at Graham. Wells are reported to yield up to 45 gpm and average about 35 gpm. Static water levels in most wells are reported to be about 20 feet below land surface.

Prior to construction of the present surface-water system, Graham used ground water as a source for the municipal supply. Other than being moderately hard, the water from the wells was of excellent chemical quality and was used without treatment.

The city probably has no further plans to use ground water for a source of supply. However, the potential exists for development of adequate supplies of up to 0.06 mgd per well, which would be adequate for many needs.

CITY OF GRAHAM



GRAHAM, ALAMANCE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.......	7-25-66	7-25-66	11-24-70	11-24-70
Copper (Cu).............	------	-------	0.020	0.000
Cobalt (Co).............	------	-------	.000	.000
Zinc (Zn)...............	------	-------	.030	.067
Chromium (Cr)...........	------	-------	.000	.000
Boron (B)...............	------	-------	.011	.010
Strontium (Sr)..........	------	-------	.055	.030
Barium (Ba).............	------	-------	.000	.000
Mercury (Hq)............	------	-------	<.0005	<.0005
Lead (Pb)...............	------	-------	.000	.000
Lithium (Li)............	------	-------	.000	.000
Cadmium (Cd)............	------	-------	.000	.000
Cyanide (CN)............	------	-------	.00	.00
Chloride (Cl)...........	3.5	12	5.3	9.8
Manganese (Mn)..........	.01	.02	.020	.000
Iron (Fe)...............	.01	.01	.242	.034
Calcium (Ca)............	8.2	21	-------	-------
Magnesium (Mg)..........	2.9	3.2	-------	-------
Sodium (Na).............	5.4	5.2	-------	-------
Potassium (K)...........	1.9	1.9	-------	-------
Fluoride (F)............	.2	.1	-------	-------
Silica (SiO2)...........	15	15	-------	-------
Bicarbonate (HCO3)......	43	56	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)...........	3.2	17	-------	-------
Nitrate (NO3)...........	.7	.1	-------	-------
Dissolved Solids........	62	104	-------	-------
Hardness as CaCO3:				
Total...................	33	66	-------	-------
Noncarbonate............	0	20	-------	-------
Alkalinity as CaCO3.....	35	46	-------	-------
Specific conductance (micromhos at 25° C)....	92	166	-------	-------
pH......................	7.2	7.6	-------	-------
Temperature.............	25	25	10.5	10

MEBANE, ALAMANCE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,800 in 1970 (1,150 metered customers, 150 of which are in suburban areas).

SOURCE:

Mill Creek impounded in Lake Michael: The intakes are about 1/2 mile northeast of Mebane at lat 36°06'28", long 79°15'02". The intake structure is at the dam and has five inlets at various depths.

RAW-WATER STORAGE:

Lake Michael, 217 million gallons.

ALLOWABLE DRAFT:

Not determined. Carryover storage analysis required.

TOTAL USE:

Average (1970) 0.60 mgd, metered; maximum daily (7-29-70) 0.82 million gallons.

INDUSTRIAL USE:

0.15 mgd, estimated. Principal users include Universal Textured Yarns, Co Fo Hosiery, and Roxy Hosiery.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd.

PUMPING CAPACITY:

Raw water, 1.3 mgd; finished water, 1.3 mgd.

FINISHED-WATER STORAGE:

One clear well, 250,000 gallons; two elevated tanks, 300,000 and 75,000 gallons.

FUTURE PLANS:

Plan to install an additional filter and settling basin in near future.

MEBANE, ALAMANCE COUNTY

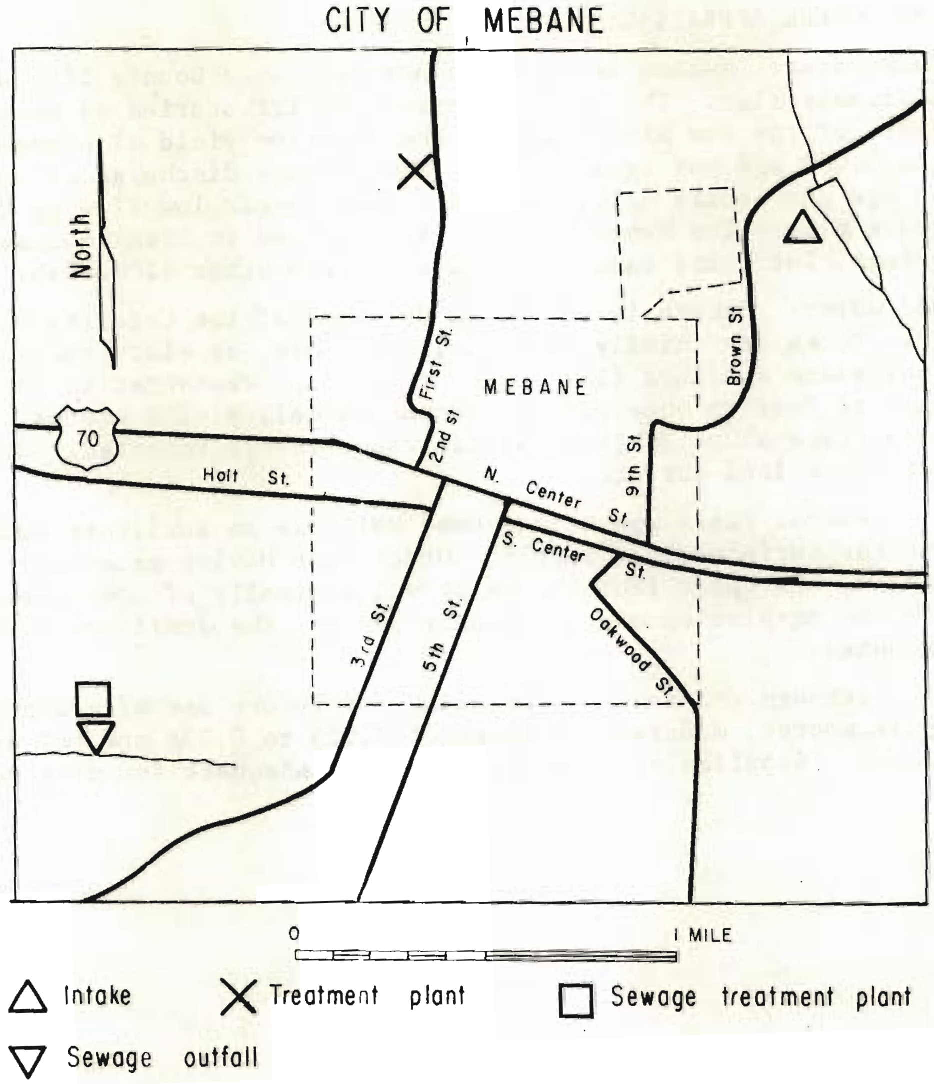
WATER-RESOURCES APPRAISAL:

Surface water: Mebane is on the Alamance-Orange County line and is relatively flat. The area is drained by tributaries of Back and Haw Creeks of the Haw River basin. The low-flow yield of streams ranges from 0 to 0.003 mgd per square mile. The average discharge of all streams is 0.6 mgd per square mile, and the 7-day, 2-year low flow is 0.02 mgd per square mile. The Mebane system is connected to Orange-Alamance Water Systems, Inc., and each can supplement the other if needed.

Ground water: Mebane is underlain by rocks of the Carolina Slate Belt. These rocks are chiefly gneissic, schistose, or slaty tuffs with argillaceous slate and lava flows. The rocks have weathered to depths of at least 60 feet in some places. Reported well yields are as high as 30 gpm and average about 20 gpm. Static water levels reportedly average 30 to 40 feet below land surface.

Several years ago Mebane used wells as an auxiliary source to supplement the surface-water supply. Other than having excessive iron concentration, the water from the wells was generally of good chemical quality. With the completion of the present system, the auxiliary wells were abandoned.

Although the town has no plans for future use of ground water as a supply source, moderate supplies of 0.025 to 0.035 mgd per well can be developed. Supplies of this magnitude are adequate for many needs.


CITY OF MEBANE
North
MEBANE
70
Holt St.
First St.
2nd st
3rd St.
5th St.
N. Center St.
S. Center St.
9th St
Brown St
Oakwood St.
0
1 MILE
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

MEBANE, ALAMANCE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.......	3-31-66	3-31-66	12- 4-70	12- 3-70
Copper (Cu)..............	------	-------	0.000	0.005
Cobalt (Co)..............	------	-------	.000	.000
Zinc (Zn)................	------	-------	.030	.120
Chromium (Cr)............	------	-------	.000	.000
Boron (B)................	------	-------	.022	.005
Strontium (Sr)...........	------	-------	.055	.055
Barium (Ba)..............	------	-------	.000	.000
Mercury (Hq).............	------	-------	<.0005	<.0005
Lead (Pb)................	------	-------	.000	.000
Lithium (Li).............	------	-------	.000	.000
Cadmium (Cd).............	------	-------	.000	.000
Cyanide (CN).............	------	-------	.00	.00
Chloride (Cl)............	3.0	7.1	3.1	6.3
Manganese (Mn)...........	.01	.03	.005	.080
Iron (Fe)................	.02	.00	.069	.017
Calcium (Ca).............	4.2	13	-------	-------
Magnesium (Mg)...........	1.3	1.6	-------	-------
Sodium (Na)..............	3.5	3.2	-------	-------
Potassium (K)............	1.1	0.9	-------	-------
Fluoride (F).............	.1	.1	-------	-------
Silica (SiO2)............	12	11	-------	-------
Bicarbonate (HCO3).......	20	29	-------	-------
Carbonate (CO3)..........	0	0	-------	-------
Sulfate (SO4)............	2.8	16	-------	-------
Nitrate (NO3)............	.4	.2	-------	-------
Dissolved Solids.........	39	69	-------	-------
Hardness as CaCO3:				
Total..................	16	40	-------	-------
Noncarbonate...........	0	17	-------	-------
Alkalinity as CaCO3......	16	24	-------	-------
Specific conductance (micromhos at 25° C)....	48	100	-------	-------
pH.......................	6.4	7.7	-------	-------
Temperature..............	12	-	11	12

CASWELL COUNTY

WATER-RESOURCES APPRAISAL

Caswell County is in the north central part of the Piedmont Province. The topography is characterized by rolling hills, with mild to steep land slopes. The Dan River and its tributaries drain all but a small area in the southwest corner of the county which is drained by tributaries of the Haw River. For all streams in the county, the average discharge is 0.6 mgd per square mile. Minimum flow is variable; streams in the eastern half of the county occasionally go dry, while minimum flow of those in the remainder of the county ranges from 0.01 to 0.02 mgd per square mile. The 7-day, 2-year low flow of all streams ranges from 0.005 to 0.12 mgd per square mile and averages 0.05 mgd per square mile.

Yanceyville and Milton have the only municipal water-supply systems in the county. Yanceyville obtains its water from surface sources and serves about 1,500 people. Milton obtains its supply from wells and has less than 500 customers. The total population in 1970 was 19,055.

Five principal rock units underlie Caswell County. The largest unit is mica-gneiss, which underlies approximately the northwestern two-thirds of the county. A body of mica-schist crops out as a narrow tongue, extending from the southwest corner to the center of the county. Mafic volcanic rocks extend in a northeast-trending belt across the south-central part. Within this belt, near the southern boundary, are two areas underlain by diorite. Granite underlies approximately 40 square miles in the southeast corner and two smaller areas north of Leasburg. In general, the overlying layer of weathered rock is thinner in the areas underlain by granite and diorite.

Ground-water conditions differ widely between rock units, the higher yielding wells are usually found in the area underlain by mica-gneiss. In all rock units, the higher yielding wells are those located where the layer of weathered rock is thickest and in topographically low or in flat areas. The following table shows typical yields reported and average depths of drilled wells in the various rock units in the county:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Mica-gneiss	75	10	120
Mica-schist	15	7	85
Mafic-volcanic rocks	55	11	150
Diorite	25	5	81
Granite	20	5	78

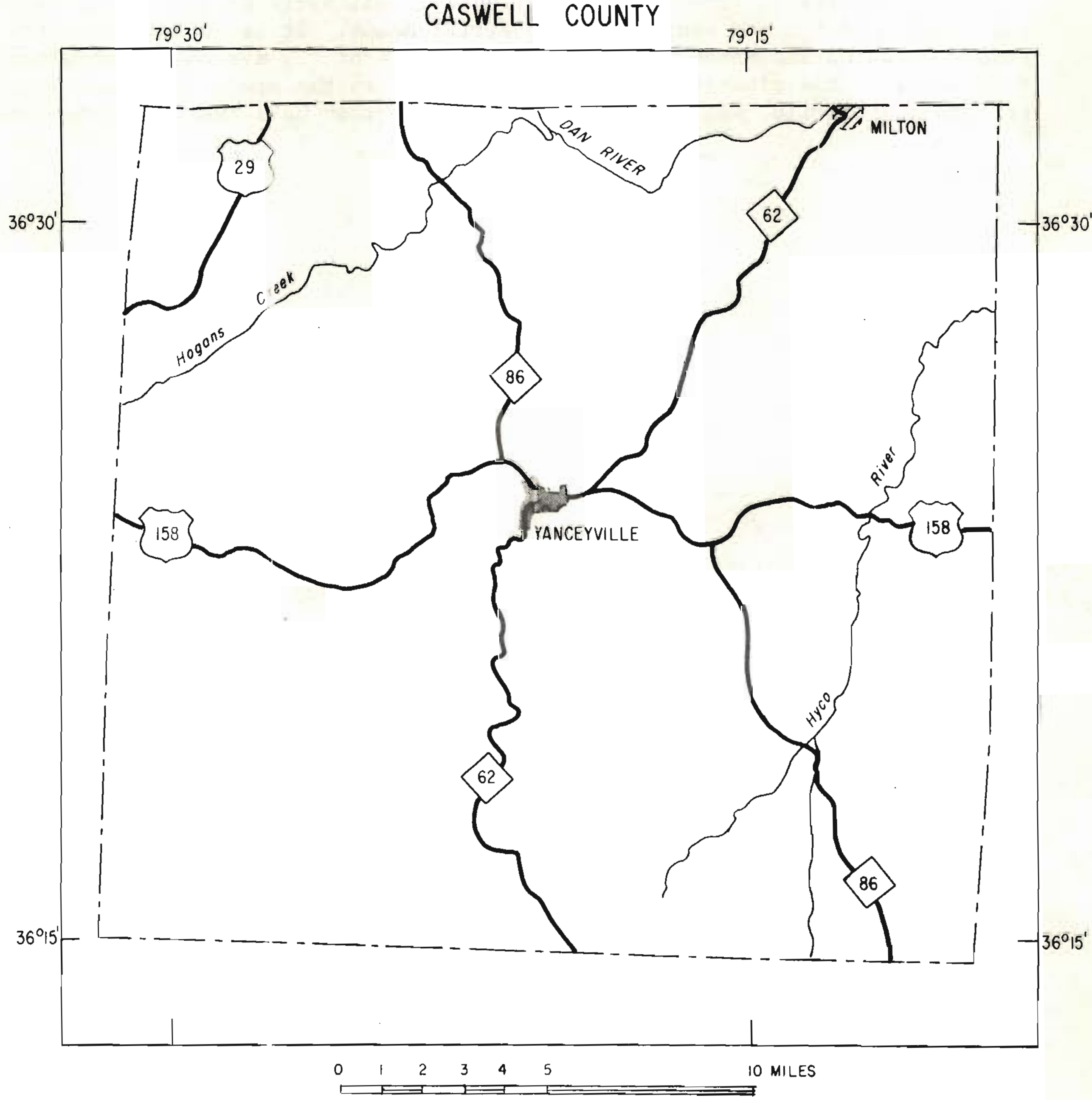
Ground water in the county is principally of the bicarbonate type and is acceptable for most uses without treatment. Locally, in each rock unit, iron concentrations and hardness-causing constituents may be higher than desirable.

CASWELL COUNTY

WATER-RESOURCES APPRAISAL

The quantity of ground water available in all parts of the county is adequate for domestic and many small industrial needs. It is estimated that with proper location and management, sustained yields of 0.2 mgd may be obtained from wells in the mica-gneiss and mica schist. In the areas underlain by granite and diorite, well yields may be no more than half those in other areas.

CASWELL COUNTY



EXPLANATION

Areas served by municipal water systems in 1970

More than 500 customers

Less than 500 customers

YANCEYVILLE, CASWELL COUNTY

OWNERSHIP:

Yanceyville Sanitary District. Total population supplied, about 1,500 in 1970 (500 metered customers, 20 of which are in suburban areas).

SOURCE:

Fullers Creek impounded in Yanceyville Reservoir: The intakes are approximately 1 mile southwest of Yanceyville at lat 36°23'40", long 79°21'05". Country Line Creek serves as a supplementary source; water is pumped from it to Yanceyville Reservoir during most summers. The pump and pipeline (of the irrigation type) from Country Line Creek are considered a semipermanent installation.

RAW-WATER STORAGE:

Yanceyville Reservoir, 10 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.16 mgd, with a storage of 10 million gallons. Estimated allowable draft of Country Line Creek at the supplementary pumping station is 0.8 mgd.

TOTAL USE:

Average (1970) 0.18 mgd, estimated; maximum daily (date not recorded), 0.20 mgd.

INDUSTRIAL USE

0.03 mgd, estimated.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor when necessary, rapid-sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, and post chlorination when necessary.

RATED CAPACITY OF TREATMENT PLANT:

0.50 mgd.

PUMPING CAPACITY:

Raw water, 0.50 mgd; finished water, 1.26 mgd. Capacity of supplementary pump on Country Line Creek is approximately 0.8 mgd.

FINISHED-WATER STORAGE:

One clear well, 20,000 gallons; two elevated tanks, 250,000 and 75,000 gallons.

FUTURE PLANS:

Plans are being developed for a new raw-water storage reservoir on Country Line Creek.

YANCEYVILLE, CASWELL COUNTY

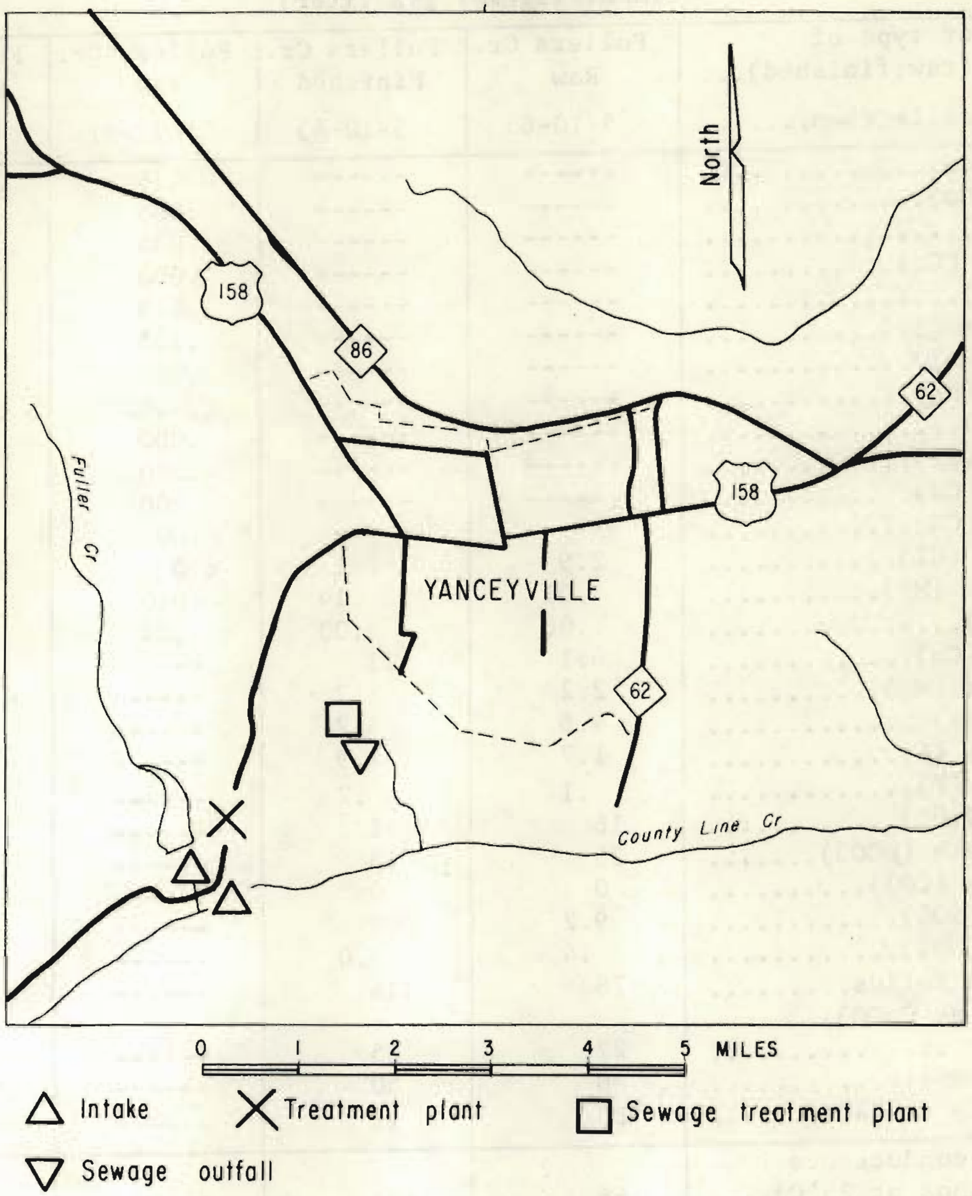
WATER-RESOURCES APPRAISAL:

Surface water: Yanceyville is in an upland area in the center of Caswell County. The area is drained by tributaries of Rattlesnake and Country Line Creeks, with Country Line being the largest nearby creek. The low-flow yields of streams in the immediate vicinity of Yanceyville is 0.02 mgd per square mile. The average discharge of streams draining the area is 0.6 mgd per square mile, and the 7-day, 2-year low flow is 0.08 mgd per square mile. Fullers Creek and its impoundment have not provided a sufficient supply several times in recent years. The proposed impoundment on Country Line Creek is expected to supply sufficient water for the foreseeable future.

Ground water: Yanceyville is underlain by gneissic rocks that contain mica, quartz, and feldspar and are of sedimentary origin. The rocks have weathered to depths of at least 60 feet in some places. Reported well yields at Yanceyville do not exceed 15 gpm. However, in other parts of the county, in the same rock unit, wells are known to yield up to 75 gpm. Static water levels stand about 20-35 feet below land surface in the town. Other than being moderately hard in some places, the water generally is of very good chemical quality.

The Yanceyville Sanitary District began supplying water to the town in 1937. Prior to construction of the present surface-water system at a later date, water was supplied from wells. The present system, with the planned new reservoir, seems to be adequate for the foreseeable needs of the town. However, for small industrial or supplemental supplies, the potential exists for individual wells to supply about 0.02 to 0.03 mgd.

CITY OF YANCEYVILLE



YANCEYVILLE, CASWELL COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Fullers Cr. Raw	Fullers Cr. Finished	Fullers Cr. Raw	Fullers Cr. Finished
Date of collection.......	5-10-65	5-10-65	1-12-71	1-12-71
Copper (Cu).............	------	------	0.015	0.010
Cobalt (Co).............	------	------	.000	.000
Zinc (Zn)................	------	------	.034	.067
Chromium (Cr)............	------	------	.000	.000
Boron (B)................	------	------	.018	.005
Strontium (Sr)...........	------	------	.105	.155
Barium (Ba)..............	------	------	.000	.000
Mercury (Hq).............	------	------	<.0005	<.0005
Lead (Pb)................	------	------	.000	.000
Lithium (Li).............	------	------	.000	.000
Cadmium (Cd).............	------	------	.000	.000
Cyanide (CN).............	------	------	.00	.00
Chloride (Cl)............	2.9	7.1	6.0	9.4
Manganese (Mn)...........	.01	.14	.040	.050
Iron (Fe)................	.06	.00	.104	.069
Calcium (Ca).............	6.1	21	------	------
Magnesium (Mg)...........	2.2	2.7	------	------
Sodium (Na)..............	4.6	4.2	------	------
Potassium (K)............	1.7	1.9	------	------
Fluoride (F).............	.1	.2	------	------
Silica (SiO2)............	16	12	------	------
Bicarbonate (HCO3).......	25	18	------	------
Carbonate (CO3)..........	0	0	------	------
Sulfate (SO4)............	9.2	46	------	------
Nitrate (NO3)............	.4	.0	------	------
Dissolved Solids.........	78	114	------	
Hardness as CaCO3:				
Total..................	27	65	------	------
Noncarbonate...........	6	50	------	------
Alkalinity as CaCO3......	20	15	------	------
Specific conductance (micromhos at 25° C)....	66	157	------	------
pH.......................	6.7	7.1	------	------
Temperature..............	13	------	5.0	5.0

CHATHAM COUNTY

WATER-RESOURCES APPRAISAL

Chatham County is in the eastern Piedmont Province near the geographical center of North Carolina. The topography is characterized by rolling hills, and ranges from broad smooth interstream country to steeply sloping. Stream slopes are relatively steep. Chatham County is drained by the Haw, Deep, and Cape Fear Rivers and their tributaries. For all streams in the county, the average discharge ranges from 0.6 to 0.7 mgd per square mile. Minimum flows are variable. Streams with less than 50 square miles occasionally go dry, while the minimum flow of others ranges from 0.002 to 0.01 mgd per square mile. The 7-day, 2-year low flow ranges from 0.007 to 0.12 mgd per square mile. Siler City, Pittsboro, Bynum, Goldston, and Gulf obtain their water from surface sources. Most other industrial and domestic water supplies are obtained from ground water. The county's total population in 1970 was 29,554.

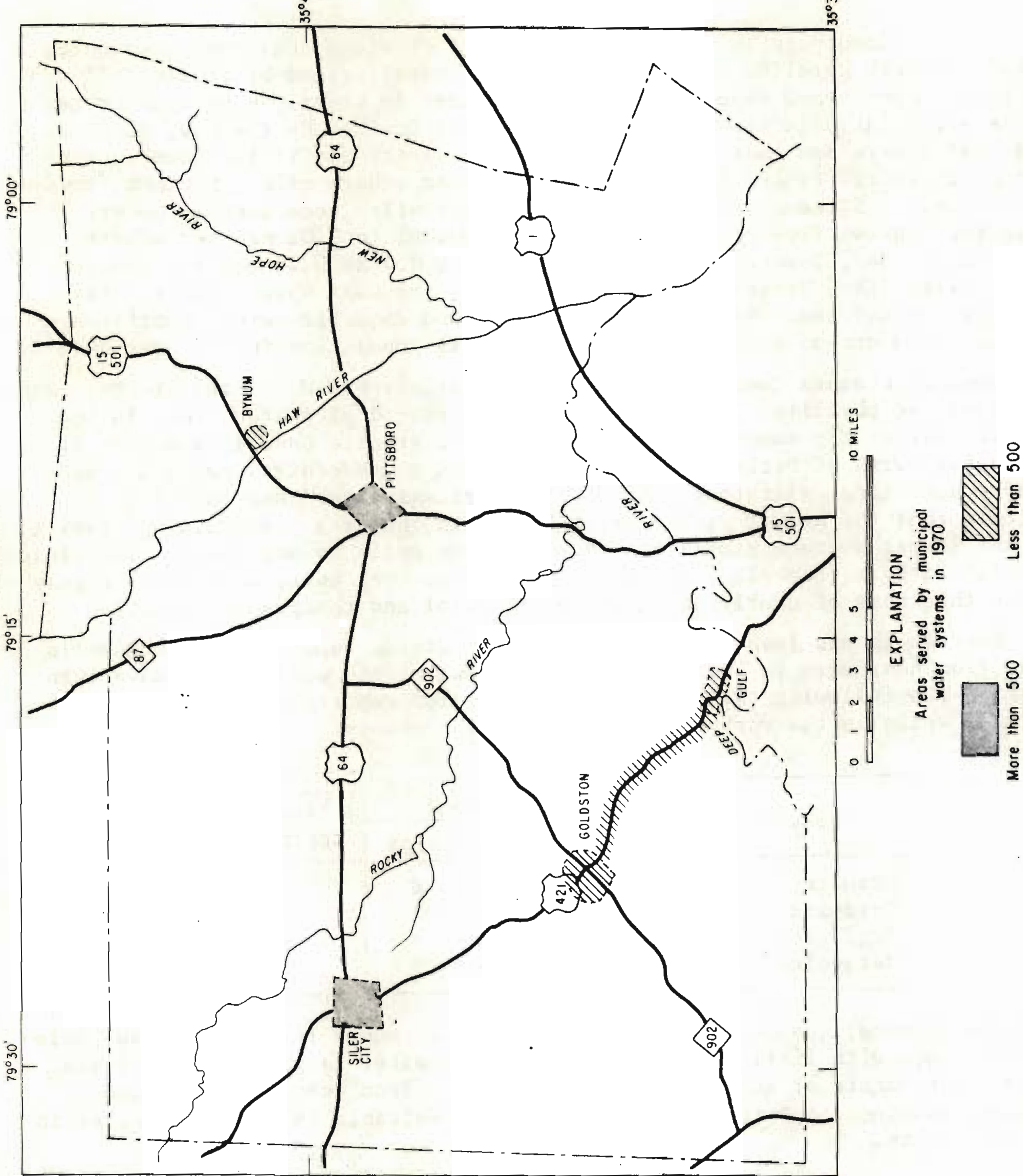
Most of Chatham County is underlain by metamorphosed volcanic rocks, such as schist and phyllite. Argillite and tuff occur in elongated areas in the western half of the county, and a large body of granite underlies a part of the county north of Pittsboro. The eastern and south-central parts are underlain by sandstone, siltstone, and shale of Triassic age. Records of wells indicate that the higher yields are obtained in the area underlain by granite, and the lowest average yields are obtained from wells in argillite. The yield of wells differs from place to place in the same rock unit, depending largely on the thickness of overlying weathered material and topographic location.

Most wells are less than 200 feet deep. Yields reported from 229 wells range from near zero to 100 gpm, and 22 percent of the wells yield more than 10 gpm. The following table shows typical yields reported and the average depth of wells in the various rock units in the county:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Granite	30	8	68
Triassic	20	7	98
Argillite	11	5	123
Metavolcanic rocks	100	7	99

The chemical quality of ground water in the county is generally suitable for most uses with little or no treatment. The water is principally of the sodium bicarbonate or calcium bicarbonate type. Iron concentrations and hardness-causing constituents are higher than desirable in some well water in all rock units.

CHATHAM COUNTY



PITTSBORO, CHATHAM COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,550 in 1970 (637 metered customers, 87 of which are in suburban areas).

SOURCE:

Robeson Creek impounded in two small reservoirs in town: The intake is at the dam at lat 35°42'52", long 79°11'00". Haw River: The intake is 4 miles northeast of Pittsboro at lat 35°46'00", long 79°07'30".

RAW-WATER STORAGE:

Robeson Creek reservoirs, 20 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft of Robeson Creek reservoirs is 0.30 mgd, with an adjusted storage of 10 million gallons. Estimated allowable draft of Haw River at the intake is 15 mgd, with no storage.

TOTAL USE:

Average (1969), 0.90 mgd, metered; maximum daily (1-26-70), 1.06 million gallons. Totals include large industrial user no longer in Pittsboro.

INDUSTRIAL USE:

0.25 mgd, metered. Does not include large industrial user no longer in Pittsboro.

TREATMENT:

Prechlorination, coagulation with alum and soda ash, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, and post chlorination.

RATED CAPACITY OF TREATMENT PLANTS:

Plant No. 1 - Robeson Creek Plant: 0.50 mgd.

Plant No. 2 - Haw River Plant: 0.25 mgd.

PUMPING CAPACITY:

Plant No. 1: Raw water, 0.75 mgd; finished water, 0.9 mgd.

Plant No. 2: Raw water, 0.75 mgd; finished water, 0.35 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 50,000 and 40,000 gallons; two elevated tanks, 100,000 and 200,000 gallons.

FUTURE PLANS:

A survey and analysis of the water system was completed recently. It was recommended that the capacity of the Haw River plant be increased to 1.0 mgd; however, there are no definite plans for expansion at this time (1970).

PITTSBORO, CHATHAM COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Pittsboro is in the central part of Chatham County, where the topography is mildly rolling. The immediate area is drained by Robeson Creek, a Haw River tributary. The Haw River, which flows southeasterly across the county, is about 4 miles northeast of Pittsboro at its closest point. Robeson Creek and other nearby small streams frequently reach zero flow. The low-flow yield of Haw River generally exceeds 0.01 mgd per square mile. The average discharge for all streams in the Pittsboro area is 0.6 mgd per square mile. The 7-day, 2-year low flow is 0.05 mgd per square mile.

Pittsboro has experienced water shortages in the last few years because demand exceeds treatment capacity and by the lack of raw water available to the largest treatment plant, Plant No. 1. There is ample water in the Haw River at the intake of Plant No. 2.

Ground water: Pittsboro is underlain by metamorphosed volcanic rocks, which include pyroclastic, flow, and sedimentary rocks. Usually these rocks are deeply weathered. In the Pittsboro vicinity, weathered depths range from 20 feet to 125 feet. According to the available data, reported well yields are seldom greater than 10 gpm. It is probable that these figures reflect pump capacities rather than actual well capacities. In geologic and topographic conditions of the Piedmont as occur at Pittsboro, sustained well yields of 0.1 to 0.15 mgd may be expected from about 50 percent of the wells drilled in draws, valleys, or low flat areas.

Concentrations of iron and hardness-causing constituents are excessive in water from many wells in Pittsboro, but with relatively inexpensive treatment, the water can be made suitable for most uses.

CITY OF PITTSBORO

PITTSBORO, CHATHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Robeson Cr. Raw	Robeson Cr. Finished	Haw River Raw	Haw River Finished
Date of collection.......	5-24-66	5-24-66	5-24-66	5-24-66
Copper (Cu).............	-------	-------	-------	-------
Cobalt (Co).............	-------	-------	-------	-------
Zinc (Zn)...............	-------	-------	-------	-------
Chromium (Cr)...........	-------	-------	-------	-------
Boron (B)...............	-------	-------	-------	-------
Strontium (Sr)..........	-------	-------	-------	-------
Barium (Ba).............	-------	-------	-------	-------
Mercury (Hq)............	-------	-------	-------	-------
Lead (Pb)...............	-------	-------	-------	-------
Lithium (Li)............	-------	-------	-------	-------
Cadmium (Cd)............	-------	-------	-------	-------
Cyanide (CN)............	-------	-------	-------	-------
Chloride (Cl)...........	5.7	12	6.2	12
Manganese (Mn)..........	.00	.00	.01	.01
Iron (Fe)...............	.02	.00	.03	.00
Calcium (Ca)............	9.1	8.7	8.2	8.5
Magnesium (Mg)..........	1.9	2.1	1.8	2.3
Sodium (Na).............	5.9	28	7.6	36
Potassium (K)...........	.6	.7	2.0	2.8
Fluoride (F)............	.1	.1	.3	.2
Silica (SiO2)...........	11	12	11	12
Bicarbonate (HCO3)......	38	63	35	61
Carbonate (CO3).........	0	0	0	0
Sulfate (SO4)...........	5.0	24	7.4	36
Nitrate (NO3)...........	.3	.2	.3	.8
Dissolved Solids.........	62	121	72	146
Hardness as CaCO3:				
Total..................	32	31	28	31
Noncarbonate...........	0	0	0	0
Alkalinity as CaCO3......	31	52	29	50
Specific conductance (micromhos at 25°C)....	87	191	94	225
pH......................	6.7	7.4	6.2	7.2
Temperature.............	22	-------	19	-------

Note.--See next page for analyses of 1-20-70.

PITTSBORO, CHATHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Robeson Cr. Raw	Robeson Cr. Finished	Haw River Raw	Haw River Finished
Date of collection.......	11-20-70	11-20-70	11-20-70	11-20-70
Copper (Cu)............	0.010	0.002	0.030	0.020
Cobalt (Co)............	.000	.000	.000	.000
Zinc (Zn)............	.030	.040	.050	.050
Chromium (Cr)............	.000	.000	.000	.000
Boron (B)............	.060	.090	.125	.048
Strontium (Sr)............	.030	.030	.030	.055
Barium (Ba)............	.000	.000	.000	.000
Mercury (Hq)............	<.0005	<.0005	----	----
Lead (Pb)............	.000	.000	.000	.000
Lithium (Li)............	.000	.000	.000	.000
Cadmium (Cd)............	.000	.000	.000	.000
Cyanide (CN)............	.00	.00	.00	.00
Chloride (Cl)............	4.8	12	18	19
Manganese (Mn)............	.000	.200	.000	.000
Iron (Fe)............	.242	.007	.138	.000
Calcium (Ca)............	-------	-------	-------	-------
Magnesium (Mg)............	-------	-------	-------	-------
Sodium (Na)............	-------	-------	-------	-------
Potassium (K)............	-------	-------	-------	-------
Fluoride (F)............	-------	-------	-------	-------
Silica (SiO2)............	-------	-------	-------	-------
Bicarbonate (HCO3).......	-------	-------	-------	-------
Carbonate (CO3)..........	-------	-------	-------	-------
Sulfate (SO4)............	-------	-------	-------	-------
Nitrate (NO3)............	-------	-------	-------	-------
Dissolved Solids.........	-------	-------	-------	-------
Hardness as CaCO3:				
Total.................	-------	-------	-------	-------
Noncarbonate..........	-------	-------	-------	-------
Alkalinity as CaCO3......	-------	-------	-------	-------
Specific conductance (micromhos at 25° C)....	-------	-------	-------	-------
pH......................	-------	-------	-------	-------
Temperature.............	16.5	16.5	16.5	16.5

SILER CITY, CHATHAM COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 5,000 in 1970 (1,823 customers, 1,200 of which are metered). Approximately 600 customers are in suburban areas.

SOURCE:

Rocky River impounded in two lakes, Lacey Creek, a tributary, impounded, and an unnamed tributary of Rocky River impounded in Aaron Fox Lake. The intakes are at the dam of the downstream lake on Rocky River 2.8 miles north of Siler City at lat 35°46'00", long 79°28'00".

RAW-WATER STORAGE:

Rocky River Lakes, 160 and 50 million gallons; Lacey Creek Lake, 60 million gallons, and Aaron Fox Lake, 20 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.9 mgd, with an adjusted storage of 250 million gallons.

TOTAL USE:

Average (1970), 1.9 mgd, metered; maximum daily (8-17-70), 2.48 million gallons.

INDUSTRIAL USE:

0.6 mgd, estimated. Principal users include Carolina Poultry, Inc., Mid-state Farms Company, Hadley Peoples Manufacturing Company, and Collins and Aikman Corporation.

TREATMENT:

Prechlorination, coagulation with alum and potassium permanganate, sedimentation, addition of carbon for control of taste and odor when necessary, rapid mixed-media filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, and post chlorination when necessary.

RATED CAPACITY OF TREATMENT PLANT:

2.5 mgd.

PUMPING CAPACITY:

Raw water, 2.5 mgd; finished water, 2.5 mgd.

FINISHED-WATER STORAGE:

One elevated tank, 100,000 gallons; three standpipes, 500,000, 500,000, and 300,000 gallons.

FUTURE PLANS:

Plans are being developed for expansion of the water-treatment plant and enlarging the upstream lake on Rocky River by 270 million gallons.

SILER CITY, CHATHAM COUNTY

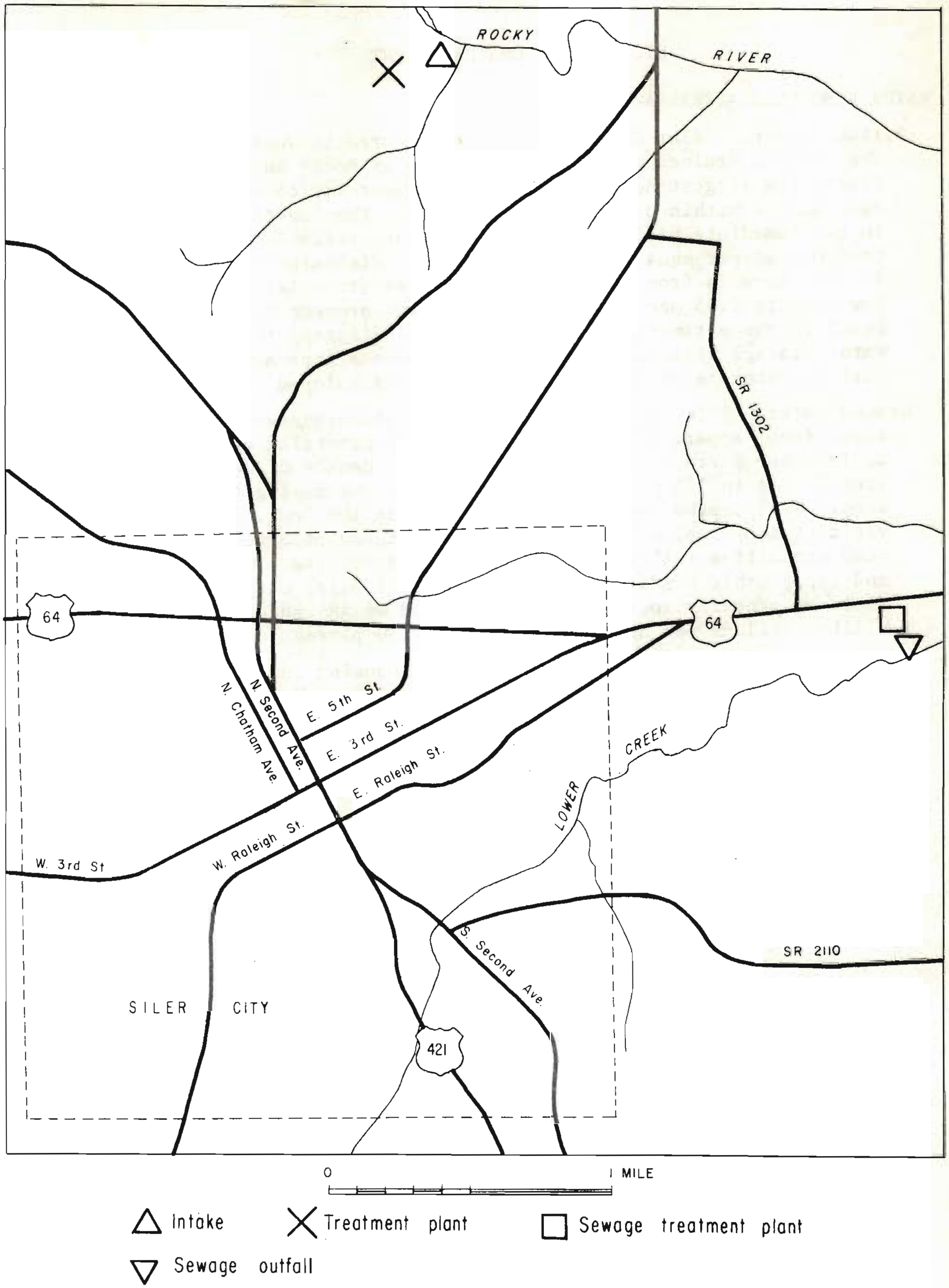
WATER-RESOURCES APPRAISAL:

Surface water: Siler City is in an upland area in western Chatham County. The area is drained by small tributaries of Rocky and Deep Rivers. Rocky River, the largest nearby stream and present source of water, flows southeast and is within 3 miles of Siler City. The low-flow yield of streams in the immediate vicinity of Siler City are variable and range from 0.001 to 0.01 mgd per square mile. The average discharge of all streams draining the area is from 0.5 to 0.7 mgd per square mile. The 7-day, 2-year low flow is 0.05 mgd per square mile. The present rate of withdrawal is equal to the estimated allowable draft, indicating that additional raw-water storage will be needed if water demands increase. Plans for additional storage on Rocky River are being developed.

Ground water: Siler City is underlain by metamorphosed volcanic rocks and argillite. Apparently these rocks are not generally as deeply weathered as in other parts of the county. Reported depths of well casing range from 7 feet to 175 feet, but in most wells the casing is less than 30 feet deep. Well depths average little more than 100 feet, and the average yield of these wells is 5 gpm. Possibly these reported yields reflect pump capacities rather than actual well capacities. Generally in geologic and topographic conditions such as occur at Siler City, the sustained yield of properly located and constructed wells ranges from 0.01 to 0.15 million gallons per day in approximately 50 percent of the wells.

Concentrations of iron and hardness-causing constituents are excessive in water from many wells in Siler City. However, with relatively inexpensive treatment the water can be made suitable for most uses.

SILER CITY


ROCKY
RIVER
SR 1302
64
64
N. Chatham Ave.
N. Second Ave.
E. 5th St.
E. 3rd St.
E. Raleigh St.
W. Raleigh St.
W. 3rd St
CREEK
LOWER
S. Second Ave.
SR 2110
SILER CITY
421
0
1 MILE
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

SILER CITY, CHATHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Rocky R.a/ Raw	Rocky R.a/ Finished	Rocky R.a/ Raw	Rocky R.a/ Finished
Date of collection.......	3-30-66	3-30-66	11-20-70	11-20-70
Copper (Cu)............	--------	--------	.040	.008
Cobalt (Co)............	--------	--------	.000	.000
Zinc (Zn)............	--------	--------	.010	.103
Chromium (Cr)...........	--------	--------	.000	.000
Boron (B)............	--------	--------	.078	.030
Strontium (Sr)...........	--------	--------	.030	.030
Barium (Ba)............	--------	--------	.000	.000
Mercury (Hq)............	--------	--------	<.0005	<.0005
Lead (Pb)............	--------	--------	.000	.000
Lithium (Li)............	--------	--------	.000	.000
Cadmium (Cd)............	--------	--------	.000	.000
Cyanide (CN)............	--------	--------	.00	.00
Chloride (Cl)............	11	8.7	8.3	15
Manganese (Mn)...........	.02	.01	.005	.005
Iron (Fe)............	.16	.03	.248	.000
Calcium (Ca)............	6.6	12	--------	--------
Magnesium (Mg)...........	2.3	2.0	--------	--------
Sodium (Na)............	4.7	4.9	--------	--------
Potassium (K)............	1.0	1.0	--------	--------
Fluoride (F)............	.1	.1	--------	--------
Silica (SiO2)............	11	11	--------	--------
Bicarbonate (HCO3).......	21	29	--------	--------
Carbonate (CO3)..........	0	0	--------	--------
Sulfate (SO4)............	4.6	14	--------	--------
Nitrate (NO3)............	.3	.1	--------	--------
Dissolved Solids.........	52	65	--------	--------
Hardness as CaCO3:				
Total..................	28	38	--------	--------
Noncarbonate...........	10	14	--------	--------
Alkalinity as CaCO3......	17	24	--------	--------
Specific conductance (micromhos at 25° C)....	79	106	--------	--------
pH......................	6.6	7.2	--------	--------
Temperature.............	13	---------	--------	--------

a/ Rocky River and tributaries.

DAVIDSON COUNTY

WATER-RESOURCES APPRAISAL

Davidson County is in the central part of the Piedmont Province. The topography is characterized by rolling hills, with gentle to steep land slopes in the northern half of the county and sharper hills rising to an elevation of about 1,150 feet in the southern part. The county is drained by the Yadkin River, which flows along the west border, and its tributaries. The average discharge of streams ranges from 0.5 to 0.9 mgd per square mile. Minimum flows are variable. Streams in the southern half of the county, with less than 10 square miles drainage area, occasionally go dry, while the low flows of others ranges from 0.01 to 0.09 mgd per square mile and averages 0.04 mgd per square mile. The 7-day, 2-year low flow ranges from 0.01 mgd per square mile in the southern half of the county to 0.23 mgd per square mile in the northern half and averages 0.11 mgd per square mile.

Lexington, Thomasville, Denton, and North Davidson Water Systems, Inc., obtain their water from surface sources. The four systems supply about 64,000 people. The county's total population in 1970 was 95,627.

The county is underlain by a large variety of rocks, but they may be grouped into four major units: granite, diorite, gabbro, and volcanic rocks. Granite underlies a large area in the northwestern part and is bounded on the east by a large body of diorite. Gabbro occurs in two relatively-large areas in the central part. Almost half the county, the southeastern part, is underlain by volcanic rocks. These are slatelike rocks that include slate, tuff, breccia, and flows. In all rock units, the depths of weathering ranges from a few inches to more than 100 feet and averages 35 to 50 feet. Ground-water conditions in the county apparently are about average for the Piedmont. Yields of up to 120 gpm have been reported from wells in the granite unit, and many wells in the diorite and volcanic rock units are reported to yield more than 50 gpm. The following table indicates the range in yields and average depths that have been reported in the various rock units.

Rock unit	Range in yield (gpm)	Average depth (feet)
Granite	0-120	254
Diorite	0-120	258
Gabbro	0- 52	302
Volcanic	0-100	133

No public water systems use wells as a source of supply in Davidson County, but most rural domestic and some small industrial users rely on ground water for their supplies.

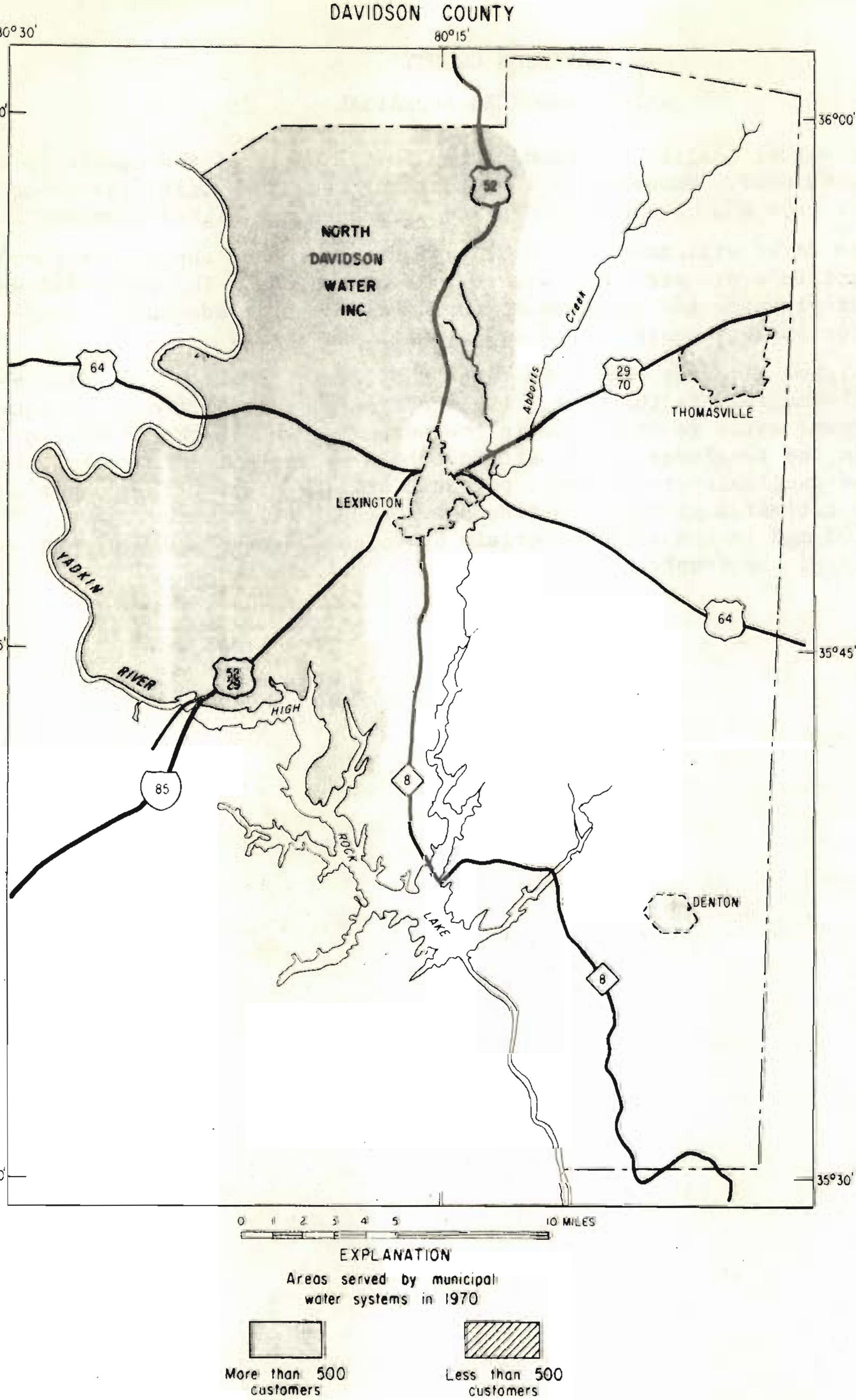
DAVIDSON COUNTY

WATER-RESOURCES APPRAISAL

The chemical quality of ground water in all parts of the county is acceptable for most uses. However, in some parts of each rock unit, the concentrations of iron and hardness-causing constituents are higher than desirable.

Ground water will continue to be the main source of supply for rural users except in areas served by water-district systems. The potential exists, with proper planning and management, for development of adequate ground-water supplies for small industrial and small municipal needs.

The higher yielding wells are those drilled in draws or low, flat areas where weathered rock is thickest. It is estimated that 0.26 mgd per square mile of ground water is available in the northwestern two-thirds of the county. In the remainder, that part underlain by the volcanic rocks, the quantity of available ground water per unit area is about 0.13 mgd per square mile. The estimated yield of continuously pumped wells spaced about 2,500 feet is 0.03 mgd in the areas underlain by volcanic rocks and 0.05 mgd in the other parts of the county.


DAVIDSON COUNTY
80°30'
80°15'
36°00'
35°45'
35°30'
NORTH DAVIDSON WATER INC.
LEXINGTON
THOMASVILLE
DENTON
Abbotts Creek
YADKIN RIVER
HIGH ROCK LAKE
52
64
29 70
52 29
85
8
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1970
More than 500 customers
Less than 500 customers

DENTON, DAVIDSON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,075 in 1970 (575 metered customers, 75 of which are in suburban areas).

SOURCE:

Yadkin River. The intakes are in the backwaters of Tuckertown Reservoir 7 miles southwest of Denton at lat 35°35'39", long 80°15'53".

RAW WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft is 465 mgd without storage.

TOTAL USE:

Average (1970), 0.23 mgd, metered; maximum daily (9-2-70), 0.33 million gallons.

INDUSTRIAL USE:

0.08 mgd, estimated. Principal users include Klopman Mills, Colony Craft, and Bisher Hosiery.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, addition of carbon for control of taste and odor when necessary, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with sodium hydroxide, and post chlorination when necessary.

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd.

PUMPING CAPACITY

Raw water, 1.0 mgd; finished water 1.4 mgd.

FINISHED-WATER STORAGE:

One clear well, 500,000 gallons; one elevated tank, 100,000 gallons.

FUTURE PLANS:

Treatment plant is new (1967), and there are no immediate plans for expansion. However, the plant was designed so capacity could readily be doubled with the addition of two new filters and two new settling basins.

DENTON, DAVIDSON COUNTY

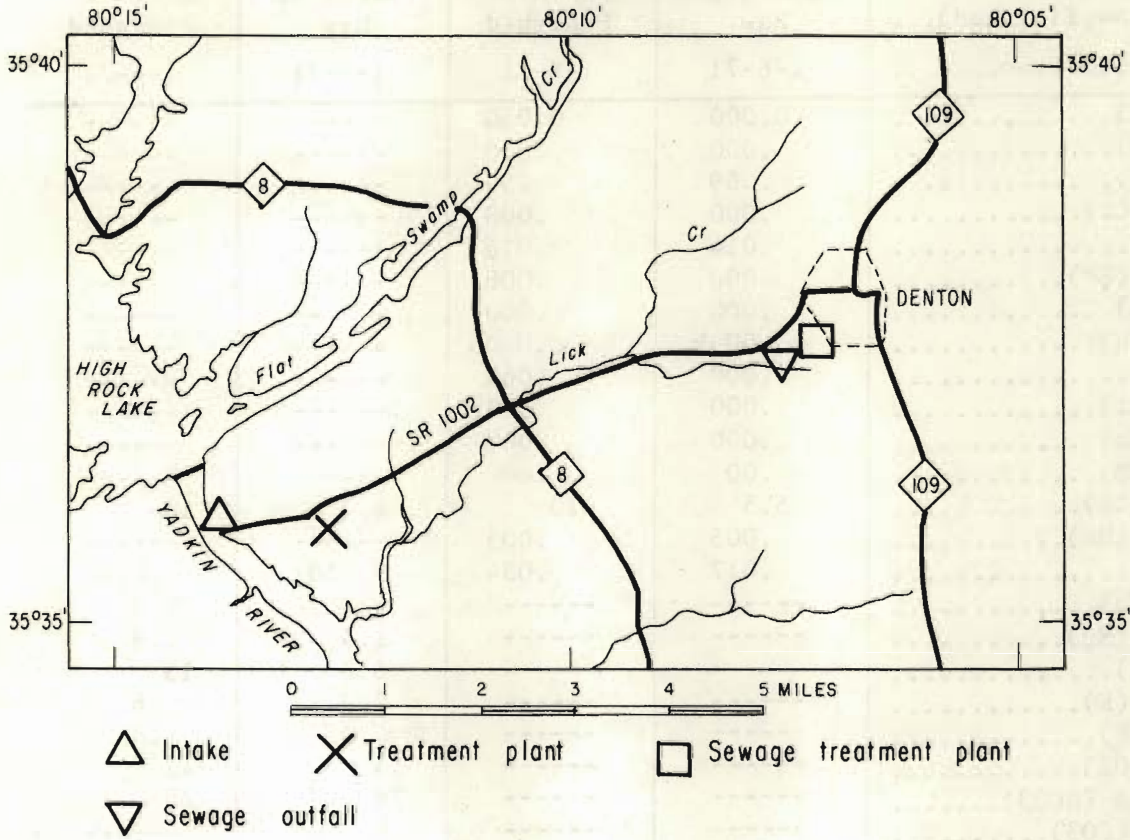
WATER-RESOURCES APPRAISAL:

Surface water: Denton is in the southern half of Davidson County. Streams in the region have below average low-flow yields. There is ample water in the Yadkin River at the Denton intake to supply the needs of the foreseeable future.

Ground water: Denton is underlain by rocks of the Carolina Slate Belt. The principal rock type at the town is andesite tuff. Generally the tuff and slate have weathered to a clayey soil that is less than 30 feet thick. These conditions are not condusive to high-yielding wells. Reported well yields in the Denton vicinity are as large as 55 gpm, and static water levels range from 1 foot above to 60 feet below land surface. Typical of water from the slatey rocks, the chemical quality ranges from good to poor. In some localities, iron and hardness are considerably higher than desirable.

Probably the best wells in the Denton area will not yield more than 0.10 to 0.15 mgd on a sustained basis. Adequate supplies for domestic uses can be obtained in practically all parts of the area.

CITY OF DENTON



DENTON, DAVIDSON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Yadkin R. Raw	Yadkin R. Finished	Yadkin R. Raw	Yadkin R. Finished
Date of collection.......	1-6-71	1-6-71	1-6-71	1-6-71
Copper (Cu)..............	0.000	0.050	------	------
Cobalt (Co)..............	.000	.000	------	------
Zinc (Zn)................	.069	.090	------	------
Chromium (Cr)............	.000	.000	------	------
Boron (B)................	.014	.016	------	------
Strontium (Sr)...........	.000	.000	------	------
Barium (Ba)..............	.000	.000	------	------
Mercury (Hq).............	<.0005	<.0005	------	------
Lead (Pb)................	.000	.000	------	------
Lithium (Li).............	.000	.000	------	------
Cadmium (Cd).............	.000	.000	------	------
Cyanide (CN).............	.00	.00	------	------
Chloride (Cl)............	5.5	10	6.0	10
Manganese (Mn)...........	.005	.005	------	------
Iron (Fe)................	.017	.034	.050	.017
Calcium (Ca).............	------	------	4.9	5.9
Magnesium (Mg)...........	------	------	1.9	1.8
Sodium (Na)..............	------	------	6.0	15
Potassium (K)............	------	------	2.0	.6
Fluoride (F).............	------	------	.0	1.0
Silica (SiO2)............	------	------	14	13
Bicarbonate (HCO3).......	------	------	26	26
Carbonate (CO3)..........	------	------	0	------
Sulfate (SO4)............	------	------	4.4	16
Nitrate (NO3)............	------	------	2.1	1.0
Dissolved Solids.........	------	------	55	78
Hardness as CaCO3:				
Total..................	------	------	20	22
Noncarbonate...........	------	------	0	1
Alkalinity as CaCO3......	------	------	21	21
Specific conductance (micromhos at 25°C)....	------	------	80	113
pH.......................	------	------	6.6	6.8
Temperature..............	6.5	8.0	6.5	8.0

LEXINGTON, DAVIDSON COUNTY

OWNERSHIP:

Municipal. Total population supplied about 25,000 in 1970 (7,137 metered customers, approximately 2,000 of which are in suburban areas).

SOURCE:

Abbotts Creek impounded in Lexington-Thomasville Reservoir: The intakes are approximately 2-1/2 miles northeast of Lexington at lat 35°51'54", long 80°11'41". The intake structure is approximately 200 feet upstream from the dam and has inlets at 7 and 17 feet below normal water level. The source on Abbotts Creek is shared with Thomasville.

Leonards Creek, a tributary of Abbotts Creek, impounded in Old City Lake (auxiliary supply): The intakes are approximately 2-1/2 miles northeast of Lexington at lat 35°51'30", long 80°12'54". The intakes are at the dam and are 3, 6, and 10 feet below normal water level.

RAW-WATER STORAGE:

Old City Lake, 165 million gallons.

Lexington-Thomasville Reservoir, 1,800 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 17.4 mgd, with an adjusted storage of 1,900 million gallons. This includes an allowable draft estimated to be 1.4 mgd from Old City Lake. The allowable draft, estimated to be 16 mgd from Lexington-Thomasville Reservoir, is shared with Thomasville.

TOTAL USE:

Average (1969-70) 4.10 mgd, metered; maximum daily (8-7-69), 5.57 million gallons.

INDUSTRIAL USE:

2.0 mgd, estimated. Principal users include Pittsburg Plate Glass Company Industries Incorporated, Wennonah Cotton Mill, Coble Dairy Incorporated, and Lexington Food Manufacturing.

TREATMENT:

Aeration (at times), prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

Old plant, 5.0 mgd.

New plant, 4.0 mgd.

PUMPING CAPACITY:

Raw water: 36" gravity line from Lexington-Thomasville Reservoir supplies both plants; 5.0 mgd pumping capacity from Old City Lake.

Finished water: Old plant, 7.0 mgd; new plant, 8.0 mgd.

LEXINGTON, DAVIDSON COUNTY

FINISHED-WATER STORAGE:

Three clear wells, 1,000,000, 1,000,000, and 1,000,000 gallons; three elevated tanks, 1,000,000, 500,000, and 500,000 gallons.

FUTURE PLANS:

New filter plant completed in September 1969 is readily expandable to 12.0 mgd when needed.

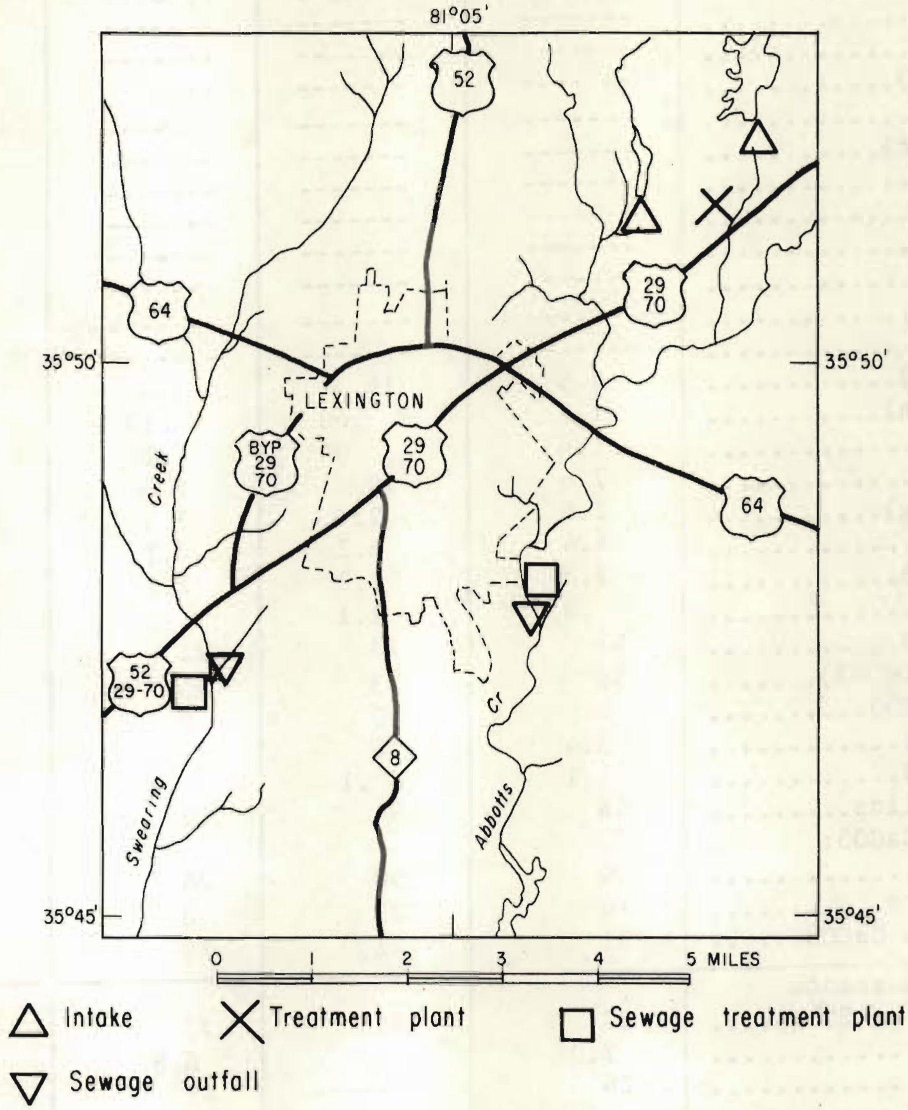
WATER-RESOURCES APPRAISAL:

Surface water: Lexington is on an upland area in the central part of Davidson County. The area is drained by tributaries of Abbotts Creek and Swearing Creek. The low-flow yield of streams in the Lexington area generally exceeds 0.01 mgd per square mile. The average discharge for streams is from 0.7 to 0.8 mgd per square mile. The 7-day, 2-year low flow is 0.10 mgd per square mile. The two reservoirs presently in use have a capacity large enough to meet foreseeable future needs. The Yadkin River is a potential source of future water supply.

Ground water: Lexington is underlain by diorite and granite, with diorite being the principal rock type. Diorite is generally weathered much deeper than the granite in this area. In some places the weathered depth is as much as 175 feet. Well yields from the dioritic rocks are as much as 50 gpm in some places, and the average well depth is 225 feet. Depths to static water levels differ according to the topographic conditions at the individual wells. Reported depths to static water levels range from 60 feet in wells on hills to 15 feet in wells in flat areas. The chemical quality of water from wells in diorite can be made suitable for most uses with little treatment. Generally the water is hard, and in some places the iron content is higher than desirable.

The potential exists for development of ground-water supplies on the magnitude of 0.02 to 0.03 mgd in the Lexington vicinity.

CITY OF LEXINGTON



LEXINGTON, DAVIDSON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Abbotts Cr. Raw	Abbotts Cr. Finished	Leonards Cr. Raw	
Date of collection.......	9-10-65	9-10-65	9-10-65	
Copper (Cu)..............	-------	-------	-------	
Cobalt (Co)..............	-------	-------	-------	
Zinc (Zn)................	-------	-------	-------	
Chromium (Cr)............	-------	-------	-------	
Boron (B)................	-------	-------	-------	
Strontium (Sr)...........	-------	-------	-------	
Barium (Ba)..............	-------	-------	-------	
Mercury (Hq).............	-------	-------	-------	
Lead (Pb)................	-------	-------	-------	
Lithium (Li).............	-------	-------	-------	
Cadmium (Cd).............	-------	-------	-------	
Cyanide (CN).............	-------	-------	-------	
Chloride (Cl)............	4.5	14	3.0	
Manganese (Mn)...........	1.3	.00	.13	
Iron (Fe)................	1.6	.04	.22	
Calcium (Ca).............	7.6	15	6.6	
Magnesium (Mg)...........	2.6	2.7	2.3	
Sodium (Na)..............	4.4	6.2	3.1	
Potassium (K)............	2.3	2.2	2.2	
Fluoride (F).............	.2	1.1	.2	
Silica (Si02)............	13	13	15	
Bicarbonate (HCO3).......	38	33	35	
Carbonate (CO3)..........	0	0	0	
Sulfate (SO4)............	3.4	16	3.4	
Nitrate (NO3)............	1.1	.1	.2	
Dissolved Solids.........	58	94	55	
Hardness as CaCO3:				
Total..................	30	50	26	
Noncarbonate...........	0	23	0	
Alkalinity as CaCO3......	31	27	29	
Specific conductance (micromhos at 25° C)....	87	145	73	
pH.......................	7.0	7.0	6.8	
Temperature..............	26	-------	24	

Note.--See next page for analyses on 1-7-71.

LEXINGTON, DAVIDSON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Abbotts Cr. Raw	Abbotts Cr. Finished		
Date of collection.......	1-7-71	1-7-71		
Copper (Cu).............	0.110	0.005		
Cobalt (Co).............	.000	.000		
Zinc (Zn)................	.050	.130		
Chromium (Cr)...........	.000	.000		
Boron (B)................	.095	.058		
Strontium (Sr)...........	.080	.080		
Barium (Ba).............	.000	.000		
Mercury (Hq)............	<.0005	<.0005		
Lead (Pb)................	.000	.000		
Lithium (Li).............	.000	.000		
Cadmium (Cd)............	.000	.000		
Cyanide (CN).............	.00	.00		
Chloride (Cl)...........	6.9	11		
Manganese (Mn)..........	.000	.005		
Iron (Fe)................	.028	.034		
Calcium (Ca).............	-------	-------		
Magnesium (Mg)..........	-------	-------		
Sodium (Na).............	-------	-------		
Potassium (K)...........	-------	-------		
Fluoride (F)............	-------	-------		
Silica (SiO2)...........	-------	-------		
Bicarbonate (HCO3).......	-------	-------		
Carbonate (CO3)..........	-------	-------		
Sulfate (SO4)............	-------	-------		
Nitrate (NO3)............	-------	-------		
Dissolved Solids.........	-------	-------		
Hardness as CaCO3:				
Total..................	-------	-------		
Noncarbonate...........	-------	-------		
Alkalinity as CaCO3......	-------	-------		
Specific conductance (micromhos at 25° C)...	-------	-------		
pH........................	-------	-------		
Temperature..............	6.0	7.5		

NORTH DAVIDSON WATER, INC., DAVIDSON COUNTY

OWNERSHIP:

North Davidson Water Incorporated. Total population supplied, about 19,200 in 1970 (6,000 metered customers in rural Davidson County).

SOURCE:

Yadkin River. The intakes are approximately 0.2 mile downstream from U. S. Highway 64 bridge over Yadkin River at lat 35°15'18", long 82°23'08".

RAW-WATER STORAGE:

10 million gallons in off-river raw-water reservoir at treatment plant.

ALLOWABLE DRAFT:

Estimated allowable draft is 380 mgd, without storage.

TOTAL USE:

Average (1970), 0.70 mgd, metered; maximum daily (9-13-70), 1.15 million gallons.

INDUSTRIAL USE:

None.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, adjustment of pH with lime, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water, 2.1 mgd; finished water, 2.3 mgd.

FINISHED-WATER STORAGE:

One clear well, 500,000 gallons; five elevated tanks, 500,000, 500,000, 500,000, 500,000, and 250,000 gallons.

FUTURE PLANS:

Plan to enlarge treatment plant capacity to 4.0 mgd, add fluoridation to treatment process, and extend service to 2,000 additional customers in near future.

NORTH DAVIDSON WATER, INC., DAVIDSON COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: There is ample water in the Yadkin River to meet the needs of the system. Streamflow records have been collected near the intake since 1928. The instantaneous minimum discharge since 1928 was 114 mgd in 1954, and this is over 100 times more than is presently used.

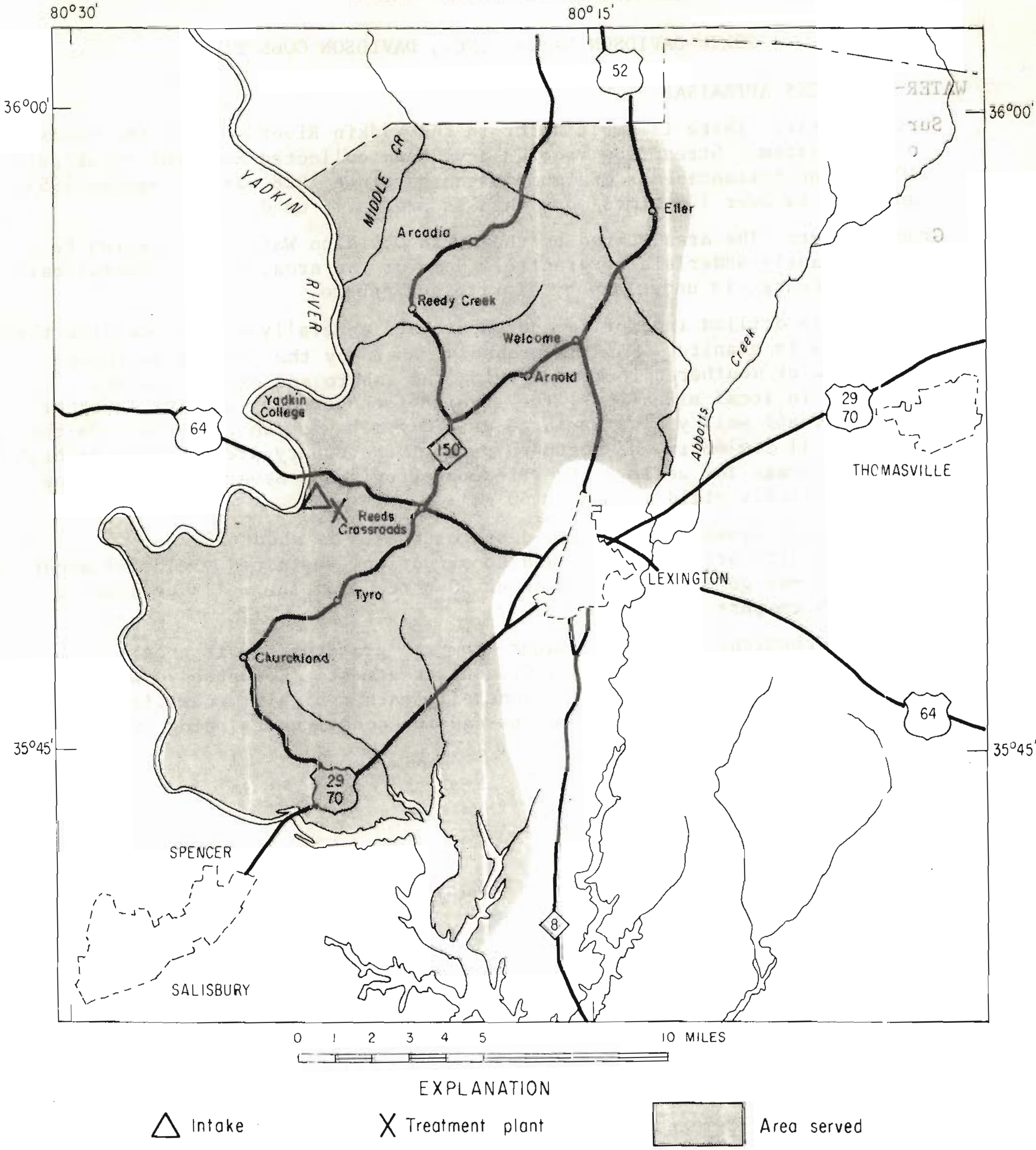
Ground water: The area served by the North Davidson Water Corporation is predominantly underlain by granite. Some of the area, in the central part of the county, is underlain by diorite and gabbro.

Wells drilled in diorite and gabbro are generally more productive than the wells in granite. This is probably caused by the thicker depth of residuum, or weathered rock, overlying the gabbro and diorite units. However, in local situations, the granite is covered by a thick layer of residuum, and well yields as large as 120 gpm have been reported. On the whole, well yields in the northern part of the county are at least as high as the average for wells in the Piedmont Province. Several wells in the area reportedly yield more than 40 gpm.

In most cases, the maximum depth of wells is about 250 feet, and with proper spacing and construction, sustained yields of about 0.025 mgd may be expected from about 50 percent of the wells drilled in the northern part of the county.

The chemical quality of water from the granite unit is generally good and suitable for most uses without treatment. Conversely, water from the gabbro and diorite units is generally rather highly mineralized, with concentrations of iron and hardness-causing constituents being excessive.

NORTH DAVIDSON WATER INC.



NORTH DAVIDSON WATER, INC., DAVIDSON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Yadkin R. Raw	Yadkin R. Finished	Yadkin R. Raw	Yadkin R. Finished
Date of collection.......	1-13-71	1-13-71	1-26-72	1-26-72
Copper (Cu).............	0.003	0.005	--------	--------
Cobalt (Co).............	.000	.000	--------	--------
Zinc (Zn)................	.030	.194	--------	--------
Chromium (Cr)............	.000	.000	--------	--------
Boron (B)................	.041	.009	--------	--------
Strontium (Sr)...........	.000	.030	--------	--------
Barium (Ba)..............	.000	.000	--------	--------
Mercury (Hq).............	<.0005	<.0005	--------	--------
Lead (Pb)................	.000	.000	--------	--------
Lithium (Li).............	.000	.000	--------	--------
Cadmium (Cd).............	.000	.000	--------	--------
Cyanide (CN).............	.00	.00	--------	--------
Chloride (Cl)............	6.2	12	12	8.8
Manganese (Mn)...........	.005	.000	.022	.008
Iron (Fe)................	.017	.034	.000	.069
Calcium (Ca).............	--------	--------	9.4	14
Magnesium (Mg)...........	--------	--------	1.4	1.4
Sodium (Na)..............	--------	--------	6.8	5.6
Potassium (K)............	--------	--------	2.8	1.9
Fluoride (F).............	--------	--------	0.1	0.9
Silica (SiO2)............	--------	--------	9.2	8.8
Bicarbonate (HCO3).......	--------	--------	12	23
Carbonate (CO3)..........	--------	--------	0	0
Sulfate (SO4)............	--------	--------	20	19
Nitrate (NO3)............	--------	--------	0.4	0.4
Dissolved Solids.........	--------	--------	79	79
Hardness as CaCO3:				
Total....................	--------	--------	30	41
Noncarbonate.............	--------	--------	20	22
Alkalinity as CaCO3......	--------	--------	10	19
Specific conductance (micromhos at 25° C)....	--------	--------	112	122
pH.......................	--------	--------	6.5	6.7
Temperature..............	--------	--------	9	--------

THOMASVILLE, DAVIDSON COUNTY

OWNERSHIP:

Municipal. Total population supplied about 18,500 in 1970 (6,626 metered customers, 1,676 of which are in suburban areas).

SOURCE:

Abbotts Creek impounded in Lexington-Thomasville Reservoir: The intakes are approximately 5-1/2 miles west of Thomasville at lat 35°53'29", long 80°10'55". The source is shared with Lexington.

RAW-WATER STORAGE:

Lexington-Thomasville Reservoir, 1,800 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 16 mgd, with a storage of 1.8 billion gallons. This allowable draft is shared with Lexington.

TOTAL USE:

Average (1970), 2.41 mgd, metered; maximum daily (8-26-70), 3.24 million gallons.

INDUSTRIAL USE:

0.85 mgd, estimated. Principal users include Celand Yarn Dyers, Thomasville Furniture Industries, Masonite Corporation, Rogers Knitting Company, and Hill Hosiery Mill.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, adjustment of pH with lime, post chlorination when needed, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd.

PUMPING CAPACITY:

Raw water, 3.3 mgd; finished water, 4.0 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 1,000,000 and 500,000 gallons; one elevated tank, 1,000,000 gallons.

FUTURE PLANS:

Plans are being developed to expand the treatment-plant capacity to 6.0 mgd. Bond issue approved by voters and construction is scheduled to start in 1971.

THOMASVILLE, DAVIDSON COUNTY

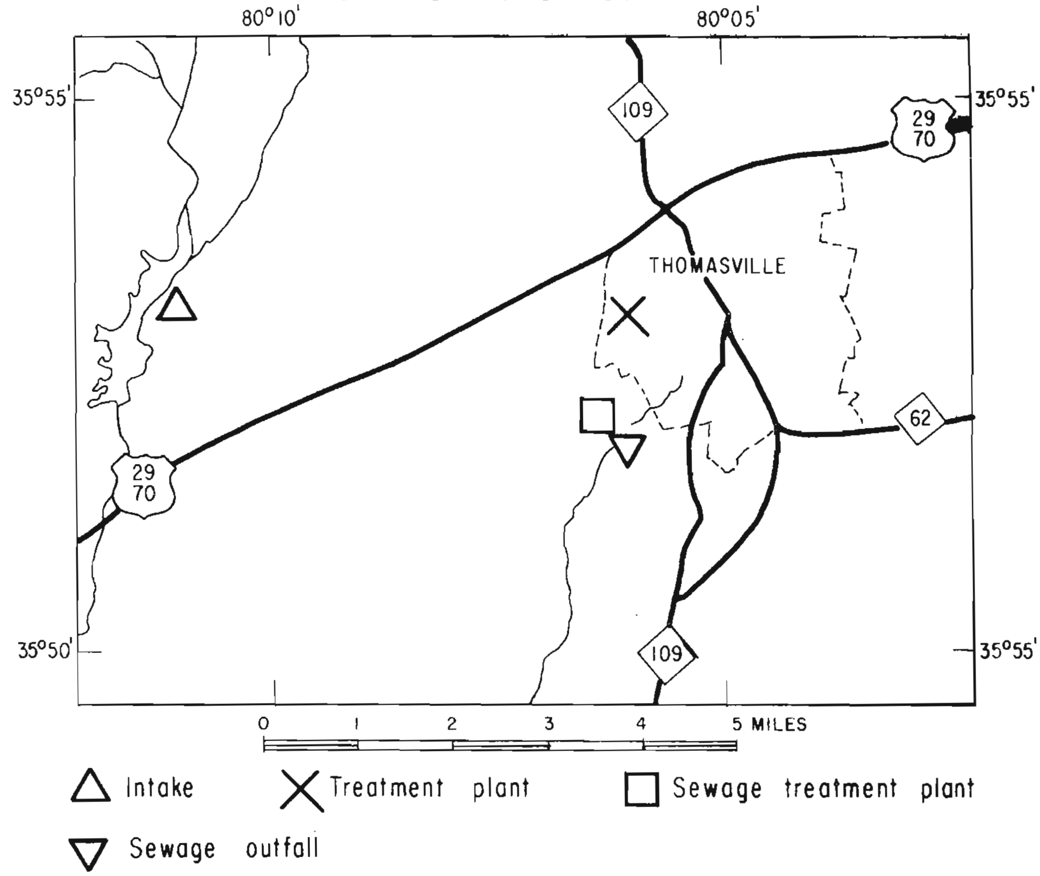
WATER-RESOURCES APPRAISAL:

Surface water: Thomasville is in an upland area in the northeastern part of Davidson County between the Rich Fork and Hambys Creek drainage basins. The low-flow yield of streams in the region generally exceeds 0.01 mgd per square mile. The average discharge for all streams is 0.8 mgd per square mile. The 7-day, 2-year low flow is 0.05 mgd per square mile. The 1,800-million-gallon reservoir, though shared with Lexington, has a capacity large enough to meet foreseeable needs. The estimated allowable draft is more than twice as large as the combined use of Lexington and Thomasville.

The town of Thomasville is underlain by granite. It is a light-colored rock containing large phenocrysts of feldspar and upon weathering forms a coarse sandy soil. Even though the depth of weathered rock is generally less than 30 feet, the texture of the soil and the nature of the jointing and sheeting in the unweathered parts of the rocks tend to make the granitic rocks one of the better aquifers in this area of the Piedmont. In the vicinity of Thomasville, wells are reported to yield as much as 120 gpm. Static water levels stand 40 to 50 feet below land surface, and generally the water from wells in the granite is of excellent chemical quality.

Thomasville is adequately supplied from surface-water sources. However, for small industrial and domestic supplies, the potential exists for properly located individual wells to supply 0.02 to 0.03 mgd.

CITY OF THOMASVILLE



THOMASVILLE, DAVIDSON COUNTY

ANALYSES

(In milligrams per liter)

Source, or type of water (raw;finished)...	Abbotts Cr. Raw	Abbotts Cr. Finished	Abbotts Cr. Raw	Abbotts Cr. Finished
Date of collection.......	9-10-65	9-10-65	1- 7-71	1- 7-71
Copper (Cu)...............	------	------	0.080	0.010
Cobalt (Co)...............	------	------	.000	.000
Zinc (Zn).................	------	------	.040	.049
Chromium (Cr).............	------	------	.000	.000
Boron (B).................	------	------	.047	.039
Strontium (Sr)............	------	------	.130	.080
Barium (Ba)...............	------	------	.000	.000
Mercury (Hq)..............	------	------	<.0005	<.0005
Lead (Pb).................	------	------	.000	.000
Lithium (Li)..............	------	------	.000	.000
Cadmium (Cd)..............	------	------	.000	.000
Cyanide (CN)..............	------	------	.00	.00
Chloride (Cl).............	6.8	11	7.0	12
Manganese (Mn)............	.11	.00	.000	.008
Iron (Fe).................	.37	.03	.007	.052
Calcium (Ca)..............	8.0	15	------	------
Magnesium (Mg)............	1.8	2.4	------	------
Sodium (Na)...............	5.8	5.8	------	------
Potassium (K).............	2.2	2.4	------	------
Fluoride (F)..............	.2	.3a/	------	------
Silica (SiO2).............	14	14	------	------
Bicarbonate (HCO3).......	36	43	------	------
Carbonate (CO3)...........	0	0	------	------
Sulfate (SO4).............	5.4	13	------	------
Nitrate (NO3).............	.2	.1	------	------
Dissolved Solids.........	65	88	------	------
Hardness as CaCO3:				
Total.................	28	48	------	------
Noncarbonate...........	0	13	------	------
Alkalinity as CaCO3......	30	35	------	------
Specific conductance (micromhos at 25°C)....	92	137	------	------
pH......................	6.8	7.1	------	------
Temperature.............	25	-------	17.0	7.0

a/ Fluoridation equipment out of order at time of sample collection.

Note.--Also see analyses results for Lexington.

DAVIE COUNTY

WATER-RESOURCES APPRAISAL

Davie County is in the west-central part of the Piedmont province and is well drained by tributaries of the Yadkin and South Yadkin Rivers. The Yadkin River forms the eastern boundary and the South Yadkin River forms the southern boundary of the county. The average discharge of streams is 0.9 mgd per square mile. Minimum flows are variable, ranging from 0.01 to 0.15 mgd per square mile, and averaging 0.09 mgd per square mile. The 7-day, 2-year low-flow averages 0.22 mgd per square mile. Mocksville and Cooleemee obtain their municipal supplies from surface sources. The county's total population in 1970 was 18,855.

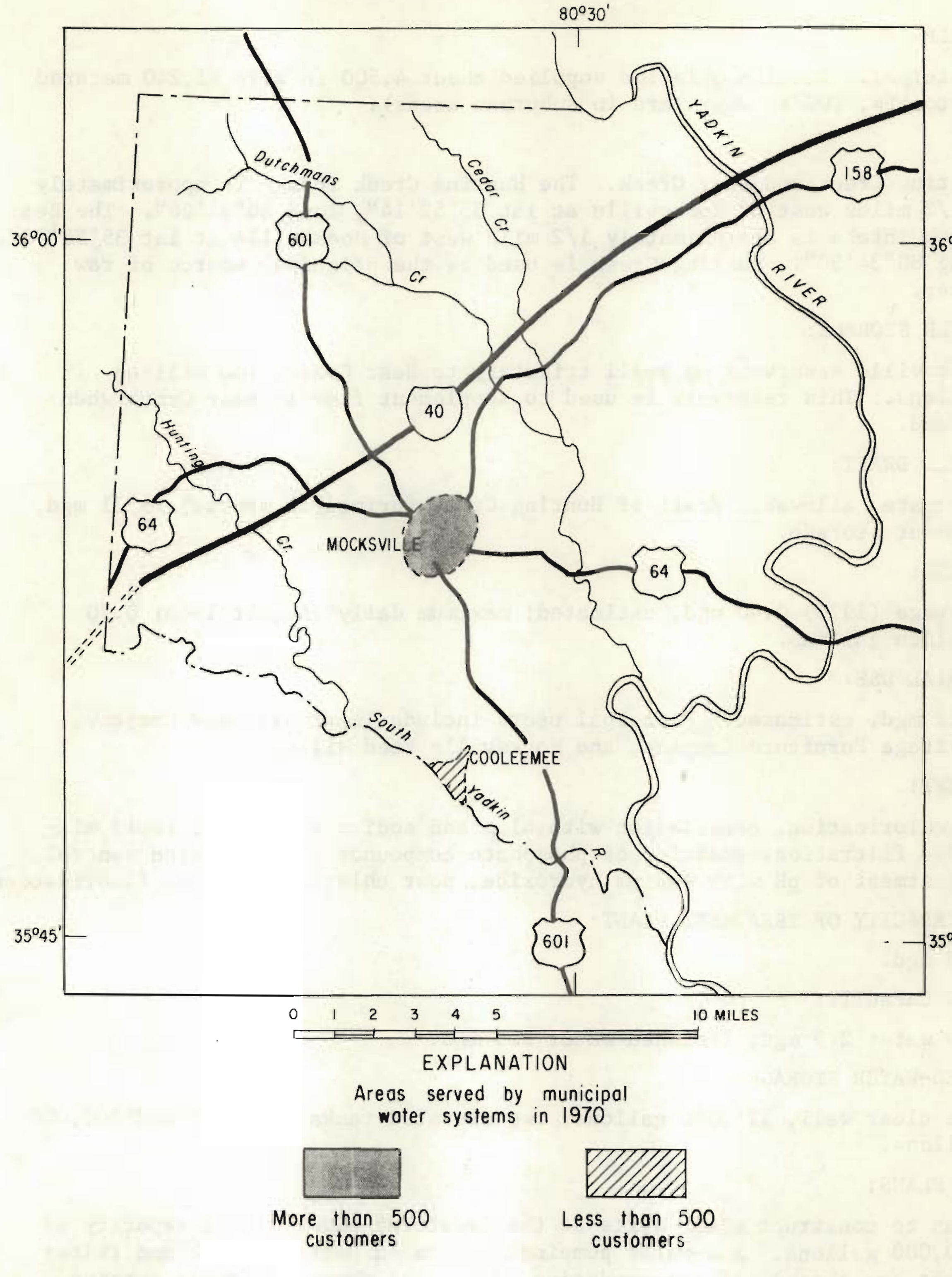
A wide variety of rocks, generally massive and subject to fracturing underlie the county. The major rock units may be grouped as granite, schist, gabbro, and diorite. The scarcity of records of drilled wells of tested capacity prevents an accurate appraisal of ground-water conditions. With the exception of a small area of sedimentary rocks in the northwest corner, the geology, and, consequently, the ground-water conditions, should be similar to those in adjacent counties.

Maximum reported well yields in the available records is 20 gpm. It is probable that properly developed wells drilled at favorable sites would yield considerably more water. Favorable sites for higher yielding wells are in topographically low or flat areas, where the covering of weathered rocks is thickest. It is estimated that 0.3 to 0.4 mgd per square mile of ground water is available in the county, and continuously pumped wells spaced about 2,500 feet apart would yield 0.06 to 0.08 mgd.

The chemical quality of water from all rocks should be suitable for most uses, but locally, iron and hardness-causing constituents may be a problem.

Ground water is not used as a source for municipal supply, but will continue to be an important source for agricultural, domestic, and small industrial supplies in areas remote from municipal systems.

DAVIE COUNTY



MOCKSVILLE, DAVIE COUNTY

OWNERSHIP:

Municipal. Total population supplied about 4,500 in 1970 (1,240 metered customers, 200 of which are in suburban areas).

SOURCE:

Hunting Creek and Bear Creek. The Hunting Creek intake is approximately 2-1/2 miles west of Mocksville at lat 35°52'14", long 80°36'26". The Bear Creek intake is approximately 1/2 mile west of Mocksville at lat 35°53'03", long 80°34'30". Hunting Creek is used as the principal source of raw water.

RAW-WATER STORAGE:

Mocksville Reservoir on small tributary to Bear Creek, 100 million gallons. This reservoir is used to supplement flow in Bear Creek when needed.

ALLOWABLE DRAFT:

Estimated allowable draft of Hunting Creek (principal source) is 31 mgd, without storage.

TOTAL USE:

Average (1970) 0.40 mgd, estimated; maximum daily (August 1968) 0.70 million gallons.

INDUSTRIAL USE:

0.12 mgd, estimated. Principal users include Ingersoll-Rand Company, Heritage Furniture Company, and Mocksville Feed Mills.

TREATMENT:

Prechlorination, coagulation with alum and sodium hydroxide, rapid mix-media filtration, addition of phosphate compounds for corrosion control, adjustment of pH with sodium hydroxide, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water 2.5 mgd; finished water 2.5 mgd.

FINISHED-WATER STORAGE:

One clear well, 125,000 gallons; two elevated tanks, 125,000 and 200,000 gallons.

FUTURE PLANS:

Plan to construct clear wells at the treatment plant with a capacity of 450,000 gallons. Raw-water pumping station on Hunting Creek and filter plant are capable of accommodating additional pumps to double pumping capacity, as needed.

MOCKSVILLE, DAVIE COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Mocksville is in an upland area in south central Davie County. The area is drained by tributaries of Bear, Elisha, and Dutchmans Creeks. The low-flow yield of streams draining the immediate area is 0.01 to 0.03 mgd per square mile. The average discharge of all streams is 0.9 mgd per square mile, and the 7-day, 2-year low flow is 0.15 mgd per square mile. The low-flow yield of Hunting Creek is ample to supply the needs of Mocksville for the foreseeable future.

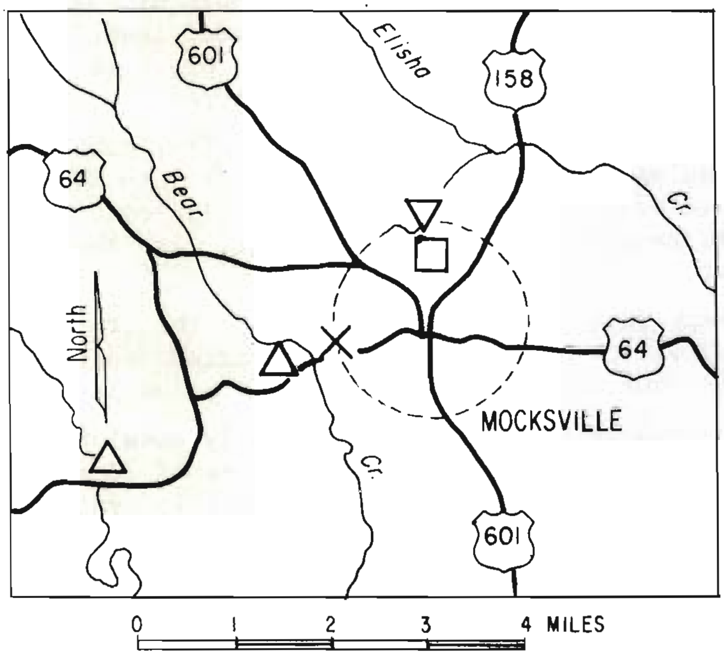
Ground water: Mocksville is underlain by granite, gabbro, and diorite rocks, with granite being the predominant type. Prior to 1947, the municipal supply was obtained from ground water. Available records show the depths of these wells ranged from 90 to 1,200 feet, with the average depth being about 200 feet.

The maximum reported yield was 20 gpm. The static water level in a long-term observation well in Mocksville varied seasonably and averaged 19 feet below land surface in April to 23 feet below land surface in November.

It is reasonable to assume that properly developed wells located at favorable sites would produce water in excess of 20 gpm. It is estimated that 0.35 mgd per square mile of ground water is available from the rocks underlying the immediate area.

The chemical quality of ground water is suitable for most domestic uses, but some may require treatment for iron removal.

CITY OF MOCKSVILLE



△ Intake ✕ Treatment plant □ Sewage treatment plant

▽ Sewage outfall

MOCKSVILLE, DAVIE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Bear Cr. Raw	Bear Cr. Finished		
Date of collection.......	7-26-66	7-26-66		
Copper (Cu)..............	-------	-------		
Cobalt (Co)..............	-------	-------		
Zinc (Zn)................	-------	-------		
Chromium (Cr)............	-------	-------		
Boron (B)................	-------	-------		
Strontium (Sr)...........	-------	-------		
Barium (Ba)..............	-------	-------		
Mercury (Hq).............	-------	-------		
Lead (Pb)................	-------	-------		
Lithium (Li).............	-------	-------		
Cadmium (Cd).............	-------	-------		
Cyanide (CN).............	-------	-------		
Chloride (Cl)............	2.1	5.6		
Manganese (Mn)...........	.01	.01		
Iron (Fe)................	.04	.01		
Calcium (Ca).............	8.8	9.3		
Magnesium (Mg)...........	4.0	3.8		
Sodium (Na)..............	5.5	22		
Potassium (K)............	1.5	1.5		
Fluoride (F).............	.1	.2		
Silica (SiO2)............	22	21		
Bicarbonate (HCO3).......	58	71		
Carbonate (CO3)..........	0	0		
Sulfate (SO4)............	1.2	19		
Nitrate (NO3)............	.2	.1		
Dissolved Solids.........	75	118		
Hardness as CaCO3:				
Total..................	39	38		
Noncarbonate...........	0	0		
Alkalinity as CaCO3......	48	58		
Specific conductance (micromhos at 25° C)....	100	177		
pH.......................	6.9	7.3		
Temperature..............	23	23		

Note.--See additional analyses on next page.

MOCKSVILLE, DAVIE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)... Date of collection.......	Hunting Cr. Raw 1-8-71	Hunting Cr. Finished 1-8-71	Hunting Cr. Raw 1-8-71	Hunting Cr. Finished 1-8-71
Copper (Cu).............	0.000	0.000	--------	--------
Cobalt (Co).............	.000	.000	--------	--------
Zinc (Zn)...............	.038	.068	--------	--------
Chromium (Cr)...........	.000	.000	--------	--------
Boron (B)...............	.016	.170	--------	--------
Strontium (Sr)..........	.000	.030	--------	--------
Barium (Ba).............	.000	.000	--------	--------
Mercury (Hq)............	<.0005	<.0005	--------	--------
Lead (Pb)...............	.000	.000	--------	--------
Lithium (Li)............	.000	.000	--------	--------
Cadmium (Cd)............	.000	.000	--------	--------
Cyanide (CN)............	.00	.00	--------	--------
Chloride (Cl)...........	4.2	8.0	3.0	7.0
Manganese (Mn)..........	.005	.030	--------	--------
Iron (Fe)...............	.062	.028	.049	.027
Calcium (Ca)............	--------	--------	3.5	4.1
Magnesium (Mg)..........	--------	--------	1.1	1.7
Sodium (Na).............	--------	--------	2.3	13
Potassium (K)...........	--------	--------	2.2	2.3
Fluoride (F)............	--------	--------	0	1.3
Silica (SiO2)...........	--------	--------	10	12
Bicarbonate (HCO3).......	--------	--------	12	23
Carbonate (CO3)..........	--------	--------	0	0
Sulfate (SO4)...........	--------	--------	4.0	12
Nitrate (NO3)...........	--------	--------	2.1	1.5
Dissolved Solids........	--------	--------	42	78
Hardness as CaCO3:				
Total..................	--------	--------	13	17
Noncarbonate...........	--------	--------	3	0
Alkalinity as CaCO3......	--------	--------	9.8	19
Specific conductance (micromhos at 25° C)....	--------	--------	47	96
pH......................	--------	--------	6.0	6.9
Temperature.............	6.5	6.5	6.5	6.5

DURHAM COUNTY

WATER-RESOURCES APPRAISAL

Durham County is in the eastern part of the Piedmont Province. The land surface in the northern half of the county is prevailingly level, gently rolling, or rolling, and stream channels are narrow with steep slopes. In the southern half, the land surface ranges from undulating to gently rolling; stream channels are wider and have moderate slopes. The Eno, Flat, Little, and Neuse Rivers and their tributaries drain all but the southwestern corner of the county. The southwestern corner is drained by New Hope River and its tributaries. The average discharge for streams ranges from 0.5 to 0.7 mgd per square mile. Most streams have small low-flow yields, in the range of 0.001 to 0.007 mgd per square mile, and streams with less than 5 square miles drainage area occasionally go dry. The 7-day, 2-year low flow averages about 0.07 mgd per square mile in the northern part of the county and about 0.05 mgd per square mile in the southern part. The City of Durham, serving about 100,000 people, has the only municipal supply and obtains its water from surface-water sources. The county's total population in 1970 was 132,681.

Most of the northwestern fourth of the county is underlain by metamorphosed volcanic rocks. The remainder is principally underlain by sedimentary deposits, including sandstone, siltstone, shale, and conglomerate of Triassic age. Granite and granitelike rocks have intruded the older rocks along the western edge of the Triassic deposits and through the north-central part of the county.

Because of the large area underlain by the Triassic deposits, the average ground-water conditions are less favorable for large well yields than in most of the other Piedmont counties. Great differences in yield from place to place in the same rock unit have been noted. Available well records indicate that the depth of weathered material has a greater influence on well yield from the metamorphosed volcanic rocks than does topography. In the granite-like rocks and Triassic deposits the well yields seem to be principally influenced by topography.

The table shown below was compiled from available well data from Durham County, and it shows the maximum and average reported well yields and average well depth in each major rock unit.

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Granite and Granodiorite	12	4	90
Metamorphosed Volcanic rocks	50	12	108
Triassic	40	8	138

DURHAM COUNTY

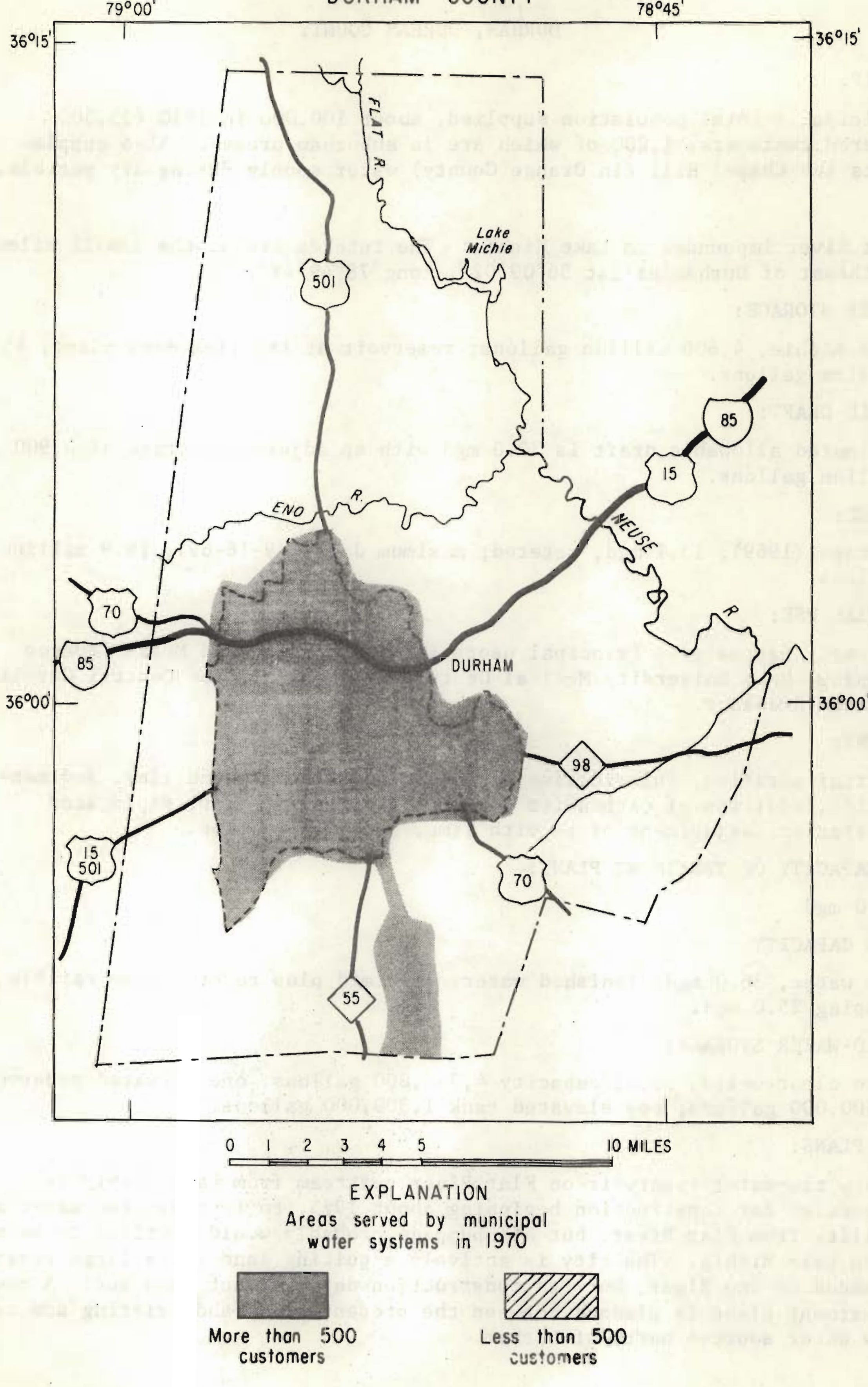
WATER-RESOURCES APPRAISAL

Ground water in Durham County is principally a calcium bicarbonate type or sodium bicarbonate type, and it is suitable for most domestic and industrial uses.

Excessive hardness is common in water from the Triassic rocks and is frequently found in water from all other rock units. Iron concentrations in water from the Triassic deposits are usually below 0.3 mg/l (milligrams per liter). In water from the other rock units, iron concentrations are considerably higher than 0.3 mg/l in some localities.

In most parts of Durham County the available quantity of ground water is adequate for domestic needs, and, in some places, small industrial supplies can be developed. Although yields of up to 40 gpm have been reported from wells in Triassic deposits, it seems more reasonable that the safe sustained yields would be on the order of 8 to 10 gpm, or 0.06 mgd per square mile.

DURHAM COUNTY



DURHAM, DURHAM COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 100,000 in 1970 (25,500 metered customers, 1,200 of which are in suburban areas). Also supplements the Chapel Hill (in Orange County) water supply during dry periods.

SOURCE:

Flat River impounded in Lake Michie: The intakes are at the dam 12 miles northeast of Durham at lat 36°09'02", long 78°49'49".

RAW-WATER STORAGE:

Lake Michie, 4,600 million gallons; reservoir at the treatment plant, 45 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 30.0 mgd with an adjusted storage of 3,900 million gallons.

TOTAL USE:

Average (1969), 13.1 mgd, metered; maximum daily (9-16-69), 18.9 million gallons.

INDUSTRIAL USE:

4.5 mgd, estimated. Principal users include Liggett and Myers Tobacco Company, Duke University Medical Center, Erwin Mills, and Central Carolina Farmers Exchange.

TREATMENT:

Partial aeration, chlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, adjustment of pH with lime, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

22.0 mgd.

PUMPING CAPACITY:

Raw water, 36.0 mgd; finished water, 25.0 mgd plus reserve also capable of pumping 25.0 mgd.

FINISHED-WATER STORAGE:

Five clear wells, total capacity 4,350,000 gallons; one elevated reservoir, 3,500,000 gallons; one elevated tank 1,500,000 gallons.

FUTURE PLANS:

A new raw-water reservoir on Flat River upstream from Lake Michie is scheduled for construction beginning about 1975, to increase the water availability from Flat River, but all pumpage probably would continue to be made from Lake Michie. The city is actively acquiring land for a large reservoir planned on Eno River, but its construction date has not been set. A new treatment plant is planned between the present plant and existing and new raw water sources north of Durham.

DURHAM, DURHAM COUNTY

WATER-RESOURCES APPRAISAL:

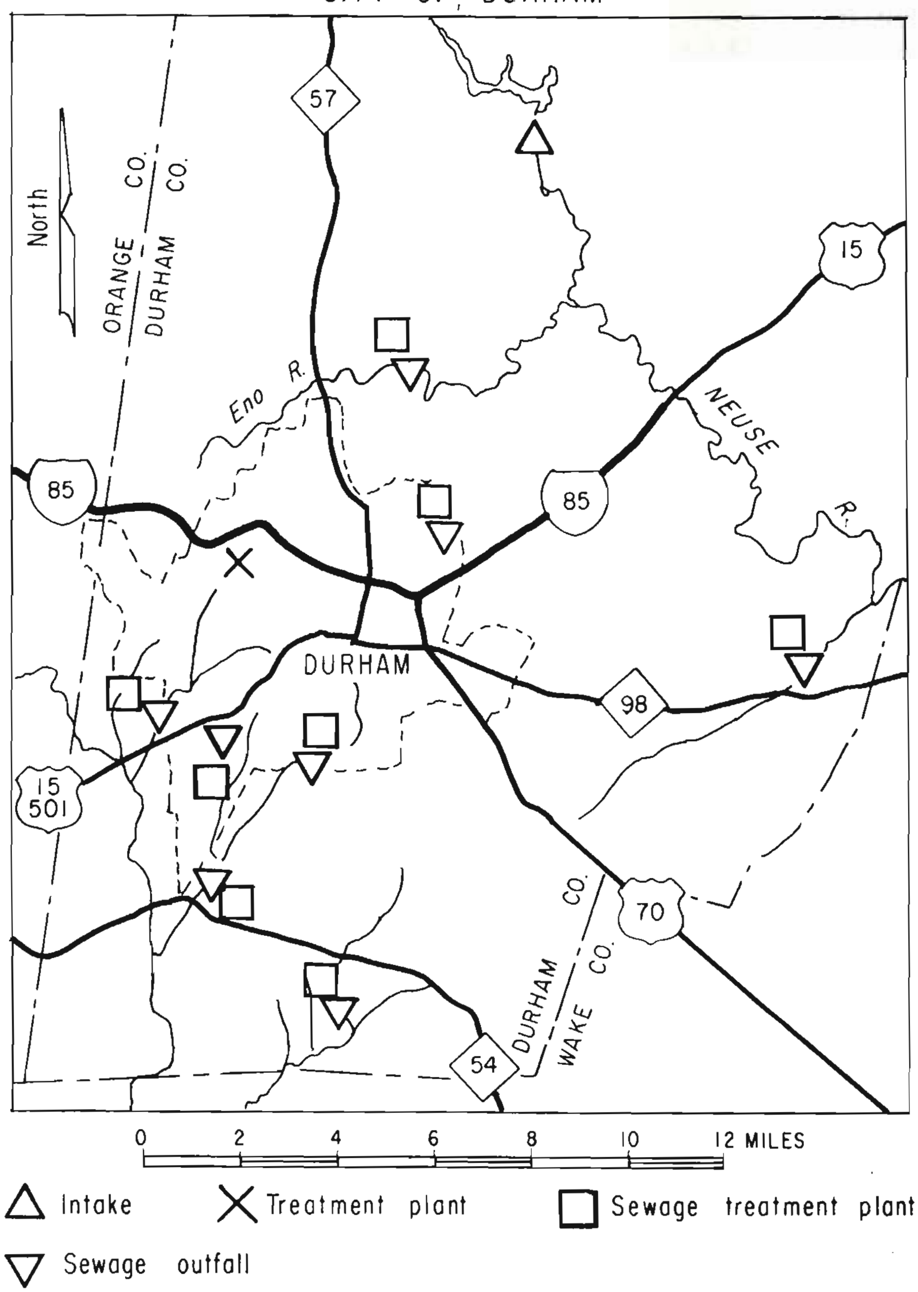
Surface water: Durham is in the central part of Durham County in the Piedmont section of North Carolina. The area is drained by tributaries of the Neuse and Cape Fear River basins. The low-flow yields of the streams in the immediate area generally exceed 0.001 mgd per square mile. However, streams with less than 5 square miles drainage area can be expected to go dry during most years. The average discharge for all streams is 0.6 mgd per square mile and the 7-day, 2-year low-flow is 0.02 mgd per square mile.

Ground water: The City of Durham is underlain by rocks of Triassic age that mainly include sandstone, shale, and conglomerate. Numerous dikes or sills of diabase have intruded the beds of Triassic material.

Because of the impermeable nature of the Triassic materials, it is difficult to develop large ground-water supplies within the city. The most favorable well sites are those in which the well may penetrate local faults or dikes. It has been reported that some wells near Durham have yields of over 100 gpm, and it is probable that these wells penetrate such fractures. However, the average yield of wells in Durham probably does not exceed 10 gpm. The average well depth is probably 150 feet.

The chemical quality of ground water in Durham is typical of other areas in the Triassic basin. Marked differences in quality are noted within short distances. In many wells, the water is hard and corrosive, and in some excessive concentrations of iron and chloride are present. Water from some wells, such as those in diabase dikes, is suitable for most uses with little or no treatment.

CITY OF DURHAM



DURHAM, DURHAM COUNTY

ANALYSES

(In milligrams per liter)

Source, or type of water (raw;finished)...	Flat River Raw	Flat River Finished	Flat River Raw	Flat River Finished
Date of collection.......	5-13-66	5-13-66	11- 3-70	11- 3-70
Copper (Cu)...............	------	------	0.015	0.003
Cobalt (Co)...............	------	------	.000	.000
Zinc (Zn).................	------	------	.072	.050
Chromium (Cr).............	------	------	.000	.000
Boron (B).................	------	------	.095	.070
Strontium (Sr)............	------	------	.000	.030
Barium (Ba)...............	------	------	.000	.000
Mercury (Hq)..............	------	------	<.0005	<.0005
Lead (Pb).................	------	------	.000	.000
Lithium (Li)..............	------	------	.000	.000
Cadmium (Cd)..............	------	------	.000	.000
Cyanide (CN)..............	------	------	.00	.00
Chloride (Cl).............	1.5	8.0	5.2	12
Manganese (Mn)............	.02	.01	.020	.002
Iron (Fe).................	.10	.00	.028	.000
Calcium (Ca)..............	.02	18	------	------
Magnesium (Mg)............	1.3	1.1	------	------
Sodium (Na)...............	3.4	4.0	------	------
Potassium (K).............	1.1	1.3	------	------
Fluoride (F)..............	.0	1.0	------	------
Silica (SiO2).............	11	11	------	------
Bicarbonate (HCO3)........	20	29	------	------
Carbonate (CO3)...........	0	0	------	------
Sulfate (SO4).............	5.6	20	------	------
Nitrate (NO3).............	.2	.1	------	------
Dissolved Solids..........	58	88	------	------
Hardness as CaCO3:				
Total.....................	18	51	------	------
Noncarbonate..............	2	27	------	------
Alkalinity as CaCO3.......	16	24	------	------
Specific conductance (micromhos at 25°C)....	61	127	------	------
pH........................	6.5	7.0	------	------
Temperature...............	18	------	18.5	17.7

FORSYTH COUNTY

WATER-RESOURCES APPRAISAL

Forsyth County is in the northwestern part of the Piedmont Province. The topography is characterized by rolling hills with moderate to steep land slopes. The Yadkin River, which forms the west boundary of the county, and its tributaries drain about three-fourths of the county. The northeastern corner of the county is drained by tributaries of the Dan River. The average discharge of streams ranges from 0.6 to 0.9 mgd per square mile and averages 0.8 mgd per square mile. Minimum flows generally exceed 0.05 mgd per square mile and average 0.09 mgd per square mile. The 7-day, 2-year low flow averages 0.2 mgd per square mile.

Winston-Salem and Kernersville obtain their municipal supplies from surface sources. Other municipal supplies and most domestic and industrial supplies are obtained from ground-water sources. The county's total population in 1970 was 214,348.

Ground water is used for public supply at Rural Hall, for several industrial supplies, and for nearly all rural domestic supplies. Ground water will continue to be an important source of water supply in areas remote from large municipal systems.

The chemical quality of ground water in all parts of the county is acceptable for most uses. Iron concentrations and hardness-causing constituents are higher than desirable in water from parts of each rock unit.

Ground water is available, with proper planning and management, for development of adequate supplies for small industrial and municipal needs. Higher yielding wells may be developed at favorable sites such as topographically low or flat areas where the weathered rock is thickest. It is estimated that 0.4 mgd per square mile of ground water is available in much of the northwestern part of the county. In the southeast, especially that part underlain by granite rocks, the quantity available is on the order of 0.3 mgd per square mile. Wells spaced about 2,500 feet apart will probably yield 0.06 mgd in the southeast, and 0.07 mgd elsewhere in the county.

Approximately 85 percent of the county is underlain by mica-gneiss, the remainder is underlain by granite or diorite-gabbro. The granite crops out principally along the southern boundary and in the southeast corner of the county, although smaller bodies of granite occur in other places. The diorite-gabbro crops out in the southwest corner. The zone of weathering is thick, especially in the gneiss unit where it is known to be more than 60 feet thick in many places and possibly reaches a depth of 100 feet.

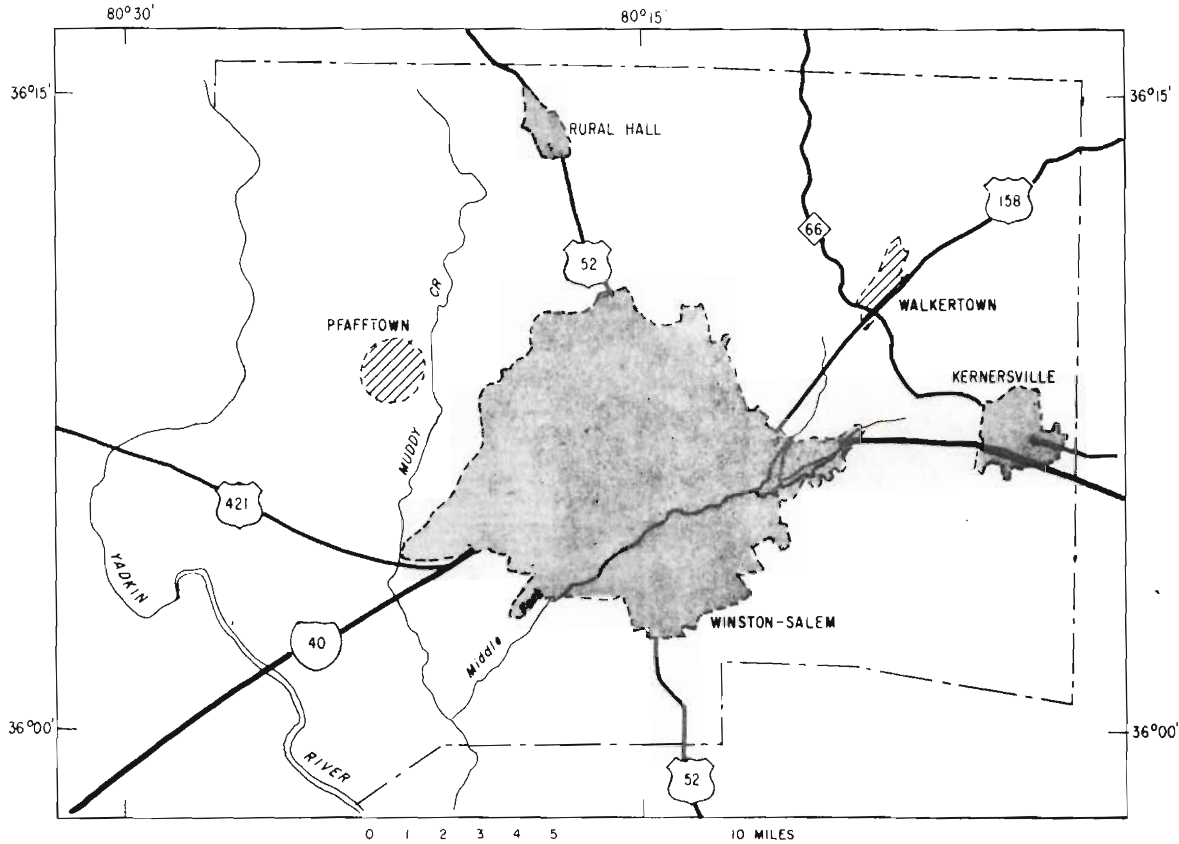
FORSYTH COUNTY

WATER-RESOURCES APPRAISAL

No records on wells drilled in the diorite-gabbro are available. The following table shows typical yields and average depth of wells drilled in the mica-gneiss and granite units:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Mica gneiss	125	20	232
Granite	15	8	199

FORSYTH COUNTY



EXPLANATION

Areas served by municipal water systems in 1970

More than 500 customers

Less than 500 customers

KERNERSVILLE, FORSYTH COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 5,000 in 1970 (1,300 metered customers, 18 of which are in suburban areas).

SOURCE:

Harmon Mill Creek impounded in Old Town Lake: The intakes are approximately one-half mile northwest of Kernersville at lat 36°07'29", long 80°05'45". Belews Creek impounded in New Town Lake: The intakes are approximately 3 miles northwest of Kernersville at lat 36°09'10", long 80°01'05".

RAW-WATER STORAGE:

Old Town Lake, 10 million gallons.

New Town Lake, 125 million gallons.

ALLOWABLE DRAFT:

Old Town Lake; estimated allowable draft is 0.2 mgd with a storage of 10 million gallons.

New Town Lake; not determined; carryover storage analysis required.

TOTAL USE:

Average (1970), 0.80 mgd, metered; maximum daily (11-17-69), 1.16 million gallons.

INDUSTRIAL USE:

0.53 mgd, metered. Principal users include Burlington Industries, Carolina Industrial Pumping, and Adams Mills.

TREATMENT:

Prechlorination, coagulation with alum and occasionally lime, sedimentation, rapid sand filtration, adjustment of pH with lime, and post chlorination when necessary.

RATED CAPACITY OF TREATMENT PLANT:

1.5 mgd.

PUMPING CAPACITY:

Raw water, 4.1 mgd; finished water, 5.0 mgd.

FINISHED-WATER STORAGE:

One clear well, 300,000 gallons; two elevated tanks, 100,000 and 500,000 gallons.

FUTURE PLANS:

Expansion of treatment plant recently completed and no other work presently planned.

KERNERSVILLE, FORSYTH COUNTY

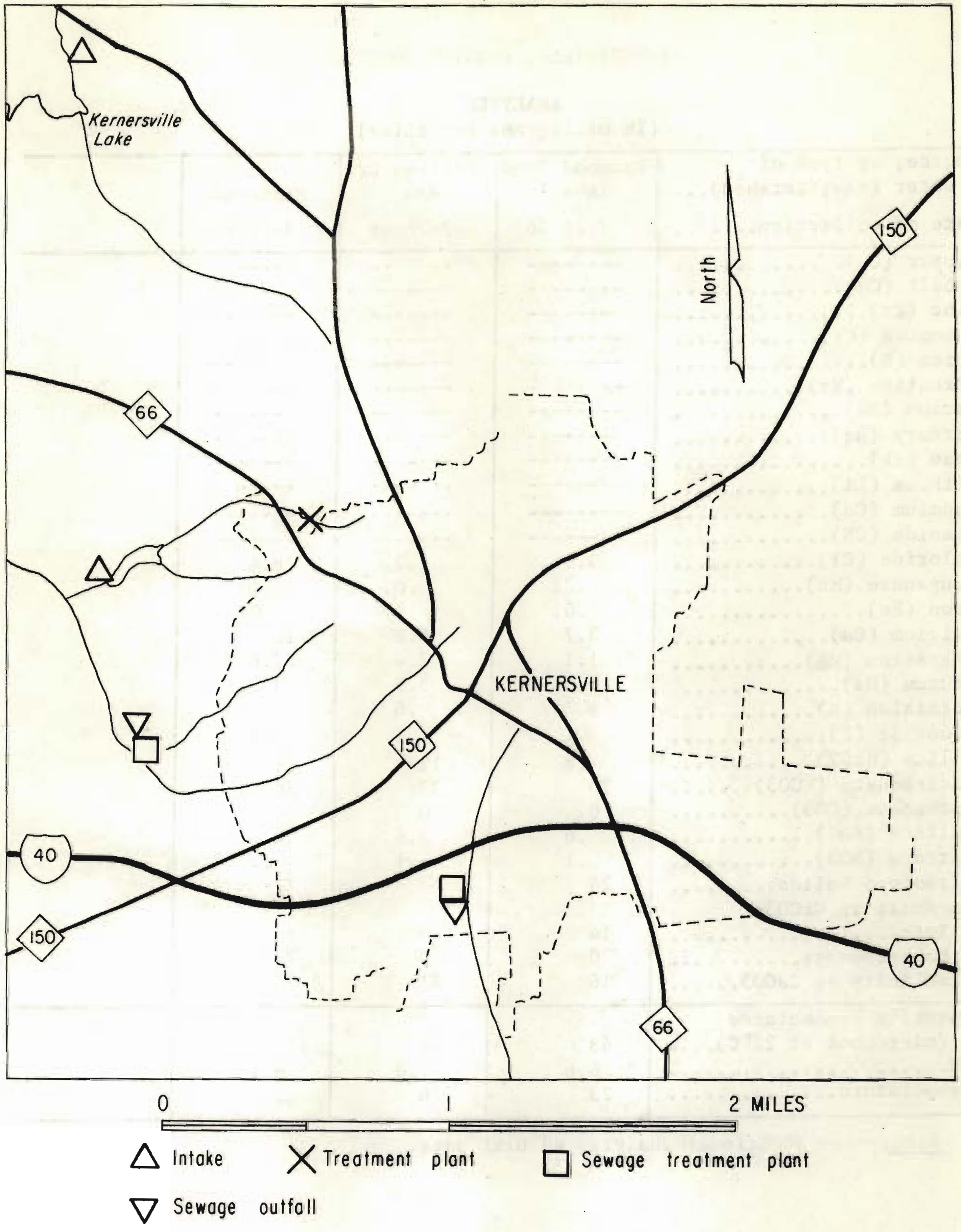
WATER-RESOURCES APPRAISAL:

Surface water: Kernersville is in eastern Forsyth County near the basin divides between the Yadkin, Dan, and Cape Fear Rivers. The area is drained by numerous small tributaries in all directions. Thus, it is not ideally situated for a surface-water supply. The minimum flow of streams in the immediate vicinity of Kernersville generally exceeds 0.1 mgd per square mile. The average discharge of all streams in the area is 0.8 mgd per square mile and the 7-day, 2-year low flow averages 0.25 mgd per square mile. The reservoirs currently in use on Harmon Mill and Belews Creeks have a capacity large enough to meet the immediate needs of Kernersville. However, due to Kernersville's location near the basin divides of several major rivers, potential raw-water sources to meet long-range needs are limited. If long-range needs beyond present supply capabilities develop, the town might consider acquiring supplemental water from Winston-Salem.

Ground water: Most of Kernersville is underlain by granite. Small areas in the southeast and northwest edge of town are underlain by gneiss. Ground water was used to supply the town until the late twenties when the wells failed to supply sufficient water. The wells were drilled to depths ranging from 150 to 580 feet and were reported to yield as much as 75 gpm.

The scarcity of records of drilled wells of tested capacity prevents an accurate appraisal of ground-water conditions in Kernersville. However, it is estimated that wells drilled in favorable locations have a potential yield of about 0.06 mgd. Records of wells in the surrounding area indicate the gneiss to be the better aquifer, generally yielding about 2-1/2 times more water than the granite.

CITY OF KERNERSVILLE



KERNERSVILLE, FORSYTH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Hammond Pond (Aux.)	Bellews Cr. Raw	Finished	
Date of collection.......	7-26-66	7-26-66	7-26-66	
Copper (Cu).............	--------	-------	-------	
Cobalt (Co).............	--------	-------	-------	
Zinc (Zn)...............	--------	-------	-------	
Chromium (Cr)...........	--------	-------	-------	
Boron (B)...............	--------	-------	-------	
Strontium (Sr)..........	--------	-------	-------	
Barium (Ba).............	--------	-------	-------	
Mercury (Hq)............	--------	-------	-------	
Lead (Pb)...............	--------	-------	-------	
Lithium (Li)............	--------	-------	-------	
Cadmium (Cd)............	--------	-------	-------	
Cyanide (CN)............	--------	-------	-------	
Chloride (Cl)...........	3.9	1.7	8.4	
Manganese (Mn)..........	.01	.01	.01	
Iron (Fe)...............	.01	.07	.00	
Calcium (Ca)............	3.7	5.8	16	
Magnesium (Mg)..........	1.1	2.4	2.6	
Sodium (Na).............	2.3	3.5	3.5	
Potassium (K)...........	1.2	.6	.7	
Fluoride (F)............	.1	.1	.1	
Silica (Si02)...........	.8	11	11	
Bicarbonate (HCO3)......	20	33	36	
Carbonate (CO3).........	0	0	0	
Sulfate (SO4)...........	.6	2.6	16	
Nitrate (NO3)...........	.1	.1	.1	
Dissolved Solids........	24	45	77	
Hardness as CaCO3:				
Total.................	14	25	50	
Noncarbonate..........	0	0	21	
Alkalinity as CaCO3.....	16	27	30	
Specific conductance (micromhos at 25° C)....	43	62	121	
pH......................	6.6	7.0	8.1	
Temperature.............	23	26	26	

Note.--See additional analyses on next page.

KERNERSVILLE, FORSYTH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Bellews Cr. Raw	Bellews Cr. Finished		
Date of collection.......	1-14-71	1-14-71		
Copper (Cu)............	1.30	0.020		
Cobalt (Co)............	.000	.000		
Zinc (Zn)............	.397	.053		
Chromium (Cr)............	.000	.000		
Boron (B)............	.010	.010		
Strontium (Sr)............	.000	.030		
Barium (Ba)............	.000	.000		
Mercury (Hq)............	<.0005	<.0005		
Lead (Pb)............	.000	.000		
Lithium (Li)............	.000	.000		
Cadmium (Cd)............	.000	.000		
Cyanide (CN)............	.00	.00		
Chloride (Cl)............	9.0	7.6		
Manganese (Mn)............	.787	.000		
Iron (Fe)............	1.29	.014		
Calcium (Ca)............	--------	-------		
Magnesium (Mg)............	--------	-------		
Sodium (Na)............	--------	-------		
Potassium (K)............	--------	-------		
Fluoride (F)............	--------	-------		
Silica (SiO2)............	--------	-------		
Bicarbonate (HCO3)............	--------	-------		
Carbonate (CO3)............	--------	-------		
Sulfate (SO4)............	--------	-------		
Nitrate (NO3)............	--------	-------		
Dissolved Solids............	--------	-------		
Hardness as CaCO3:				
Total............	--------	-------		
Noncarbonate............	--------	-------		
Alkalinity as CaCO3............	--------	-------		
Specific conductance (micromhos at 25° C)....	--------	-------		
pH............	--------	-------		
Temperature............	6.5	6.0		

RURAL HALL SANITARY DISTRICT, FORSYTH COUNTY

OWNERSHIP:

Rural Hall Sanitary District. Total population supplied, about 2,300 in 1970 (593 metered customers, two of which are small industries).

SOURCE:

Three wells (Nos. 1, 2, and 3).

Well No. 1 (Park Avenue), Fo-3, located at: lat 36°17'29", long 80°14'03". Driller: G. W. Clayton Well Drilling Co. Year drilled: 1939. Total depth: 356 ft. Diam: 8 in. Cased to: 90 ft. Type of finish: open hole. Topography: hilltop. Aquifer: crystalline rock (gneiss). Static water level: 40-50 ft. Yield: 70 gpm. Pumping level: unknown. Type pump: turbine. Pump setting: 250 ft.

Well No. 2 (Wall Street), Fo-165, located at: lat 36°17'32", long 80°14'28". Driller: G. W. Clayton Well Drilling Co. Year drilled: 1940. Total depth: 376 ft. Diam: 8 in. Cased to: 90-100 ft. Type of finish: open hole. Topography: high, flat. Aquifer: crystalline rock (gneiss). Static water level: 40-50 ft. Yield: 85 gpm. Pumping level: unknown. Type pump: submersible. Pump setting: 60-70 ft.

Well No. 3 (Park Avenue), Fo-166, located at lat 36°17'31", long 80°14'03". Driller: G. W. Clayton Well Drilling Co. Year drilled: 1964. Total depth: about 356 ft. Diam: 8 in. Cased to: 90-100 ft. Type of finish: open hole. Topography: hilltop. Aquifer: crystalline rock (gneiss). Static water level: 40-50 ft. Yield: 125 gpm. Pumping level: unknown. Type pump: submersible. Pump setting: 200 ft.

TOTAL USE:

Average (1970), 0.13 mgd, metered; maximum daily, not available.

INDUSTRIAL USE:

0.10 mgd, estimated. Principal users include Brady Furniture Co. and Rural Hall Veneer Co.

TREATMENT:

None.

PUMPING CAPACITY:

0.39 mgd.

RAW-WATER STORAGE:

Two elevated tanks, 75,000 gallons and 225,000 gallons.

FUTURE PLANS:

None. Supply is considered adequate to meet foreseeable needs.

RURAL HALL SANITARY DISTRICT, FORSYTH COUNTY

WATER-RESOURCES APPRAISAL:

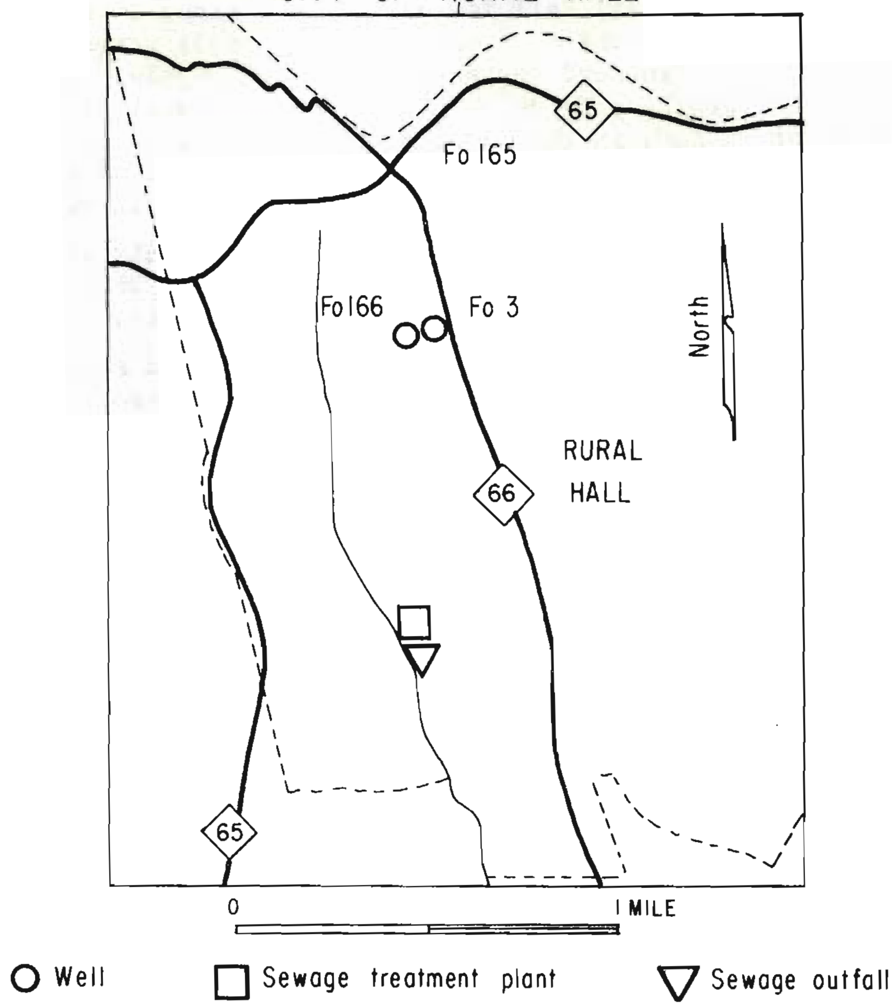
Surface water: Rural Hall is located on a ridge in the northern part of Forsyth County. The area is drained by small streams; thus the town is not favorably located for a surface water supply. The largest nearby creek is Town Fork Creek about 2 miles northwest of town. The low-flow yield of streams in the immediate vicinity of Rural Hall generally exceeds 0.1 mgd per square mile. The average discharge of streams is 0.8 mgd per square mile and the 7-day, 2-year low flow is 0.2 mgd per square mile.

Ground water: The Rural Hall vicinity is underlain principally by mica-feldspar gneiss. Included in the general rock unit are small areas of schist and intrusives such as quartz and diorite.

Most wells drilled in this rock unit yield sufficient water for domestic supplies, and wells drilled for municipalities and industrial plants reportedly yield an average of 35 gpm. The wells currently in use by the Rural Hall Sanitary District have an average yield of 93 gpm. The rock is weathered to depths of 100 feet, and a large fracture zone reportedly exists about 350 feet below the surface. These two factors probably account for the above-average yield of the Rural Hall wells. It has been reported that no pumping interference has been noted between wells. Wells 1 and 3 are only about 100 feet apart, and well no. 2 is about 2,450 feet from them. There appears to be an excellent potential for increasing the ground-water supply by drilling additional wells. On the basis of the high yields of the existing wells, it seems reasonable to assume that, with proper location and spacing, new wells may each yield about 0.07 mgd on a sustained basis.

The chemical quality of water produced from the Rural Hall Sanitary District wells is good, and is acceptable for practically all domestic and industrial uses without treatment.

CITY OF RURAL HALL



RURAL HALL, FORSYTH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No.1 Raw	Well No.2 Raw	Well No.3 Raw
Date of collection.......	10-19-65	10-19-65	1-20-71
Copper (Cu).............	------	------	0.000
Cobalt (Co).............	------	------	.000
Zinc (Zn)...............	------	------	.080
Chromium (Cr)...........	------	------	.000
Boron (B)...............	------	------	.011
Strontium (Sr)..........	------	------	.105
Barium (Ba).............	------	------	.000
Mercury (Hq)............	------	------	
Lead (Pb)...............	------	------	.000
Lithium (Li)............	------	------	.000
Cadmium (Cd)............	------	------	.000
Cyanide (CN)............	------	------	.00
Chloride (Cl)...........	3.9	3.0	3.4
Manganese (Mn)..........	.02	.00	.005
Iron (Fe)...............	.13	.10	.007
Calcium (Ca)............	22	22	------
Magnesium (Mg)..........	6.9	7.1	------
Sodium (Na).............	7.7	8.2	------
Potassium (K)...........	3.6	3.9	------
Fluoride (F)............	.3	.2	------
Silica (SiO2)...........	24	24	------
Bicarbonate (HCO3).......	113	116	------
Carbonate (CO3)..........	0	0	------
Sulfate (SO4)............	5.6	6.8	------
Nitrate (NO3)............	.0	.0	------
Dissolved Solids.........	130	132	------
Hardness as CaCO3:			
Total..................	84	84	------
Noncarbonate...........	0	0	------
Alkalinity as CaCO3......	93	95	------
Specific conductance (micromhos at 25° C)....	195	195	
pH.......................	7.0	7.5	
Temperature..............	17	16	

Note.--Water is not treated.

WINSTON-SALEM, FORSYTH COUNTY

OWNERSHIP:

Municipal. Total population supplied about 140,000 in 1970 (40,642 metered customers, 246 of which are in suburban areas). Also supplies Forsyth County Water System which has 5,300 metered customers.

SOURCE:

Salem Creek impounded in Salem Lake and Yadkin River impounded by Idols Dam. The Salem Lake intakes are at the dam at lat 36°05'45", long 80°11'32". The Yadkin River intakes are approximately 200 feet west of the dam on the north bank at lat 35°57'59", long 80°~~24'37~~".
23' 52"

RAW-WATER STORAGE:

Two 15 million gallon reservoirs at Neilson Treatment Plant.

Salem Lake, 1,160 million gallons.

Yadkin River at Idols Dam, negligible.

33,000 acre feet of storage between elevations 1,000 and 1,030 feet in W. Kerr Scott Reservoir on Yadkin River is reserved for Winston-Salem water supply.

ALLOWABLE DRAFT:

Estimated allowable draft of Salem Lake is 11.7 mgd with an adjusted storage of 1,090 million gallons. Estimated allowable draft of Yadkin River is 340 mgd with no storage.

TOTAL USE:

Average (1970), 32.26 mgd, metered; maximum daily (5-27-70), 32.84 million gallons.

INDUSTRIAL USE:

17.14 mgd, metered. Principal users include Schlitz Brewing Company, R. J. Reynolds Tobacco Company, and Hanes Dyeing and Finishing Company of the Hanes Corporation.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor when necessary, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

Thomas Plant, 20 mgd.

Neilson Plant, 24 mgd.

WINSTON-SALEM, FORSYTH COUNTY

PUMPING CAPACITY:

Raw water: Yadkin River to Neilson plant, 27 mgd; gravity line from Salem Lake to Thomas plant, 17 mgd.

Finished water: Neilson plant, 12 mgd; Thomas plant, 32 mgd. Chitty pumping station, where the 10,000,000-gallon standpipe is located, receives finished water from Neilson plant and distributes it to the system with the following pumping capacities: high-head 24 mgd, low-head 6 mgd.

FINISHED-WATER STORAGE:

Five clear wells, 2,000,000, 2,000,000, 2,000,000, 1,000,000, and 1,000,000 gallons; three elevated tanks, 1,000,000, 1,000,000, and 100,000 gallons; one standpipe, 10,000,000 gallons.

FUTURE PLANS:

Plan to open bids in spring of 1971 for expansions including: (1) New 60 mgd raw water intake on Yadkin River at Idols Dam; (2) new 40 mgd finished water line from Neilson plant to Chitty pumping station; (3) install 2 new finished water pumps at Neilson plant to make total finished water pumping capacity 36 mgd; and (4) erect two new 1,000,000-gallon elevated tanks. These expansions are estimated at $5 million.

WATER-RESOURCES APPRAISAL:

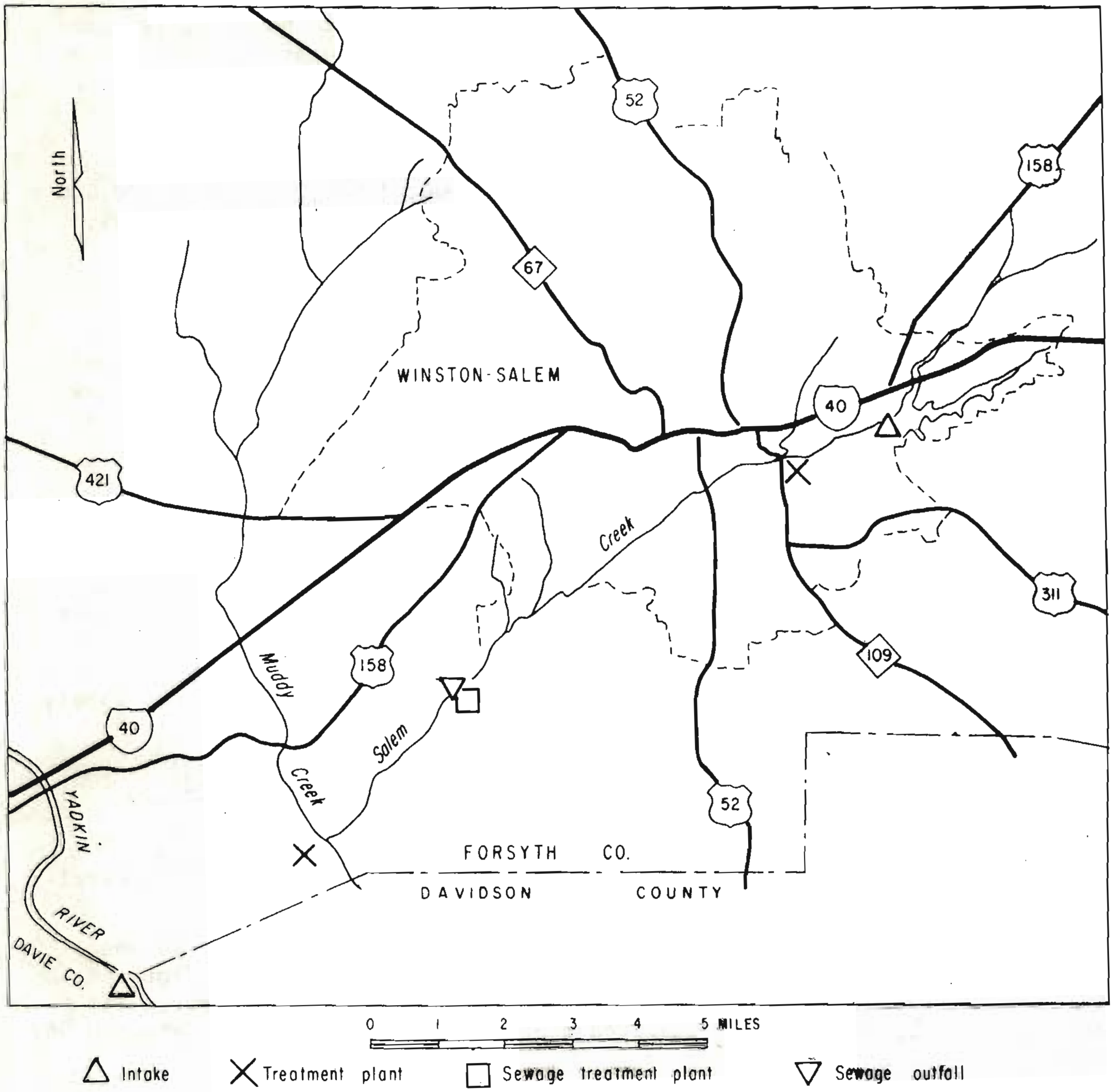
Surface water: Winston-Salem is in the center of Forsyth County. The area is drained by Muddy and Salem Creeks and their tributaries. The low-flow yield of streams draining the city generally exceeds 0.1 mgd per square mile. The average discharge of all streams is 0.8 mgd per square mile and the 7-day, 2-year low flow is 0.2 mgd per square mile. The minimum flow of the Yadkin River is large enough to supply sufficient water to the city for the foreseeable future.

Ground water: Winston-Salem is underlain by gneiss. Records of well casing lengths indicate that the gneiss is weathered to depths as much as 120 feet. The average yield of wells drilled in the gneiss is 20 gpm. The highest 5 percent of the yields are in the range of 50 to 100 gpm. Reported well depths range from 50 feet to more than 1,000 feet but generally wells are drilled 100 to 250 feet deep.

Several industrial and commercial firms in Winston-Salem use ground water. In favorable areas the amount of ground water is adequate for this purpose. Generally, wells designed and constructed for maximum yield and spaced about 2,500 feet apart can reasonably be expected to yield about 0.06 mgd.

The chemical quality of ground water in the area is suitable for most domestic uses and some industrial processes. The water ranges from soft to very hard.

CITY OF WINSTON-SALEM



WINSTON-SALEM, FORSYTH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)... Date of collection.......	Yadkin R. Thomas Plant Raw 10-20-65	Salem Lake Thomas Plant Raw 10-20-65	Thomas Plant Finished (Mixed) 10-20-65	Yadkin R. Neilson Pl. Raw 10-20-65
Copper (Cu)..............	-------	-------	-------	-------
Cobalt (Co)..............	-------	-------	-------	-------
Zinc (Zn)................	-------	-------	-------	-------
Chromium (Cr)............	-------	-------	-------	-------
Boron (B)................	-------	-------	-------	-------
Strontium (Sr)...........	-------	-------	-------	-------
Barium (Ba)..............	-------	-------	-------	-------
Mercury (Hq).............	-------	-------	-------	-------
Lead (Pb)................	-------	-------	-------	-------
Lithium (Li).............	-------	-------	-------	-------
Cadmium (Cd).............	-------	-------	-------	-------
Cyanide (CN).............	-------	-------	-------	-------
Chloride (Cl)............	3.1	3.6	8.1	2.9
Manganese (Mn)...........	.02	.02	.03	.01
Iron (Fe)................	.15	.01	.06	.08
Calcium (Ca).............	3.8	5.5	11	3.4
Magnesium (Mg)...........	1.0	1.0	1.3	1.0
Sodium (Na)..............	3.7	3.2	4.1	3.8
Potassium (K)............	1.2	2.2	1.8	1.3
Fluoride (F).............	.1	.1	.9	.0
Silica (SiO2)............	11	15	11	12
Bicarbonate (HCO3).......	21	25	26	21
Carbonate (CO3)..........	0	0	0	0
Sulfate (SO4)............	3.0	3.0	9.6	2.8
Nitrate (NO3)............	.0	.7	.0	.2
Dissolved Solids.........	41	52	69	38
Hardness as CaCO3:				
Total..................	14	18	34	12
Noncarbonate...........	0	0	12	0
Alkalinity as CaCO3......	17	20	21	8
Specific conductance (micromhos at 25° C)....	47	58	95	47
pH.......................	6.6	6.6	7.1	6.6
Temperature..............	17	18	-------	17

Additional analyses, Neilson Plant, finished water, 10-21-65 (also see next page):

Chloride (Cl)...	6.4	Fluoride (F)........	1.2	Hardness as CaCO3:	
Manganese (Mn)..	.01	Silica (SiO2).......	12	Total.............	26
Iron (Fe).......	.06	Bicarbonate (HCO3)..	21	Noncarbonate	10
Calcium (Ca)....	7.8	Carbonate (CO3......	0	Alkalinity as CaCO3..	17
Magnesium (Mg)..	1.7	Sulfate (SO4).......	9.2	Spec. Conduct.	79
Sodium (Na).....	4.6	Nitrate (NO3).......	.0	pH..................	7.3
Potassium (K)...	1.3	Dissolved Solids....	58	Temperature..........	----

WINSTON-SALEM, FORSYTH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)... Date of collection.......	Salem Lake Thomas Plant Raw 1-14-71	Thomas Plant Finished (Mixed) 1-14-71	Yadkin R. Neilson Pl. Raw 1-14-71	Neilson Pl. Finished 1-14-71
Copper (Cu)..............	0.000	0.010	0.000	0.000
Cobalt (Co)..............	.000	.000	.000	.000
Zinc (Zn)................	.025	.045	.006	.030
Chromium (Cr)............	.000	.000	.000	.000
Boron (B)................	.019	.026	.205	.022
Strontium (Sr)...........	.000	.000	.000	.000
Barium (Ba)..............	.000	.000	.000	.000
Mercury (Hq).............	<.0005	<.0005	<.0005	<.0005
Lead (Pb)................	.000	.000	.000	.000
Lithium (Li).............	.000	.000	.000	.000
Cadmium (Cd).............	.000	.000	.000	.000
Cyanide (CN).............	.00	.00	.00	.00
Chloride (Cl)............	3.7	7.6	3.4	6.0
Manganese (Mn)...........	.000	.005	.015	.000
Iron (Fe)................	.010	.017	.034	.000
Calcium (Ca).............	-------	-------	-------	-------
Magnesium (Mg)...........	-------	-------	-------	-------
Sodium (Na)..............	-------	-------	-------	-------
Potassium (K)............	-------	-------	-------	-------
Fluoride (F).............	-------	-------	-------	-------
Silica (SiO2)............	-------	-------	-------	-------
Bicarbonate (HCO3).......	-------	-------	-------	-------
Carbonate (CO3)..........	-------	-------	-------	-------
Sulfate (SO4)............	-------	-------	-------	-------
Nitrate (NO3)............	-------	-------	-------	-------
Dissolved Solids.........	-------	-------	-------	-------
Hardness as CaCO3:				
Total..................	-------	-------	-------	-------
Noncarbonate...........	-------	-------	-------	-------
Alkalinity as CaCO3......	-------	-------	-------	-------
Specific conductance (micromhos at 25° C)....	-------	-------	-------	-------
pH.......................	-------	-------	-------	-------
Temperature..............	6.5	7.0	6.0	6.0

GRANVILLE COUNTY
WATER-RESOURCES APPRAISAL

Granville County is in the eastern part of the Piedmont Province with the Virginia-North Carolina State line its northern boundary. The topography in the western and northwestern parts of the county is characterized by rolling to steeply rolling hills while in the southern part land slopes are more gentle. Tributaries of the Roanoke River drain the northern third of the county, the Tar River and its tributaries drain the central third, and tributaries of the Neuse River drain the southern third. The average discharge of streams ranges from 0.6 to 0.8 mgd per square mile. Minimum flows are small, ranging from 0 to 0.05 mgd per square mile and averaging 0.005 mgd per square mile. Streams with less than 15 to 20 square miles drainage area occasionally go dry. The 7-day, 2-year low flow ranges from 0 to 0.2 mgd per square mile and averages 0.02 mgd per square mile. Oxford, Creedmoor, and Butner obtain their water from surface-water sources. Most other domestic and industrial supplies are obtained from ground-water sources. The county's total population in 1970 was 32,762.

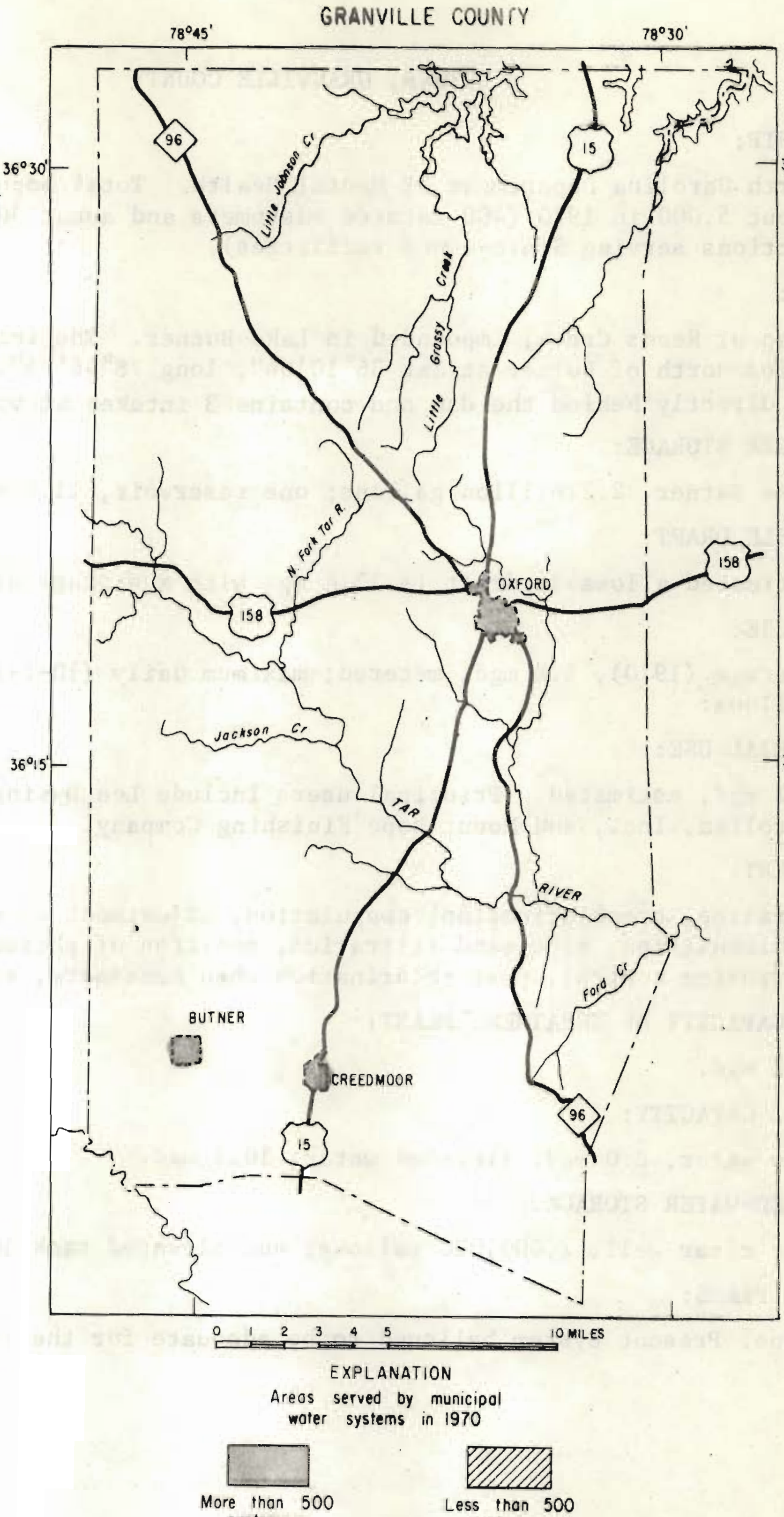
Granville County is underlain by seven major rock units: mica-gneiss, metavolcanic rocks, argillite, granadiorite, schist, gabbro, and bedded sediments of Triassic age. The three largest bodies are the metavolcanic rocks, which cover about sixty percent of the county, the Triassic deposit in the southern part, and the granodiorite in the central part.

The average yield of wells in Granville County is slightly below the average yield of wells in the Piedmont section of the State. According to the available records, it appears that the small argillite rock unit may be the most productive aquifer. However, it is of such small areal extent that it should not be considered as an important aquifer in this county. The following table shows typical yields and average depth of wells drilled in the various rock units in the county:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Mica-gneiss	30	11	136
Schist	12	4	89
Argillite	30	21	85
Metavolcanic rocks	30	8	82
Granodiorite	60	14	75
Gabbro	12	11	70
Triassic deposits	25	9	141

Adequate domestic water supplies can be obtained from wells in all parts of the county. In the better locations such as draws and large flat areas, small industrial supplies may be developed from most of the rock units. In all of the rock units successful wells generally may be drilled along quartz and diabase dikes. Safe sustained yields of the higher-yielding wells are probably on the order of 0.01 mgd in the Triassic deposits and as much as 0.04 mgd in some of the other rock units.

The chemical quality of ground water is suitable for most domestic and industrial needs. Water from the mica-gneiss unit is usually soft and contains only small amounts of dissolved solids. The chemical quality of water from the metavolcanic rocks is not uniform. Hardness is known to range from 9 mg/l to 254 mg/l, and iron ranges from 0.03 mg/l to 3.2 mg/l in water from this unit. Water from the granodiorite is generally of good quality. Two available analyses of water from the Triassic deposits indicate that it is also of good quality. However, it generally is expected that the quality of water from the Triassic deposits will differ considerably from place to place.


GRANVILLE COUNTY
78°45'
78°30'
36°30'
36°30'
36°15'
36°15'
96
15
Little Johnson Cr
Little Grassy Creek
N. Fork Tar R.
158
158
OXFORD
Jackson Cr
TAR
RIVER
Ford Cr
BUTNER
CREEDMOOR
96
15
0 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1970
More than 500 customers
Less than 500 customers

BUTNER, GRANVILLE COUNTY

OWNERSHIP:

North Carolina Department of Mental Health. Total population supplied, about 5,000 in 1970 (400 metered customers and about 300 unmetered connections serving State-owned facilities).

SOURCE:

Knap of Reeds Creek, impounded in Lake Butner. The intakes are 2-1/2 miles north of Butner at lat 36°10'04", long 78°46'25". The intake structure is directly behind the dam and contains 3 intakes at various depths.

RAW-WATER STORAGE:

Lake Butner, 2.2 billion gallons; one reservoir, 11.0 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 13.8 mgd with a storage of 2.2 billion gallons.

TOTAL USE:

Average (1970), 1.8 mgd, metered; maximum daily (10-1-70), 2.66 million gallons.

INDUSTRIAL USE:

1.2 mgd, estimated. Principal users include Lee Dyeing Company of North Carolina, Inc., and Mount Hope Finishing Company.

TREATMENT:

Aeration, prechlorination, coagulation, adjustment of pH with alum and lime, sedimentation, slow sand filtration, addition of phosphate compounds for corrosion control, post chlorination when necessary, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

4.0 mgd.

PUMPING CAPACITY:

Raw water, 8.0 mgd; finished water, 10.4 mgd.

FINISHED-WATER STORAGE.

One clear well, 2,000,000 gallons; one elevated tank 1,000,000 gallons.

FUTURE PLANS:

None. Present system believed to be adequate for the foreseeable future.

BUTNER, GRANVILLE COUNTY

WATER-RESOURCES APPRAISAL:

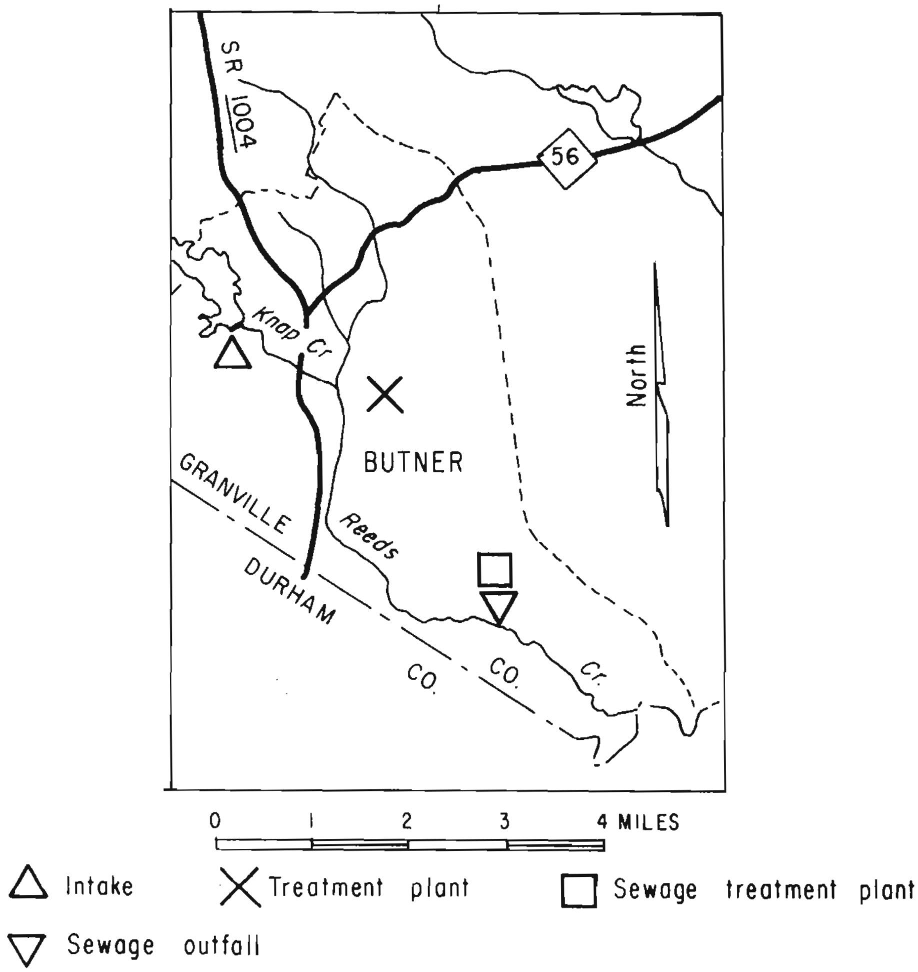
Surface water: Butner is in the southwest corner of Granville County where the topography is characterized by rolling hills with gentle to steep slopes. The area is drained by tributaries of Knap of Reeds Creek of the Neuse River basin. The low-flow yield of streams in the immediate area generally exceeds 0.003 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile. The 7-day, 2-year low flow is 0.02 mgd per square mile. The 2.2-billion gallon reservoir presently in use has a capacity large enough to meet foreseeable needs. The proposed Falls of Neuse Reservoir is a potential source of future water supply.

Ground water: Butner lies wholly within the Triassic basin and is underlain by sandstone, shale, and conglomerate typical of Triassic age deposits. Numerous dikes of diabase have intruded the otherwise relatively impermeable materials.

Because of the impermeable nature of the Triassic materials, it is difficult to develop large supplies of ground water in the vicinity of Butner. The most favorable location for successful wells are in local faults or dikes. It has been reported that wells drilled in such geologic locations have yields as great as 100 gpm. The average sustained yield of wells in this area probably does not exceed 10 gpm, and the average depth of drilled wells is about 150 feet.

The chemical quality of ground water changes appreciably over short distances in the Triassic basin. In many wells the water is hard and corrosive, and in some places excessive concentrations of iron and chloride are present. In a few locations the water is suitable for most uses without treatment.

CITY OF BUTNER



BUTNER, GRANVILLE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	a/ Raw	a/ Finished	a/ Raw	a/ Finished
Date of collection.......	10-29-70	10-29-70	9-20-71	9-20-71
Copper (Cu)..............	0.000	0.007	-------	-------
Cobalt (Co)..............	.000	.000	-------	-------
Zinc (Zn)................	.110	.050	-------	-------
Chromium (Cr)............	.000	.000	-------	-------
Boron (B)................	.060	.020	-------	-------
Strontium (Sr)...........	.000	.000	-------	-------
Barium (Ba)..............	.000	.000	-------	-------
Mercury (Hq).............	<.0005	<.0005	-------	-------
Lead (Pb)................	.000	.000	-------	-------
Lithium (Li).............	.000	.000	-------	-------
Cadmium (Cd).............	.000	.000	-------	-------
Cyanide (CN).............	.00	.00	-------	-------
Chloride (Cl)............	3.1	9.6	3.2	11
Manganese (Mn)...........	.000	.005	.000	.000
Iron (Fe)................	.086	.000	.022	.025
Calcium (Ca).............	-------	-------	4.3	15
Magnesium (Mg)...........	-------	-------	1.5	1.7
Sodium (Na)..............	-------	-------	3.5	5.1
Potassium (K)............	-------	-------	1.7	2.0
Fluoride (F).............	-------	-------	0.3	1.2
Silica (SiO2)............	-------	-------	6.6	7.5
Bicarbonate (HCO3).......	-------	-------	17	21
Carbonate (CO3)..........	-------	-------	0	0
Sulfate (SO4)............	-------	-------	5.2	19
Nitrate (NO3)............	-------	-------	0.2	.0
Dissolved Solids.........	-------	-------	34	73
Hardness as CaCO3:				
Total..................	-------	-------	17	45
Noncarbonate...........	-------	-------	3	28
Alkalinity as CaCO3......	-------	-------	14	17
Specific conductance (micromhos at 25° C)....	-------	-------	54	119
pH.......................	-------	-------	6.1	6.7
Temperature..............	17	17.5	25	25

a/ Source is Knap of Reeds Creek (Lake Butner).

USGS 1972 : Extra Copy

CREEDMOOR, GRANVILLE COUNTY

OWNERSHIP: Municipal. Total population supplied, about 2,200 in 1970 (560 metered customers, 10 of which are in suburban areas).

SOURCE: Ledge Creek impounded in Rogers Lake: The intake is about 1.2 miles northwest of Creedmoor at lat 36°07'40", long 78°42'08". The intake is approximately 20 ft upstream from the spillway about 4 ft below normal water level.

RAW-WATER STORAGE:

Rogers Lake, 120 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.8 mgd with a storage of 120 million gallons.

TOTAL USE:

Average (1970), 0.25 mgd, metered; maximum daily (9-17-70), 0.30 million gallons.

INDUSTRIAL USE:

0.04 mgd, estimated. Principal users include Kayser Roth Industries and Creedmoor Sportswear.

TREATMENT:

Prechlorination, coagulation and adjustment of pH with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.35 mgd.

PUMPING CAPACITY:

Raw water, 0.58 mgd; finished water, 0.47 mgd.

FINISHED-WATER STORAGE:

One clear well, 52,000 gallons; two elevated tanks, 68,000 and 125,000 gallons; one stand pipe, 8,000 gallons.

FUTURE PLANS:

Completion of roughed-in filter and installation of a larger pump to increase finished water pumping capacity by 0.175 mgd.

BUTNER, GRANVILLE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	a/ Raw	a/ Finished	a/ Raw	a/ Finished
Date of collection......	10-29-70	10-29-70	9-20-71	9-20-71
Copper (Cu).............	0.000	0.007	-------	-------
Cobalt (Co).............	.000	.000	-------	-------
Zinc (Zn)...............	.110	.050	-------	-------
Chromium (Cr)...........	.000	.000	-------	-------
Boron (B)...............	.060	.020	-------	-------
Strontium (Sr)..........	.000	.000	-------	-------
Barium (Ba).............	.000	.000	-------	-------
Mercury (Hq)............	<.0005	<.0005	-------	-------
Lead (Pb)...............	.000	.000	-------	-------
Lithium (Li)............	.000	.000	-------	-------
Cadmium (Cd)............	.000	.000	-------	-------
Cyanide (CN)............	.00	.00	-------	-------
Chloride (Cl)...........	3.1	9.6	3.2	11
Manganese (Mn)..........	.000	.005	.000	.000
Iron (Fe)...............	.086	.000	.022	.025
Calcium (Ca)............	-------	-------	4.3	15
Magnesium (Mg)..........	-------	-------	1.5	1.7
Sodium (Na).............	-------	-------	3.5	5.1
Potassium (K)...........	-------	-------	1.7	2.0
Fluoride (F)............	-------	-------	0.3	1.2
Silica (SiO2)...........	-------	-------	6.6	7.5
Bicarbonate (HCO3)......	-------	-------	17	21
Carbonate (CO3).........	-------	-------	0	0
Sulfate (SO4)...........	-------	-------	5.2	19
Nitrate (NO3)...........	-------	-------	0.2	.0
Dissolved Solids........	-------	-------	34	73
Hardness as CaCO3:				
Total..................	-------	-------	17	45
Noncarbonate...........	-------	-------	3	28
Alkalinity as CaCO3.....	-------	-------	14	17
Specific conductance (micromhos at 25° C)....	-------	-------	54	119
pH......................	-------	-------	6.1	6.7
Temperature.............	17	17.5	25	25

a/ Source is Knap of Reeds Creek (Lake Butner).

CREEDMOOR, GRANVILLE COUNTY

OWNERSHIP: Municipal. Total population supplied, about 2,200 in 1970 (560 metered customers, 10 of which are in suburban areas).

SOURCE: Ledge Creek impounded in Rogers Lake: The intake is about 1.2 miles northwest of Creedmoor at lat 36°07'40", long 78°42'08". The intake is approximately 20 ft upstream from the spillway about 4 ft below normal water level.

RAW-WATER STORAGE:

Rogers Lake, 120 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.8 mgd with a storage of 120 million gallons.

TOTAL USE:

Average (1970), 0.25 mgd, metered; maximum daily (9-17-70), 0.30 million gallons.

INDUSTRIAL USE:

0.04 mgd, estimated. Principal users include Kayser Roth Industries and Creedmoor Sportswear.

TREATMENT:

Prechlorination, coagulation and adjustment of pH with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.35 mgd.

PUMPING CAPACITY:

Raw water, 0.58 mgd; finished water, 0.47 mgd.

FINISHED-WATER STORAGE:

One clear well, 52,000 gallons; two elevated tanks, 68,000 and 125,000 gallons; one stand pipe, 8,000 gallons.

FUTURE PLANS:

Completion of roughed-in filter and installation of a larger pump to increase finished water pumping capacity by 0.175 mgd.

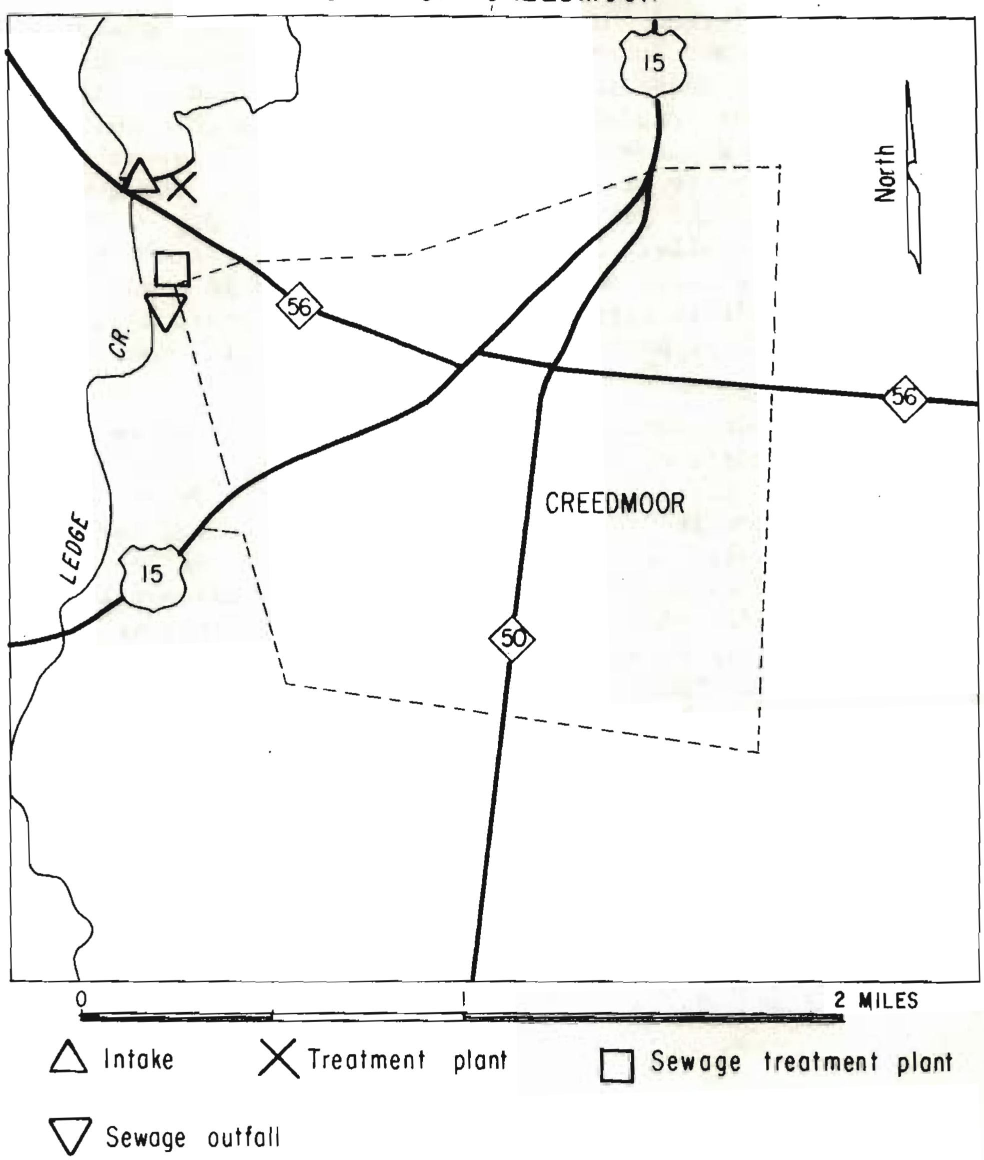
CREEDMOOR, GRANVILLE COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Creedmoor is in southern Granville County in an upland area between Ledge and Robertson Creek drainage basins. The town is drained by tributaries of these two creeks. Low-flow yield of streams in the immediate vicinity of Creedmoor is small, in the range of 0.002 to 0.004 mgd per square mile and streams with less than about 5 square miles drainage area can be expected to go dry during most summers. The average discharge of streams is 0.7 mgd per square mile, and the 7-day, 2-year low flow is 0.02 mgd per square mile. The 120 million gallon reservoir presently in use has a capacity large enough to meet foreseeable needs. The estimated allowable draft is approximately 3 times as great as present use. The proposed Falls of Neuse Reservoir is a potential source of future water supply.

Ground water: Creedmoor is entirely underlain by rocks of Triassic age, including sandstone, shale, and conglomerates. Numerous dikes of black diabase have intruded the Triassic Rocks. The Triassic materials are not generally condusive to development of large ground-water supplies. About one in four wells drilled in this rock unit yield less than one gpm. However, several wells that were drilled into diabase dikes or sandstone sills reportedly yield up to 100 gpm. The average sustained yield of drilled wells is probably 10 gpm, and the average depth of these wells is 150 feet. The chemical quality of water changes considerably over short distances in the Triassic materials. Usually the water is hard and corrosive, and in some places excessive concentrations of iron and chloride are present. In a few locations the water is suitable for most uses without treatment.

CITY OF CREEDMOOR



CREEDMOOR, GRANVILLE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Ledge Cr. Raw	Ledge Cr. Finished	Ledge Cr. Raw	Ledge Cr. Finished
Date of collection.......	5-13-66	5-13-66	9-30-70	9-30-70
Copper (Cu)............	-------	-------	0.005	0.000
Cobalt (Co)............	-------	-------	.000	.000
Zinc (Zn)............	-------	-------	.045	.088
Chromium (Cr)............	-------	-------	.000	.000
Boron (B)............	-------	-------	.085	.125
Strontium (Sr)............	-------	-------	.030	.055
Barium (Ba)............	-------	-------	.000	.000
Mercury (Hq)............	-------	-------	<.0005	<.0005
Lead (Pb)............	-------	-------	.000	.000
Lithium (Li)............	-------	-------	.000	.000
Cadmium (Cd)............	-------	-------	.000	.000
Cyanide (CN)............	-------	-------	.00	.00
Chloride (Cl)............	13	16	5.0	14
Manganese (Mn)............	.22	.01	.005	.048
Iron (Fe)............	.07	.00	.017	.034
Calcium (Ca)............	5.8	32	-------	-------
Magnesium (Mg)............	2.6	1.7	-------	-------
Sodium (Na)............	4.6	4.6	-------	-------
Potassium (K)............	1.6	1.9	-------	-------
Fluoride (F)............	.1	.1	-------	-------
Silica (SiO2)............	6.6	2.8	-------	-------
Bicarbonate (HCO3).......	9	34	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)............	9.0	44	-------	-------
Nitrate (NO3)............	.5	.1	-------	-------
Dissolved Solids.........	69	142	-------	-------
Hardness as CaCO3:				
Total..................	27	86	-------	-------
Noncarbonate..........	20	58	-------	-------
Alkalinity as CaCO3......	7	28	-------	-------
Specific conductance (micromhos at 25° C)....	77	205	-------	-------
pH.....................	6.2	7.3	-------	-------
Temperature............	18	-------	22.5	24.5

OXFORD, GRANVILLE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 8,100 in 1970 (2,300 metered customers).

SOURCE:

Tar River and Hachers Run. Hachers Run is impounded in Lake Devin and raw water is pumped from Tar River to the lake. The Tar River intake is approximately 5 miles southwest of Oxford at lat 36°16'03", long 78°40'08". Water flows by gravity from Lake Devin to the treatment plant.

RAW-WATER STORAGE:

Lake Devin, 413 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 2.0 mgd with a storage of 413 million gallons.

TOTAL USE:

Average (1970), 2.0 mgd, metered; maximum daily (8-31-70), 2.65 million gallons.

INDUSTRIAL USE:

1.5 mgd, estimated. Principal users include Burlington Industries, Inc., Steinfeld Mills, and J. F. D. Electronics, Inc.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

3.2 mgd.

PUMPING CAPACITY:

Raw water from Tar River to Lake Devin, 1.5 mgd. Raw water by gravity from Lake Devin to treatment plant, 2.7 mgd.

Finished water, 4.0 mgd.

FINISHED-WATER STORAGE:

1 clear well, 500,000 gallons; 3 elevated tanks, 300,000 gallons each.

FUTURE PLANS:

Filter media will be changed from sand to anthracite to increase treatment plant capacity to 4.5 mgd. The lack of a dependable raw-water supply is a major problem. Several alternate solutions are under consideration but plans are not definite at this time (November 1970).

OXFORD, GRANVILLE COUNTY

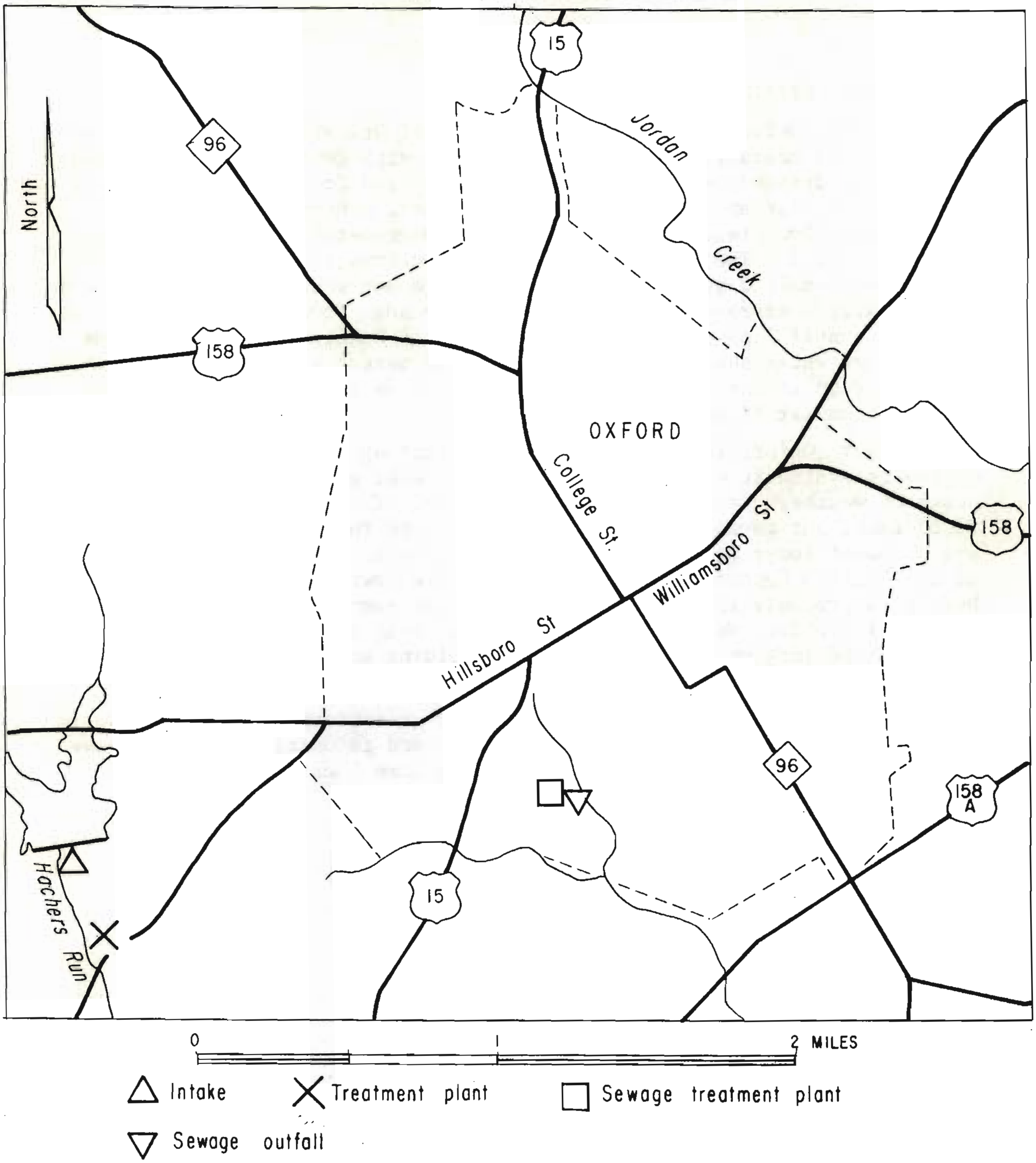
WATER-RESOURCES APPRAISAL:

Surface water: Oxford is in the central part of Granville County where the topography is characterized by rolling hills with gentle to steep slopes. The area is drained by tributaries of Fishing and Coon Creeks of the Tar River basin. Streams in the vicinity of Oxford generally have below-average low-flow yields. The low-flow yields generally exceed 0.001 mgd per square mile. The average discharge of streams is 0.6 mgd per square mile. The 7-day, 2-year low flow is 0.01 mgd per square mile. Lake Devin is basically a storage reservoir for water pumped from Tar River since it impounds runoff from only 1.55 square miles on Hachers Run. Oxford has experienced water shortages several times in recent years. Possibly the best solution to the raw-water supply problem is to construct a storage reservoir on Tar River.

Ground water: Oxford is predominantly underlain by granodiorite, and rocks of the metavolcanic unit are exposed on the west edge of the town. The depth of weathered rock differs considerably. The maximum reported depth is 85 feet, but in most areas the depth is less than 30 feet. Well yields are somewhat lower on the average than most wells in the Piedmont section of the State. Reported yields in or near the town seldom exceed 10 gpm, but it is probable that these figures reflect pump capacities rather than true well yields. Wells in draws and flat areas that penetrate about 150 feet of hard rock should be capable of yielding an average of about 15-25 gpm on a sustained basis.

The chemical quality of water from the granodiorite and metavolcanic rocks is usually suitable for most domestic and industrial uses. However, excessive hardness is present in water from some locations in both rock units.

CITY OF OXFORD



OXFORD, GRANVILLE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Tar River Raw	Tar River Finished	Tar River Raw	Tar River Finished
Date of collection.......	5-13-66	5-13-66	9-29-70	9-30-70
Copper (Cu).............	-------	-------	0.480	0.090
Cobalt (Co)..............	-------	-------	.000	.000
Zinc (Zn)................	-------	-------	.060	.360
Chromium (Cr)............	-------	-------	.000	.000
Boron (B)................	-------	-------	.035	.095
Strontium (Sr)...........	-------	-------	.030	.055
Barium (Ba)..............	-------	-------	.000	.000
Mercury (Hq).............	-------	-------	<.0005	<.0005
Lead (Pb)................	-------	-------	.000	.000
Lithium (Li).............	-------	-------	.000	.000
Cadmium (Cd).............	-------	-------	.000	.000
Cyanide (CN).............	-------	-------	.00	.00
Chloride (Cl)............	3.7	6.0	4.7	8.4
Manganese (Mn)...........	.13	.01	.140	.020
Iron (Fe)................	.03	.04	.045	.007
Calcium (Ca).............	6.3	6.6	-------	-------
Magnesium (Mg)...........	2.3	1.9	-------	-------
Sodium (Na)..............	5.0	12	-------	-------
Potassium (K)............	2.0	2.1	-------	-------
Fluoride (F).............	.1	.0	-------	-------
Silica (Si02)............	5.8	4.4	-------	-------
Bicarbonate (HCO3).......	29	33	-------	-------
Carbonate (CO3)..........	0	0	-------	-------
Sulfate (SO4)............	7.6	19	-------	-------
Nitrate (NO3)............	.3	.3	-------	-------
Dissolved Solids.........	55	72	-------	-------
Hardness as CaCO3:				
Total....................	26	24	-------	-------
Noncarbonate.............	2	0	-------	-------
Alkalinity as CaCO3......	24	27	-------	-------
Specific conductance (micromhos at 25° C)....	77	119	-------	-------
pH.......................	6.5	7.2	-------	-------
Temperature..............	18	-------	22.5	23

Note.--Water analyzed also includes some water from Hatchers Run.

GUILFORD COUNTY

WATER-RESOURCES APPRAISAL

Guilford County is in the Piedmont Province in central North Carolina. The topography varies from almost level to gently rolling, rolling, and hilly. The county is drained by tributaries of the Haw and Deep Rivers of the Cape Fear River basin. There are no large rivers in the county, as most streams originate in the county or in Forsyth County along the boundary line. For streams in the county, the average discharge is 0.8 mgd per square mile. Minimum flows are variable, ranging from 0.1 mgd per square mile in the west-central part of the county to 0.003 mgd in the area east of High Point. The average minimum flow in the county is 0.03 mgd per square mile. The 7-day, 2-year low flow averages 0.07 mgd per square mile. Greensboro, High Point, and Jamestown obtain their water supply from surface-water sources. Other municipal supplies and most domestic and industrial supplies are obtained from ground-water sources. The county's population in 1970 was 288,590.

Six irregularly distributed geologic units underlie Guilford County. Gneissic rocks crop out in several irregular belts across the northwestern third of the county. These belts are separated by areas of porphyritic granite that have intruded the gneiss. Schistose rocks underlie irregular-shaped areas in the southeastern two-thirds of the county. These are separated by areas of sheared granite. Sheared granite is the predominant rock type and it covers about 25 percent of the area. An irregular belt of slate extends across the southeastern corner, and in a small area on the south edge of High Point. Small outcrops of diorite occur in several places. The two largest bodies of diorite are found in the southern half of the county: one north of High Point, and the other at the Alamance County line. In Guilford County, the diorite unit is not hydrologically significant. An irregular shaped finger of mica-schist extends southwestward from the northeast corner.

On the whole, the rocks form better-than average aquifers for the Piedmont Province. This is partially due to a relatively large part of the county being underlain by mafic-volcanic rocks which generally are good hard-rock aquifers. The mica-gneiss rocks and granite generally form good aquifers also.

A few dug or bored wells are used in the suburban areas for domestic and stock supplies. These wells generally are satisfactory where they are constructed deep enough that they do not go dry during extended dry periods. Most wells constructed during the last few years are drilled wells, 4 to 8 inches in diameter, and are tightly cased into the unweathered rock. The following table shows typical reported yields and average depth of drilled wells in the various rock units:

GUILFORD COUNTY

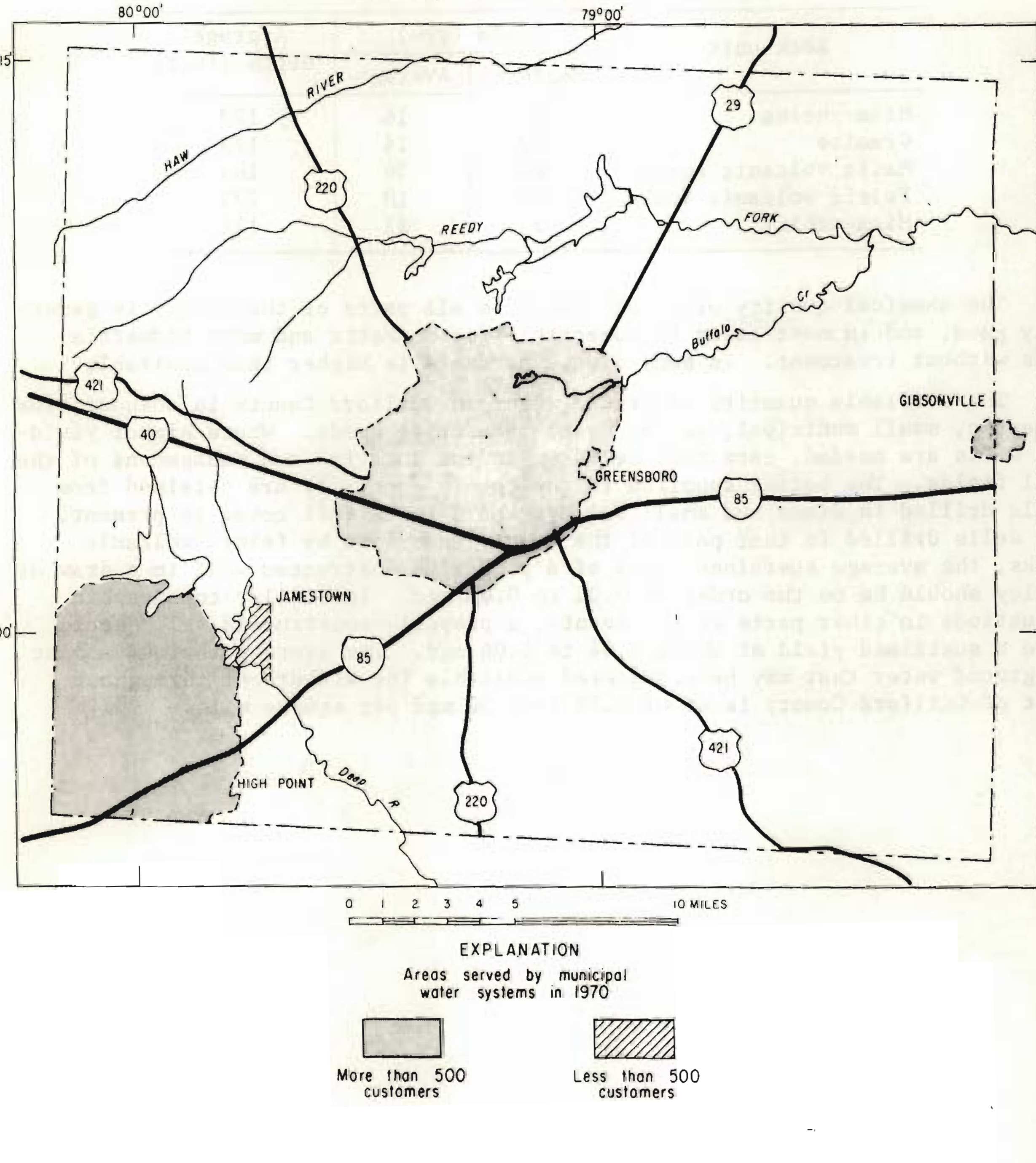
WATER-RESOURCES APPRAISAL

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Mica-gneiss	50	16	123
Granite	70	14	175
Mafic volcanic rocks	200	36	163
Felsic volcanic rocks	15	10	273
Mica-schist	20	11	116

The chemical quality of ground water in all parts of the county is generally good, and in most cases is acceptable for domestic and most industrial uses without treatment. In some areas, hardness is higher than desirable.

The available quantity of ground water in Guilford County is adequate for domestic, small municipal, and moderate industrial needs. Where higher yielding wells are needed, care must be taken in the location and management of the well fields. The better supplies in the county generally are obtained from wells drilled in draws and small valleys where thick soil cover is present. For wells drilled in that part of the county underlain by felsic volcanic rocks, the average sustained yield of a properly-constructed well in a draw or valley should be on the order of 0.02 to 0.03 mgd. In similar topographic situations in other parts of the county, a properly-constructed well should have a sustained yield of about 0.04 to 0.06 mgd. The average maximum amount of ground water that may be considered available for withdrawal throughout most of Guilford County is about 0.25 to 0.30 mgd per square mile.

GUILFORD COUNTY



EXPLANATION

Areas served by municipal water systems in 1970

More than 500 customers

Less than 500 customers

GIBSONVILLE, GUILFORD COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,500 in 1970 (955 metered customers, 100 of which are in suburban areas).

SOURCE:

Six wells (Nos. 2, 4, 8, 10, 11, 14).

Well No. 2, Gu-378, located at: lat 36°06'29", long 79°33'05". Driller: Sydnor Well Co. Date drilled: not available. Total depth: 200 ft. Diam: 8 in. Cased to: 107 ft. Type of finish: open hole. Topography: hill top. Aquifer: gabbro(?). Static water level: not available. Yield: 15-20 gpm. Type pump: turbine. Pump setting: not available.

Well No. 4, Am-218, located at: lat 36°06'24", long 79°32'13". Driller: Virginia Supply and Well Co. Date drilled: 1948. Total depth: 396 ft. Diam: 8 in. Cased to: 84 ft. Type of finish: open hole. Topography: hillside. Aquifer: granite-gabbro. Static water level: 54 ft. Yield: 125 gpm. Type pump: turbine. Pump setting: 273 ft.

Well No. 8, Gu-379, located at: lat 36°06'12", long 79°33'02". Driller: Heater Well Co. Date drilled: 1962. Total depth: 275 ft. Diam: 6-1/4 in. Cased to: 49 ft. Type of finish: open hole. Topography: valley flat. Aquifer: gabbro and quartz. Static water level: not available. Yield: 108 gpm. Type pump: not available. Pump setting: not available.

Well No. 10, Gu-380, located at: lat 36°05'56", long 79°32'54". Driller: Bainbridge and Dance. Date drilled: 1965. Total depth: 500 ft. Diam: 6-1/4 in. Cased to: 27 ft. Type of finish: open hole. Topography: valley flat. Aquifer: gabbro. Static water level: not available. Yield: 100 gpm. Type pump: not available. Pump setting: 114 ft.

Well No. 11, Gu-381, located at: lat 36°06'39", long 79°32'57". Driller: Bainbridge and Dance. Date drilled: 1965. Total depth: 425 ft. Diam: 6-1/4 in. Cased to: 22 ft. Type of finish: open hole. Topography: valley flat. Aquifer: gabbro. Static water level: not available. Yield: 125 gpm. Type of pump: not available. Pump setting: 180 ft.

Well No. 14, Am-217, located at: lat 36°06'43", long 79°31'48". Driller: Bainbridge and Dance. Date drilled: 1969. Total depth: 500 ft. Diam: 6-1/4 in. Cased to: 24 ft. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: not available. Yield: 35 gpm. Type pump: submersible. Pump setting: 200 ft.

TOTAL USE:

Average (1970), 0.3 mgd, estimated from rate and time of pumping.

INDUSTRIAL USE:

0.2 mgd, estimated. Principal users include Cone Mills, Liberty Hosiery Mills, and Kardon Industries, Inc.

TREATMENT:

Chlorination, addition of phosphate compounds for corrosion control, addition of "Aquadine" to hold iron and manganese in suspension.

GIBSONVILLE, GUILFORD COUNTY

FINISHED-WATER STORAGE:

Two elevated tanks, 75,000 and 125,000 gallons; one reservoir, 154,000 gallons.

FUTURE PLANS:

There are plans to enlarge the system. The possibility of using surface water as a source is under study. At this time, it appears likely that the town will connect its system with one of the nearby city systems for supplemental supply, or possibly for its total water supply.

WATER RESOURCES APPRAISAL:

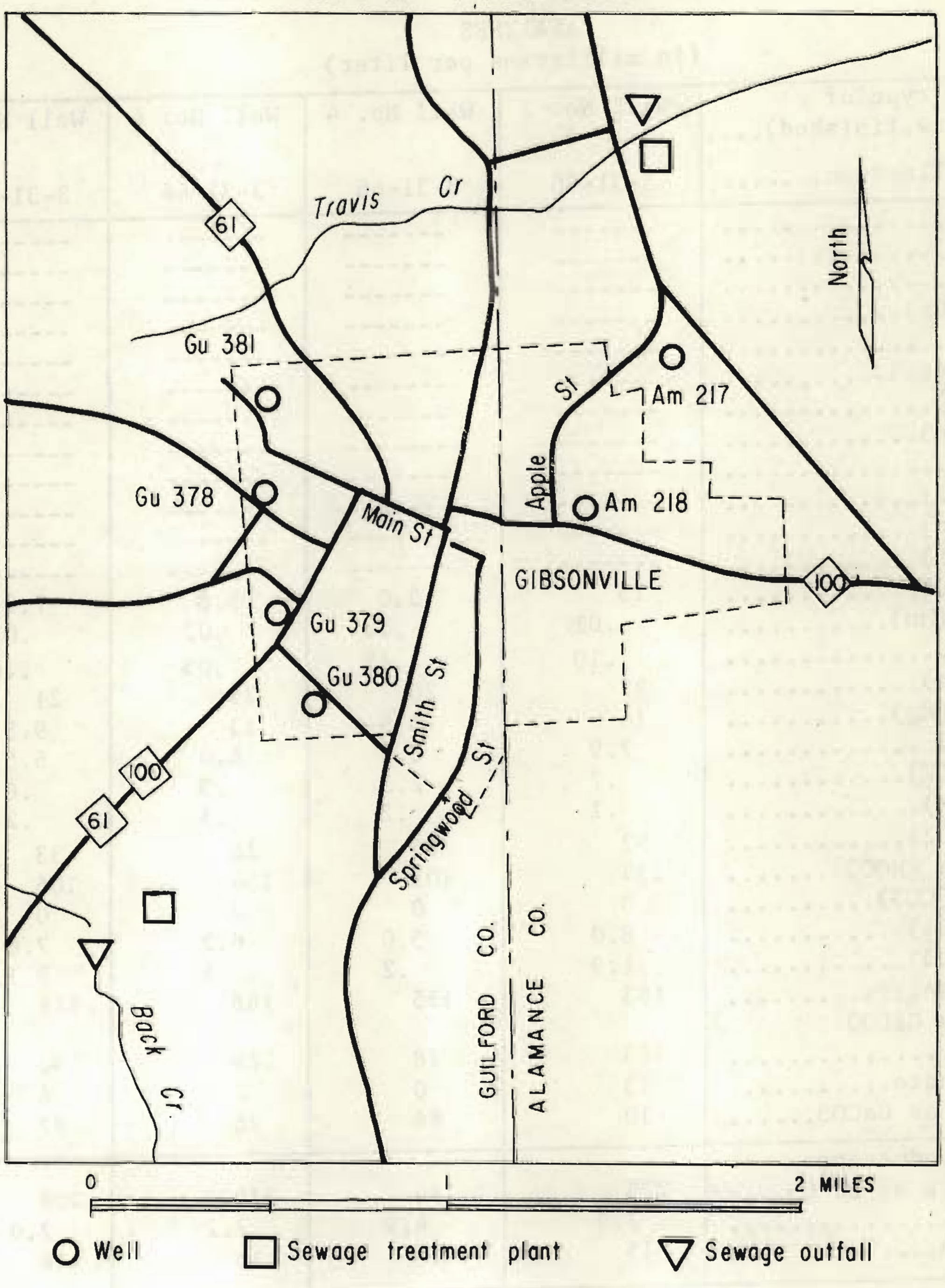
Surface water: Gibsonville is on the Alamance-Guilford County line. The area is drained by small tributaries of Alamance Creek and Reedy Fork. The low-flow yield of streams in the immediate vicinity of Gibsonville ranges from 0.002 to 0.01 mgd per square mile. Streams with less than about 5 square miles drainage area can be expected to go dry occasionally. The average discharge of streams is 0.6 to 0.8 mgd per square mile, and the 7-day, 2-year low flow is 0.05 mgd per square mile. The largest nearby stream with water of acceptable quality as a potential source for future water supply is Alamance Creek about 4.0 miles south of town.

Ground water: The Gibsonville area is generally underlain by gabbro and greenstone schist. These rocks have weathered to a relatively dark soil that is as much as 100 feet thick in places. Water occurs in the openings of fractures, bedding planes, and schistose structure in the rocks. The combination of openings and ample soil cover are favorable for above-average well yields as compared with the Piedmont Province in general.

Six wells currently supply all water used by the Gibsonville system. According to information furnished by the town, yields of these wells range from 15 gpm to 125 gpm and average about 85 gpm. The wells are either 6-inch or 8-inch diameter and range in depth from 200 feet to 500 feet. Depths of casing range from 22 feet to 107 feet and average about 52 feet. The wells are spaced from about 1,300 to about 4,500 feet apart. It is not known if pumping interference occurs between the wells, but it is probable that some interference does occur between wells that are located less than 2,500 feet apart. If new wells are located approximately one-half mile apart and are drilled to depths up to 250 or 300 feet in topographically low areas, a sustained yield averaging about 0.03 mgd for each well may be reasonably expected. With proper management, there is good potential for increasing the ground-water supply.

The chemical quality of water produced by the Gibsonville wells is acceptable for most uses, although some of the water is hard and iron is locally a problem. The water is effectively treated with "aquadine" at each well.

CITY OF GIBSONVILLE



GIBSONVILLE, GUILFORD COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 2	Well No. 4	Well No. 6	Well No. 8
Date of collection.......	3-31-66	3-31-66	3-31-66	3-31-66
Copper (Cu).............	-------	-------	-------	-------
Cobalt (Co).............	-------	-------	-------	-------
Zinc (Zn)...............	-------	-------	-------	-------
Chromium (Cr)...........	-------	-------	-------	-------
Boron (B)...............	-------	-------	-------	-------
Strontium (Sr)..........	-------	-------	-------	-------
Barium (Ba).............	-------	-------	-------	-------
Mercury (Hq)............	-------	-------	-------	-------
Lead (Pb)...............	-------	-------	-------	-------
Lithium (Li)............	-------	--------	-------	-------
Cadmium (Cd)............	-------	-------	-------	-------
Cyanide (CN)............	-------	-------	-------	-------
Chloride (Cl)...........	15	5.0	5.8	7.2
Manganese (Mn)..........	.01	.12	.02	.01
Iron (Fe)...............	.10	.42	.03	.10
Calcium (Ca)............	27	20	29	21
Magnesium (Mg)..........	14	6.6	13	9.5
Sodium (Na).............	7.9	8.3	6.0	6.5
Potassium (K)...........	.7	2.3	.9	.6
Fluoride (F)............	.1	.2	.3	.2
Silica (SiO2)...........	32	35	26	33
Bicarbonate (HCO3).......	134	105	154	106
Carbonate (CO3)..........	0	0	0	0
Sulfate (SO4)............	8.0	5.0	6.2	7.0
Nitrate (NO3)............	1.9	.2	.6	3.1
Dissolved Solids.........	183	135	168	146
Hardness as CaCO3:				
Total..................	123	78	128	92
Noncarbonate...........	13	0	2	4
Alkalinity as CaCO3......	10	86	26	87
Specific conductance (micromhos at 25° C)....	276	194	279	208
pH......................	7.3	6.9	7.2	7.0
Temperature.............	15	15	16	16

Note.--Additional analyses, 3-31-66 and 12-1-70, are on the two following pages.

GIBSONVILLE, GUILFORD COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 10	Well No. 11	Finished
Date of collection.......	3-31-66	3-31-66	3-31-66
Copper (Cu).............	-------	-------	-------
Cobalt (Co).............	-------	-------	-------
Zinc (Zn)...............	-------	-------	-------
Chromium (Cr)...........	-------	-------	-------
Boron (B)...............	-------	-------	-------
Strontium (Sr)..........	-------	-------	-------
Barium (Ba).............	-------	-------	-------
Mercury (Hq)............	-------	-------	-------
Lead (Pb)...............	-------	-------	-------
Lithium (Li)............	-------	-------	-------
Cadmium (Cd)............	-------	-------	-------
Cyanide (CN)............	-------	-------	-------
Chloride (Cl)...........	48	6.7	25
Manganese (Mn)..........	.03	.06	.04
Iron (Fe)...............	.12	.08	.08
Calcium (Ca)............	48	38	41
Magnesium (Mg)..........	17	16	1.7
Sodium (Na).............	14	8.5	12
Potassium (K)...........	2.8	1.1	1.7
Fluoride (F)............	.2	.1	.1
Silica (SiO2)...........	36	31	33
Bicarbonate (HCO3).......	173	195	182
Carbonate (CO3)..........	0	0	0
Sulfate (SO4)...........	19	10	12
Nitrate (NO3)...........	.3	.2	.7
Dissolved Solids.........	264	203	243
Hardness as CaCO3:			
Total.................	191	160	172
Noncarbonate...........	49	0	24
Alkalinity as CaCO3......	42	60	49
Specific conductance (micromhos at 25°C)....	460	342	387
pH......................	7.1	7.4	7.7
Temperature.............	16	16	16

GIBSONVILLE, GUILFORD COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 11	Well No. 14		
Date of collection.......	12-1-70	12-1-70		
Copper (Cu).............	0.135	0.000		
Cobalt (Co).............	.000	.000		
Zinc (Zn)...............	.160	.250		
Chromium (Cr)...........	.000	.000		
Boron (B)...............	.008	.007		
Strontium (Sr)..........	.200	.080		
Barium (Ba).............	.000	.000		
Mercury (Hq)............	-------	-------		
Lead (Pb)...............	.000	.000		
Lithium (Li)............	.000	.000		
Cadmium (Cd)............	.000	.000		
Cyanide (CN)............	.00	.00		
Chloride (Cl)...........	6.8	5.1		
Manganese (Mn)..........	.007	.000		
Iron (Fe)...............	.000	.000		
Calcium (Ca)............	-------	-------		
Magnesium (Mg)..........	-------	-------		
Sodium (Na).............	-------	-------		
Potassium (K)...........	-------	-------		
Fluoride (F)............	-------	-------		
Silica (Si02)...........	-------	-------		
Bicarbonate (HCO3).......	-------	-------		
Carbonate (CO3).........	-------	-------		
Sulfate (SO4)...........	-------	-------		
Nitrate (NO3)...........	-------	-------		
Dissolved Solids........	-------	-------		
Hardness as CaCO3:				
Total..................	-------	-------		
Noncarbonate...........	-------	-------		
Alkalinity as CaCO3......	-------	-------		
Specific conductance (micromhos at 25° C)....	-------	-------		
pH......................	-------	-------		
Temperature.............	16	-------		

GREENSBORO, GUILFORD COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 160,000 in 1970 (44,000 metered customers, 521 of which are in suburban areas).

SOURCE:

Reedy Fork and Horsepen Creek impounded in Lake Brandt, Brush Creek impounded in Lake Higgins, and Reedy Fork impounded in Lake Townsend. The City has two systems: the Mitchell system is supplied by Lakes Higgins and Brandt and the Townsend system by Lake Townsend. The intakes for the Mitchell system are in Lake Brandt about 3-1/2 miles north of Greensboro at lat 36°10'19", long 79°50'20". The Townsend system intakes are in Lake Townsend about 3 miles northeast of Greensboro at lat 36°11'24", long 79°43'56".

RAW-WATER STORAGE:

Lake Higgins, 0.8 billion gallons.

Lake Brandt, 2.2 billion gallons.

Lake Townsend, 6.5 billion gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 37.4 mgd with a combined adjusted storage of 9.4 billion gallons.

TOTAL USE:

Average (1970), 21.0 mgd, metered; maximum daily (6-19-70), 28.5 million gallons.

INDUSTRIAL USE:

3.5 mgd, estimated. Principal users include Burlington Industries, Oak Ridge Textiles, Swift Poultry Company, and Guilford Mills.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, post chlorination and fluoridation. Occasionally carbon is added for control of taste and odor.

RATED CAPACITY OF TREATMENT PLANTS:

Mitchell Plants (2), 24 mgd.

Townsend Plant, 20 mgd.

PUMPING CAPACITY:

Raw water: from Lake Brandt 46 mgd; from Lake Townsend, 40 mgd. Finished water: Mitchell system, 37 mgd; Townsend plant, 42 mgd.

FINISHED-WATER STORAGE:

Lake Daniel Reservoir, 18,000,000 gallons, one clear well, 3,000,000 gallons, two reservoir tanks, 2,000,000, and 2,000,000 gallons; six elevated tanks, 2,000,000, 1,500,000, 500,000, 200,000, 1,500,000, and 500,000 gallons.

GREENSBORO, GUILFORD COUNTY

FUTURE PLANS:

System considered adequate to 1990. Townsend treatment plant, at Lake Townsend, is readily expandable to 40 mgd capacity when required.

WATER-RESOURCES APPRAISAL:

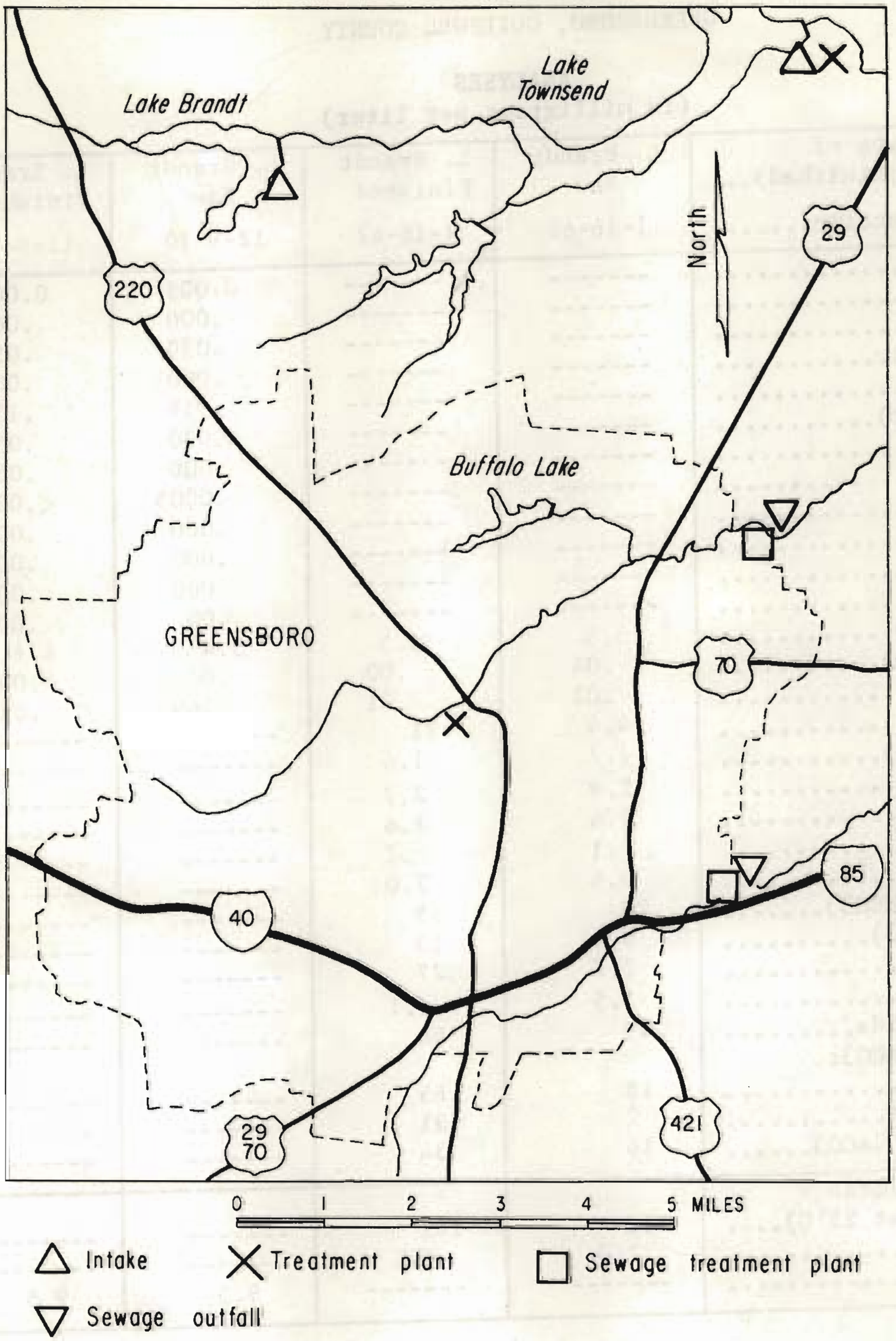
Surface water: Greensboro is in the center of Guilford County where the topography is characterized by rolling hills with moderate slopes. The area is drained by numerous tributaries of the Haw and Deep Rivers. Streams in the north and west part of the city generally have higher low-flow yields than those in the south and east. The low-flow yield of streams to the north and west generally exceed 0.05 mgd per square mile while those to the south and east generally exceed 0.01 mgd per square mile. The average discharge for streams in the immediate vicinity of Greensboro is 0.8 mgd per square mile and the 7-day, 2-year low flow is 0.07 mgd per square mile.

Greensboro, with the construction of the Townsend System, greatly expanded its water supply in 1968, and it should be adequate for the foreseeable future.

Ground water: Greensboro is underlain by crystalline rocks, principally granite and schist. The overlying mantle of weathered rock is generally more than 50 feet thick and may exceed 100 feet in some places. Wells normally are drilled to depths of 100 to 200 feet and reported yields range from about 5 to 40 gpm. Large yields ranging up to 200 gpm are reported from wells that are 200 to 450 feet deep. Generally wells in the schist are more productive than those in granite.

The chemical quality of ground water is suitable for most uses without treatment, but locally the water may be hard or contain undesirable amounts of iron.

CITY OF GREENSBORO



GREENSBORO, GUILFORD COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	L. Brandt Raw	L. Brandt Finished	L. Brandt Raw	L. Brandt Finished
Date of collection.......	1-16-62	1-16-62	12-9-70	12-9-70
Copper (Cu).............	-------	-------	0.005	0.000
Cobalt (Co).............	-------	-------	.000	.000
Zinc (Zn)...............	-------	-------	.030	.055
Chromium (Cr)...........	-------	-------	.000	.000
Boron (B)...............	-------	-------	.016	.135
Strontium (Sr)..........	-------	-------	.030	.055
Barium (Ba).............	-------	-------	.000	.000
Mercury (Hq)............	-------	-------	<.0005	<.0005
Lead (Pb)...............	-------	-------	.000	.000
Lithium (Li)............	-------	-------	.000	.000
Cadmium (Cd)............	-------	-------	.000	.000
Cyanide (CN)............	-------	-------	.00	.00
Chloride (Cl)...........	3.5	4.5	5.4	6.6
Manganese (Mn)..........	.04	.00	.004	.000
Iron (Fe)...............	.02	.01	.069	.010
Calcium (Ca)............	4.4	21	-------	-------
Magnesium (Mg)..........	1.7	1.6	-------	-------
Sodium (Na).............	2.9	2.7	-------	-------
Potassium (K)...........	2.4	2.6	-------	-------
Fluoride (F)............	.1	.2	-------	-------
Silica (SiO2)...........	9.4	7.0	-------	-------
Bicarbonate (HCO3)......	20	15	-------	-------
Carbonate (CO3).........	0	13	-------	-------
Sulfate (SO4)...........	7.2	27	-------	-------
Nitrate (NO3)...........	1.5	1.1	-------	-------
Dissolved Solids........	49	96	-------	-------
Hardness as CaCO3:				
Total.................	18	65	-------	-------
Noncarbonate..........	2	31	-------	-------
Alkalinity as CaCO3.....	16	34	-------	-------
Specific conductance (micromhos at 25° C)....	59	148	-------	-------
pH......................	7.0	9.6	-------	-------
Temperature.............	-------	-------	9.5	9.5

HIGH POINT, GUILFORD COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 61,000 in 1970 (20,626 metered customers 45 of which are in suburban areas).

SOURCE:

Deep River impounded in High Point Municipal Lake: The intakes are at the dam approximately 1 mile northeast of High Point at lat 35°59'43", long 79°56'42". West Fork Deep River impounded in new (unnamed) reservoir. Water released from the new reservoir will flow into High Point Municipal Lake.

RAW-WATER STORAGE:

High Point Municipal Lake, 1.25 billion gallons; new reservoir, 3.0 billion gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 30 mgd with an adjusted storage of 3.97 billion gallons.

TOTAL USE:

Average (1970) 8.40 mgd, metered; maximum daily (7-18-69), 11.2 million gallons.

INDUSTRIAL USE:

2.9 mgd, estimated. Principal users include Borden Dairy, Inc., Indian Head Hosiery, Inc., and A & P Dairy Center.

TREATMENT:

Prechlorination, coagulation with alum and occasionally sodium hydroxide, sedimentation, addition of carbon for control of taste and odor when necessary, rapid-sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with sodium hydroxide, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

12.0 mgd.

PUMPING CAPACITY:

Raw water 16.0 mgd; finished water, 16.8 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 8,000,000 and 3,000,000 gallons; two elevated tanks, 1,000,000 and 1,000,000 gallons.

FUTURE PLANS:

Plan to install 4 new filters to raise capacity of treatment plant to 18.0 mgd by 1972. Comprehensive study of the water system for the purpose of developing long-range plans to insure an adequate water supply for the future was in progress in November 1970.

HIGH POINT, GUILFORD COUNTY

WATER-RESOURCES APPRAISAL:

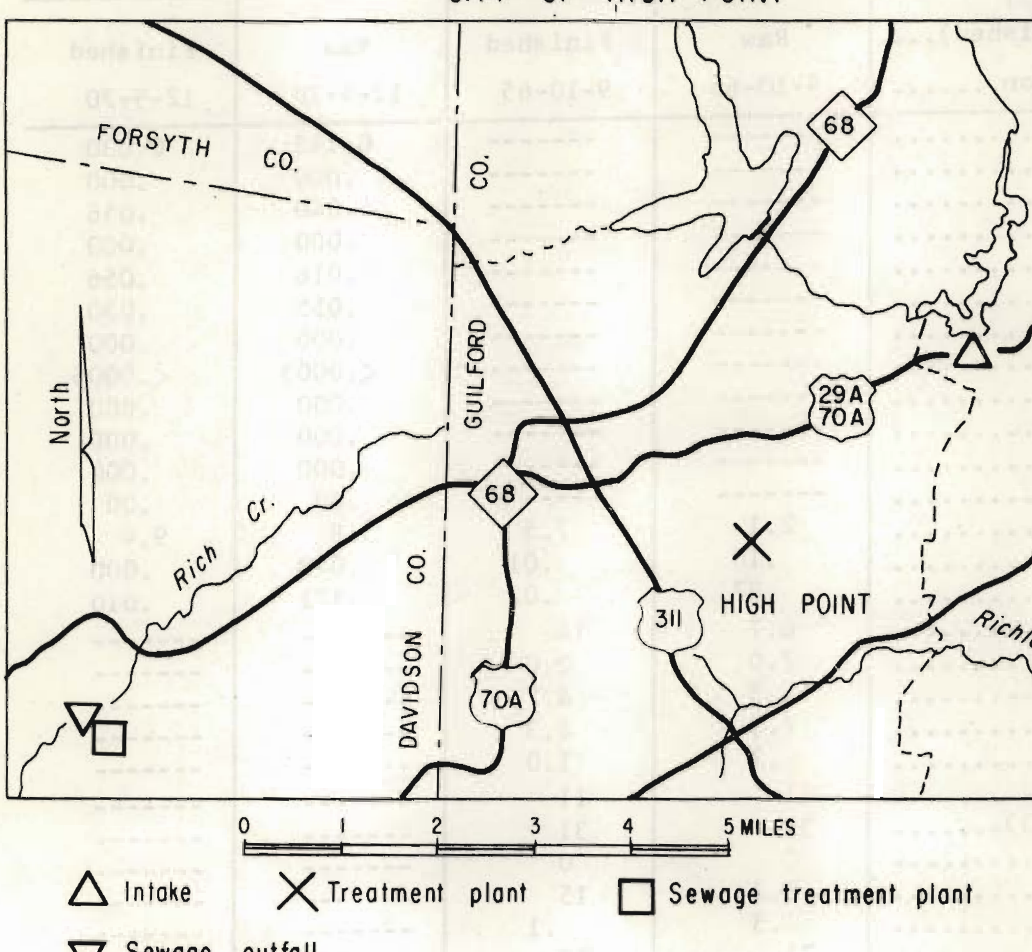
Surface water: High Point is in the southwest corner of Guilford County on the drainage divide of the Yadkin and Deep River basins. There is considerable variation in the low flow yields of streams in the immediate vicinity of High Point, ranging from 0.07 mgd in the northern part of the city to 0.003 mgd per square mile in the southeastern part and averaging 0.02 mgd per square mile. The average discharge of all streams in the immediate area is 0.8 mgd per square mile and the 7-day, 2-year low flow is 0.07 mgd per square mile. With completion of the new reservoir there is adequate raw-water storage to meet foreseeable needs. The estimated allowable draft is more than three times as great as present use.

Ground water: Granite and greenstone schist are the predominant rock types underlying High Point, with a small body of slate underlying the southeastern edge of the city. The mantle of weathered rock is as much as 100 feet thick in places. Wells in the city are generally drilled to depths of 75 to 250 feet. Well yields are reported as high as 200 gpm in the greenstone schist, 30 gpm in the granite, and 12 gpm in the slate.

The available ground water in High Point area is adequate for small industrial supplies. Wells spaced about 2,500 feet apart would probably yield as much as 0.05 mgd on a sustained basis.

The chemical quality of ground water is suitable for most domestic uses and some industrial processes without treatment. Generally the water is moderately hard and water from some shallow wells is very hard.

CITY OF HIGH POINT



HIGH POINT, GUILFORD COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.......	9-10-65	9-10-65	12-9-70	12-9-70
Copper (Cu)..............	-------	-------	0.145	0.030
Cobalt (Co)..............	-------	-------	.000	.000
Zinc (Zn)................	-------	-------	.040	.056
Chromium (Cr)............	-------	-------	.000	.000
Boron (B)................	-------	-------	.016	.056
Strontium (Sr)...........	-------	-------	.055	.030
Barium (Ba)..............	-------	-------	.000	.000
Mercury (Hq).............	-------	-------	<.0005	<.0005
Lead (Pb)................	-------	-------	.000	.000
Lithium (Li).............	-------	-------	.000	.000
Cadmium (Cd).............	-------	-------	.000	.000
Cyanide (CN).............	-------	-------	.00	.00
Chloride (Cl)............	2.1	7.5	3.9	9.4
Manganese (Mn)...........	.10	.01	.040	.000
Iron (Fe)................	.87	.02	.121	.010
Calcium (Ca).............	6.7	14	-------	-------
Magnesium (Mg)...........	2.0	2.0	-------	-------
Sodium (Na)..............	4.3	4.2	-------	-------
Potassium (K)............	2.4	2.3	-------	-------
Fluoride (F).............	.2	1.0	-------	-------
Silica (Si02)............	11	11	-------	-------
Bicarbonate (HCO3).......	31	31	-------	-------
Carbonate (CO3)..........	0	0	-------	-------
Sulfate (SO4)............	5.2	15	-------	-------
Nitrate (NO3)............	.3	.1	-------	-------
Dissolved Solids.........	71	77	-------	-------
Hardness as CaCO3:				
Total..................	26	44	-------	-------
Noncarbonate...........	1	18	-------	-------
Alkalinity as CaCO3......	25	25	-------	-------
Specific conductance (micromhos at 25° C)....	69	118	-------	-------
pH.......................	6.8	7.2		
Temperature..............	24	-------	11	10.5

ORANGE COUNTY
WATER-RESOURCES APPRAISAL

Orange County is in the eastern part of the Piedmont Province. The prevailing topography of the county is that of a gently rolling upland, however the land surface is more broken and steep in the northwestern and southern parts of the county. Stream valleys are narrow with steep side slopes and drainage is generally good. The northeastern part of the county is drained by the Eno and Little Rivers and their tributaries, the eastern and southeastern parts by New Hope and Morgan Creeks, and the western and southwestern parts by Cane Creek and Haw River. For all streams in the county, the average discharge is 0.7 mgd per square mile. Minimum flows in the northeastern part generally exceed 0.003 mgd per square mile while those in the remainder of the county average about 0.01 mgd per square mile. The 7-day, 2-year low flow of streams in the northeastern part is 0.04 mgd per square mile and 0.06 mgd per square mile in the remainder. Hillsborough, Carrboro, and Chapel Hill obtain their water from surface sources. Most other domestic supplies are obtained from ground water. The Orange-Alamance Water System, Inc., serves Efland and an expanding rural area that generally parallels U. S. Highway 70. The county's population in 1970 was 57,707.

The water systems of Hillsborough and Alamance-Orange Water Systems Corporation in Orange County, and those of Burlington, Graham, Mebane, and Haw River Sanitary District in Alamance County are connected. Each could supplement the others if necessary.

Most of Orange County is underlain by metamorphosed volcanic rocks that include tuff, flows, and interbedded sedimentary rocks. Relatively small bodies of argillite are exposed near Efland, Calvander, and Eubanks. Granite and gabbro are exposed in all parts of the county with the two largest bodies being along the northern and southern boundaries. Triassic rocks consisting mainly of sandstone and shale are exposed in the southeast corner of the County.

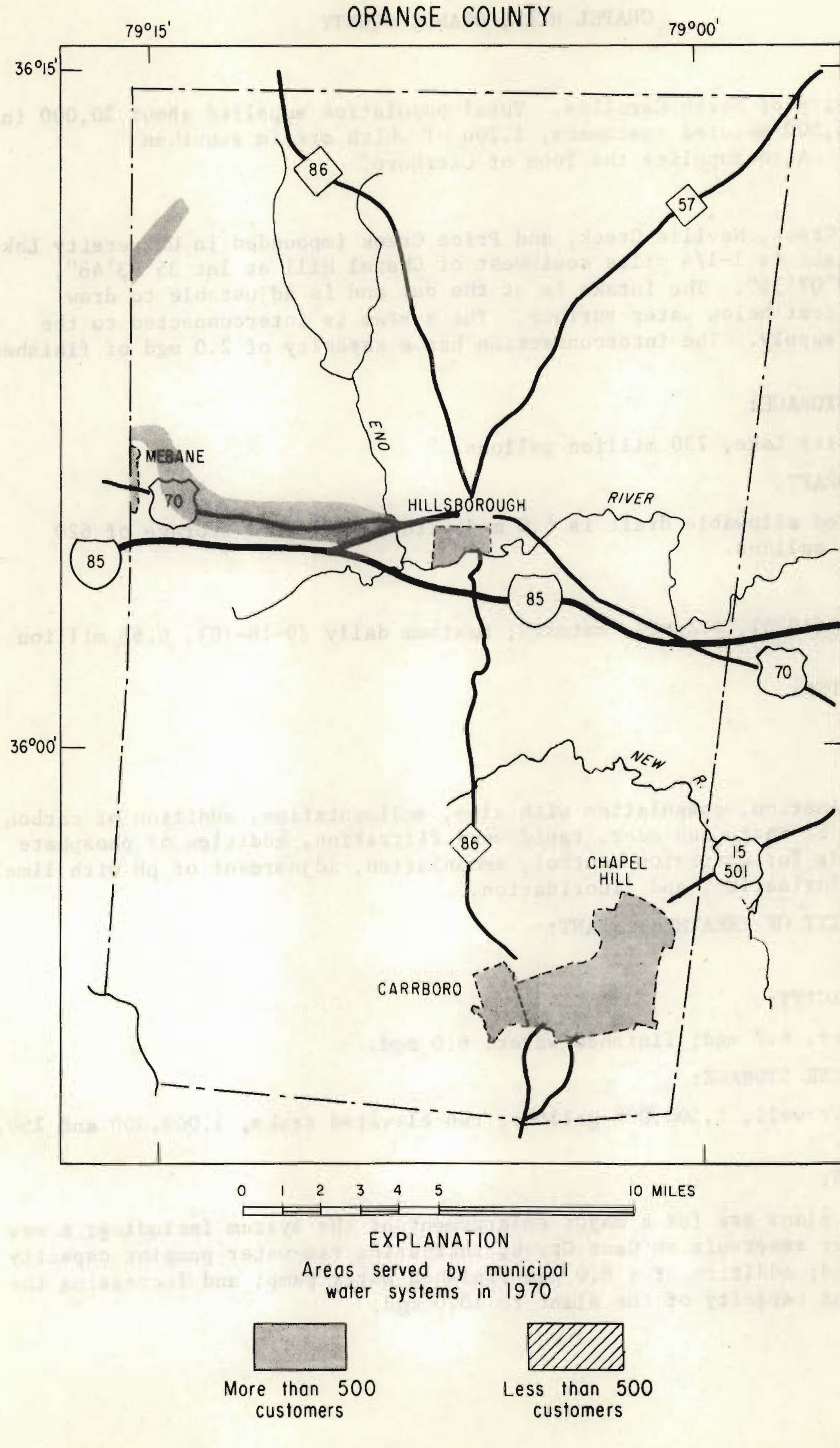
The rocks in Orange County form aquifers of about the average water-yield potential for the Piedmont Province. Comparison of available well data indicates that granite is the most productive unit with the metamorphosed rocks and argillite being about equal to each other and slightly less than the granite. The higher-yielding wells in each rock unit are those located in the draws and low, flat areas with thick zones of weathered rock overlying the hard rock. Yields of up to 50 gallons per minute have been reported. Typical reported yields and average depth of wells drilled in the major rock units are listed in the table below:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Granite	50	12	77
Argillite	10	9	95
Metamorphosed volcanics	30+	10	91

ORANGE COUNTY
WATER-RESOURCES APPRAISAL

The chemical quality of ground water in Orange County generally is good, and the water is suitable for most uses with little or no treatment. However, in localized areas in all parts of the county, excessive concentrations of iron and hardness-causing constituents are found in ground water.

The availability of ground water in Orange County is adequate for domestic and many small industrial needs. Where the higher yielding wells are needed, care should be taken in locating and managing the well fields. Until actual on-site conditions are evaluated, it is reasonable to assume that wells, spaced one-half mile apart in the granitic-type rocks, would yield 0.04 to 0.05 mgd. Similar wells in other parts of the county would probably have a sustained yield of about 0.02 to 0.04 mgd.


ORANGE COUNTY
79°15'
79°00'
36°15'
36°15'
36°00'
36°00'
86
57
ENO
MEBANE
70
HILLSBOROUGH
RIVER
85
85
70
NEW
R.
86
15
501
CHAPEL HILL
CARRBORO
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1970
More than 500 customers
Less than 500 customers

CHAPEL HILL, ORANGE COUNTY

OWNERSHIP:

University of North Carolina. Total population supplied about 30,000 in 1970 (5,500 metered customers, 1,200 of which are in suburban areas). Also supplies the Town of Carrboro.

SOURCE:

Morgan Creek, Neville Creek, and Price Creek impounded in University Lake: The intake is 1-1/4 miles southwest of Chapel Hill at lat 35°53'48", long 79°07'33". The intake is at the dam and is adjustable to draw from 2 feet below water surface. The system is interconnected to the Durham supply. The interconnection has a capacity of 2.0 mgd of finished water.

RAW WATER STORAGE:

University Lake, 730 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 6.0 mgd with an adjusted storage of 620 million gallons.

TOTAL USE:

Average (1970), 4.2 mgd, metered; maximum daily (9-18-70), 6.68 million gallons.

INDUSTRIAL USE:

None.

TREATMENT:

Preclorination, coagulation with alum, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, addition of phosphate compounds for corrosion control, ammoniation, adjustment of pH with lime, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

5.0 mgd.

PUMPING CAPACITY:

Raw water, 6.7 mgd; finished water, 6.0 mgd.

FINISHED WATER STORAGE:

One clear well, 1,500,000 gallons; two elevated tanks, 1,000,000 and 250,000 gallons.

FUTURE PLANS:

Present plans are for a major enlargement of the system including: a new raw water reservoir on Cane Creek; increasing raw-water pumping capacity to 10 mgd; addition of a 8.0 mgd finished water pump; and increasing the treatment capacity of the plant to 10.0 mgd.

CHAPEL HILL, ORANGE COUNTY

WATER-RESOURCES APPRAISAL:

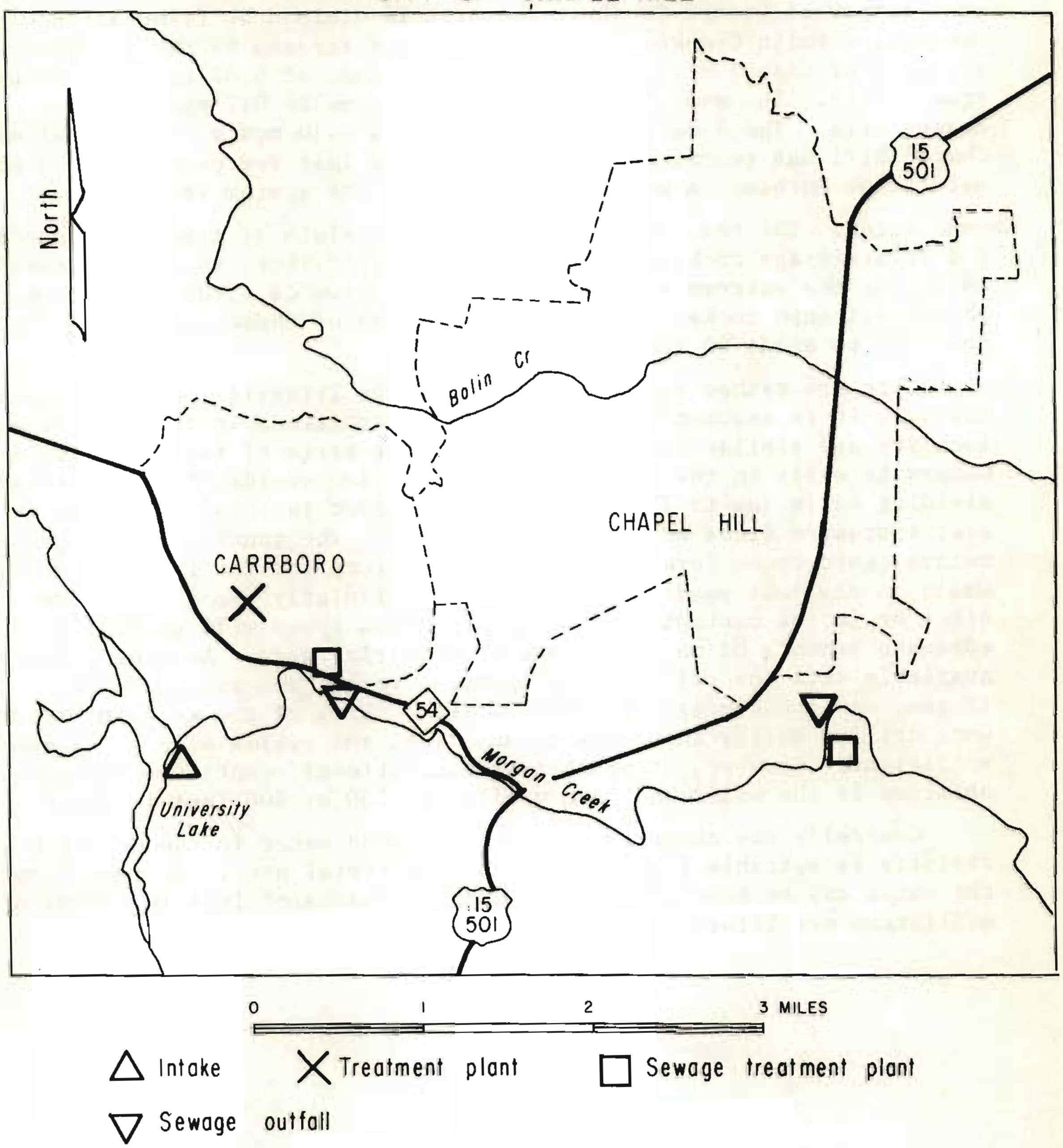
Surface water: Chapel Hill is located on a plateau-like area in the southeast corner of Orange County. The area is drained by tributaries of Morgan and Bolin Creeks. Low-flow yield of streams in the immediate vicinity of Chapel Hill is small, in the range of 0.02 to 0.04 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile. The 7-day, 2-year low flow is 0.10 mgd per square mile. Chapel Hill has restricted water use in the last few years and has obtained water from Durham. A general expansion of the system is planned.

Ground water: The town of Chapel Hill is underlain by granite, granodiorite, and Triassic-age rocks such as sandstone, siltstone, shale, and conglomerate. Adjoining the extreme southern edge of the town is a thin band of metamorphosed volcanic rocks. The weathered depths of these rocks range from a few feet to about 60 feet.

Data are rather sparse for wells in the Triassic rocks at Chapel Hill. However, it is assumed that ground-water conditions in these rocks at this locality are similar to conditions in other parts of the Triassic basin. Generally wells in the Triassic rocks have low yields, but occasional high-yielding wells (up to 125 gpm) are constructed in local faults or in and near intrusive dikes or sills in the basin. The granitic rocks and the metavolcanic rocks form about-average aquifers for the Piedmont Province. Wells in the most desirable sites and particularly along intrusive dikes or in the contact zone with other rock types will generally yield adequate amounts of water for small industrial uses. According to the available data for wells in the granitic rocks, the average yield is 12 gpm, and the average depth is 78 feet. Most of the wells of record were drilled solely for domestic supplies, and yields of 8 to 12 gpm are sufficient. However, it appears that additional quantities could have been obtained if the wells had been drilled to 150 or 200 feet in depth.

Generally the chemical quality of ground water in the Chapel Hill vicinity is suitable for domestic and industrial uses. In some locations the water may be hard and contain concentrations of iron in excess of 0.3 milligrams per liter.

CITY OF CHAPEL HILL



CHAPEL HILL, ORANGE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Univ. Lake Raw	Finished	Univ. Lake Raw	Finished
Date of collection.......	5-24-66	5-24-66	11-18-70	11-18-70
Copper (Cu).............	-------	-------	0.008	0.020
Cobalt (Co).............	-------	-------	.000	.000
Zinc (Zn)...............	-------	-------	.048	.060
Chromium (Cr)...........	-------	-------	.000	.000
Boron (B)...............	-------	-------	.007	.105
Strontium (Sr)..........	-------	-------	.000	.030
Barium (Ba).............	-------	-------	.000	.000
Mercury (Hq)............	-------	-------	<.0005	<.0005
Lead (Pb)...............	-------	-------	.000	.000
Lithium (Li)............	-------	-------	.000	.000
Cadmium (Cd)............	-------	-------	.000	.000
Cyanide (CN)............	-------	-------	.00	.00
Chloride (Cl)...........	4.4	11	6.0	13
Manganese (Mn)..........	.00	.01	.000	.120
Iron (Fe)...............	.00	.02	.010	.059
Calcium (Ca)............	5.3	14	-------	-------
Magnesium (Mg)..........	1.5	1.5	-------	-------
Sodium (Na).............	4.0	5.7	-------	-------
Potassium (K)...........	1.2	1.1	-------	-------
Fluoride (F)............	.1	.9	-------	-------
Silica (SiO2)...........	11	11	-------	-------
Bicarbonate (HCO3)......	20	25	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)...........	6.6	15	-------	-------
Nitrate (NO3)...........	.4	.2	-------	-------
Dissolved Solids........	46	80	-------	-------
Hardness as CaCO3:				
Total...................	20	41	-------	-------
Noncarbonate............	3	20	-------	-------
Alkalinity as CaCO3......	16	20	-------	-------
Specific conductance (micromhos at 25°C)....	63	114	-------	-------
pH......................	6.4	7.2	-------	-------
Temperature.............	22	--------	17.5	16

HILLSBOROUGH, ORANGE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,500 in 1970 (1,569 metered customers, 968 of which are in suburban areas).

SOURCE:

Eno River impounded by a low dam owned by Cone Mills. Flow supplemented when necessary by water released from municipally-owned Ben Johnson Dam on Eno River. The intakes are 1 mile west of Hillsborough at 36°04'02", long 79°07'39".

RAW-WATER STORAGE:

Ben Johnson Reservoir, 30 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.6 mgd with a storage of 30 million gallons.

TOTAL USE:

Average (1970), 0.62 mgd, metered; maximum daily (9-18-70), 0.76 million gallons.

INDUSTRIAL USE:

0.40 mgd, estimated. Principal users include Hillsborough Textiles, Inc., and Cone Mills.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, addition of carbon when necessary for control of taste and odor, rapid sand and anthracite filtration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

0.50 mgd. In November 1970, plant had temporary permission to treat 0.75 mgd.

PUMPING CAPACITY:

Raw water, 1.3 mgd; finished water, 1.2 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 150,000 and 50,000 gallons; one stand pipe, 200,000 gallons.

FUTURE PLANS:

In November 1970, a pipe line was under construction to obtain finished water from Orange-Alamance Water Systems, Inc., in case of emergency. Construction of a new 2.5 mgd treatment plant and elevated storage of 500,000 gallons of finished water is scheduled to begin in January 1971. When the new plant is complete, Hillsborough's system should be adequate for foreseeable needs.

HILLSBOROUGH, ORANGE COUNTY

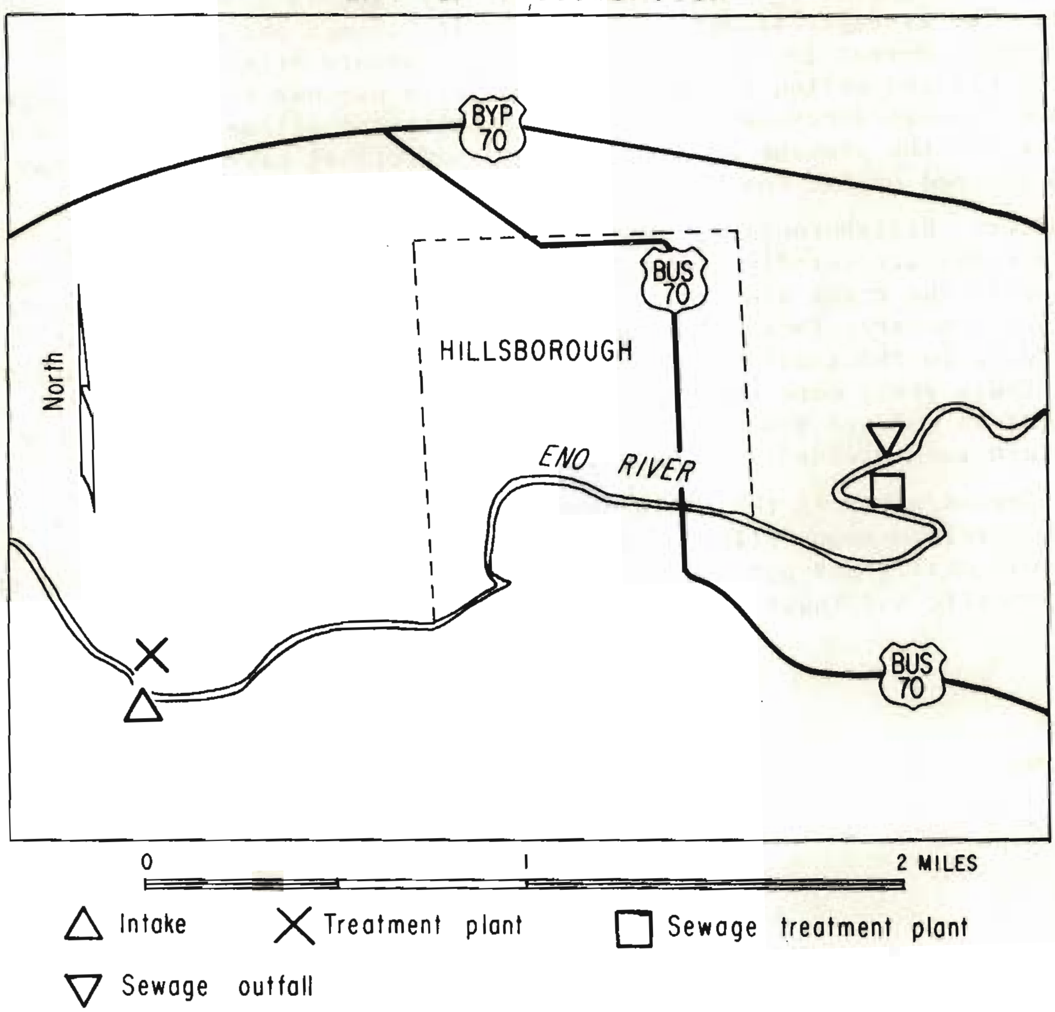
WATER-RESOURCES APPRAISAL:

Surface water: Hillsborough is in central Orange County where the topography is characterized by rolling hills with gentle to steep slopes. The area is drained by tributaries of Eno River of the Neuse River basin. The low-flow yield of the streams generally exceeds 0.003 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile. The 7-day, 2-year low-flow is 0.04 mgd per square mile. The 30-million gallon reservoir presently in use has a capacity large enough to meet foreseeable needs. The estimated allowable draft is more than twice the present use. If needed, additional raw-water storage could be developed on the Eno River.

Ground water: Hillsborough is underlain by rocks of the Carolina Slate Belt. These rocks are chiefly gneiss, schist, tuff, and argillite. Weathered depths of the rocks are at least 60 feet in some places. Average yield of wells in the area is about 10 gpm, and average well depth is about 92 feet, according to the available data. Some wells in the vicinity of Hillsborough reportedly yield more than 30 gpm, and if these wells are located in low flat areas and are spaced at least 2,000 feet from other wells, they might maintain such yields indefinitely.

Ground water in the Hillsborough vicinity generally is moderately hard, and water from some wells contains dissolved iron in concentrations greater than 0.3 milligrams per liter. In general, the ground water is suitable for domestic and industrial purposes with little or no treatment.

CITY OF HILLSBOROUGH



HILLSBOROUGH, ORANGE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Eno River Raw	Eno River Finished	Eno River Raw	Eno River Finished
Date of collection.......	7-25-66	7-25-66	11-4-70	11-4-70
Copper (Cu)..............	-------	-------	0.132	0.008
Cobalt (Co)..............	-------	-------	.000	.000
Zinc (Zn)................	-------	-------	.210	.020
Chromium (Cr)............	-------	-------	.000	.000
Boron (B)................	-------	-------	.125	.100
Strontium (Sr)...........	-------	-------	.030	.030
Barium (Ba)..............	-------	-------	.000	.000
Mercury (Hq).............	-------	-------	<.0005	<.0005
Lead (Pb)................	-------	-------	.000	.000
Lithium (Li).............	-------	-------	.000	.000
Cadmium (Cd).............	-------	-------	.000	.000
Cyanide (CN).............			.00	.00
Chloride (Cl)............	2.2	6.6	4.6	7.5
Manganese (Mn)...........	.08	.00	.055	.100
Iron (Fe)................	.20	.01	.148	.007
Calcium (Ca).............	5.8	17	-------	
Magnesium (Mg)...........	2.5	2.5	-------	
Sodium (Na)..............	4.4	3.9	-------	-------
Potassium (K)............	1.4	1.4	-------	-------
Fluoride (F).............	.1	.9	-------	-------
Silica (SiO2)............	15	15	-------	-------
Bicarbonate (HCO3).......	33	43	-------	-------
Carbonate (CO3)..........	0	0	-------	-------
Sulfate (SO4)............	4.0	17	-------	-------
Nitrate (NO3)............	.2	.1	-------	-------
Dissolved Solids.........	54	86	-------	-------
Hardness as CaCO3:				
Total..................	25	53	-------	-------
Noncarbonate...........	0	18	-------	-------
Alkalinity as CaCO3......	27	35	-------	-------
Specific conductance (micromhos at 25°C)....	70	130	-------	-------
pH.......................	6.6	7.0	-------	-------
Temperature..............	24	24	16	16

ORANGE-ALAMANCE WATER SYSTEMS, INC., ORANGE COUNTY

OWNERSHIP:

Orange-Alamance Water Systems, Inc. Total population supplied, about 3,000 in rural Orange and Alamance Counties (850 metered customers). The area served includes the Town of Efland and rural customers in a belt that parallels U. S. Highway 70 and extends into Alamance County.

SOURCE:

Eno River impounded in corporation-owned lake. The intakes are at the dam just upstream from U. S. Highway 70 at lat 36°05'04", long 79°08'29".

RAW-WATER STORAGE:

Corporation Lake, 30 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.3 mgd with a storage of 30 million gallons.

TOTAL USE:

Average (1970), 0.20 mgd, metered; maximum daily (9-2-69), 0.82 million gallons.

INDUSTRIAL USE:

Negligible.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, addition of potassium permanganate for control of taste and odor when needed, high-rate mixed-media filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd. The treatment plant is about 2 miles west of Hillsborough.

PUMPING CAPACITY:

Raw water, 2.0 mgd; finished water, 2.0 mgd.

FINISHED WATER STORAGE:

One clear well, 100,000 gallons; four elevated tanks, 300,000, 300,000, 100,000, and 100,000 gallons.

FUTURE PLANS: None. System began operation June 13, 1969, and is adequate for foreseeable needs.

ORANGE-ALAMANCE WATER SYSTEMS, INC., ORANGE COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: The area served by Orange-Alamance Water Systems, Inc., is in the Piedmont section of North Carolina, and is drained by tributaries of Eno and Haw Rivers. The low-flow yield of the streams in the immediate area generally exceeds 0.003 mgd per square mile. The average discharge for streams is 0.7 mgd per square mile. The 7-day, 2-year low flow is 0.04 mgd per square mile. The 30-million gallon reservoir presently in use has a capacity large enough to meet foreseeable needs. The estimated allowable draft is many times present use. If needed, additional raw-water storage could be developed on the Eno River.

Ground water: The principal rock type is known as the metavolcanic unit. It contains gneiss, tuff, schist, and some argillaceous slate and lava flows. Between the towns of Mebane and Efland and in the northernmost part of the area served by the Orange-Alamance Water Systems, Inc., the main rock type is granite.

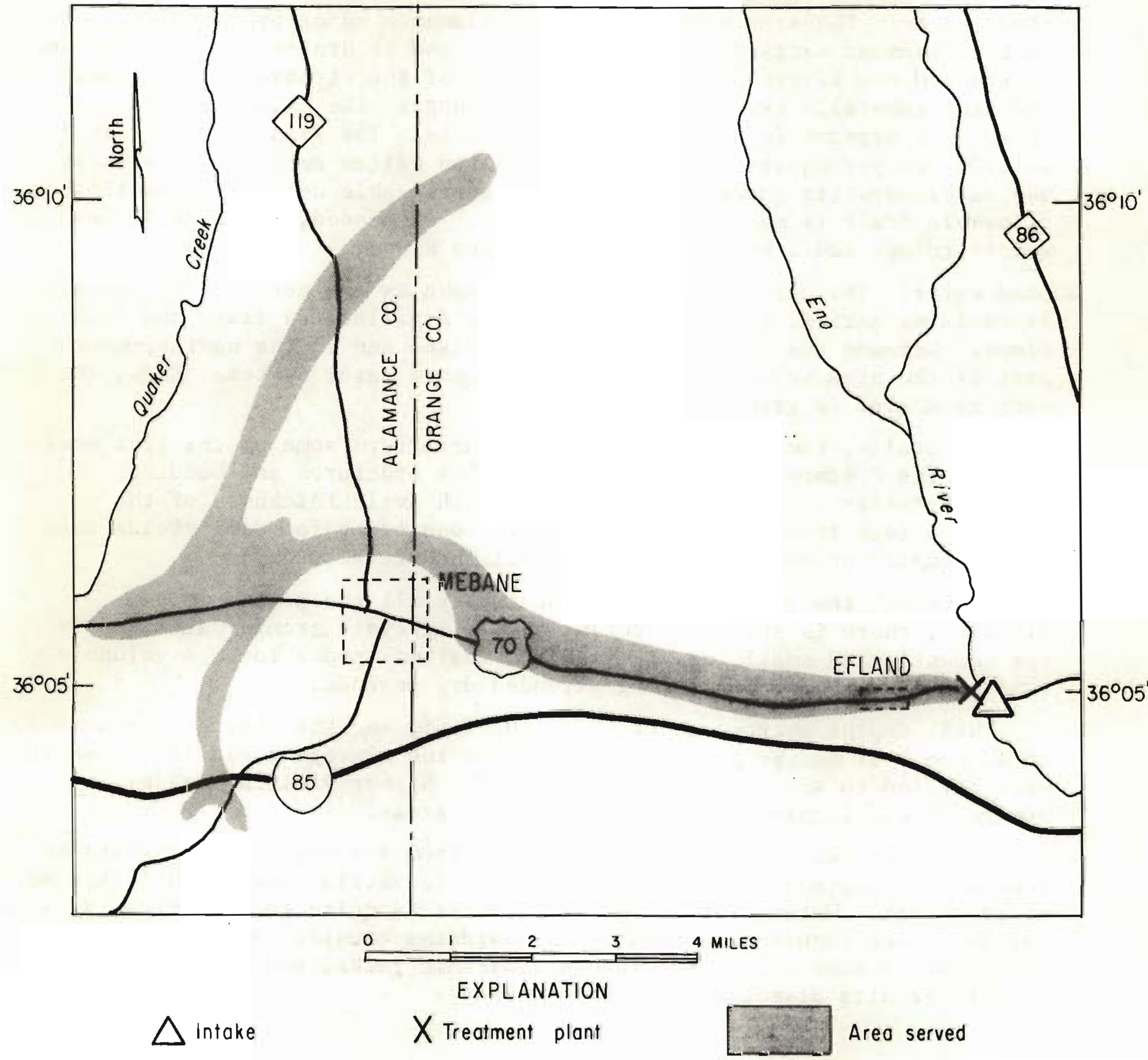
Generally, the rocks underlying the area form some of the best aquifers in the Piedmont part of the State. The fractures and bedding characteristics of these rocks together with ample thickness of the weathered rock tend to provide favorable conditions for well yields that are adequate for domestic and many small industrial uses.

Although the company serves practically all the people in the district, there is still the potential for adequate ground-water supply for domestic and small industrial needs that may prove to be a valuable supplement to the supply during extended dry periods.

Well depths average about 90 to 100 feet, and the average yield is 10 to 12 gpm. It may be possible to increase the average yield if the wells were drilled to about 150 or 200 feet. The higher-yielding wells generally are located in draws or low flat areas.

The chemical quality of ground water from the metavolcanic rocks is generally acceptable for domestic and some industrial uses with little or no treatment. Water from the granitic rocks is quite good chemically, and for most uses requires no treatment. Hardness-causing constituents are excessive in some water from the metavolcanic rocks, and in some localities in granite dissolved iron is excessive.

ORANGE-ALAMANCE WATER SYSTEMS INC.



ORANGE-ALAMANCE WATER SYSTEMS, INC., ORANGE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Eno River Raw	Eno River Finished	Eno River Raw	Eno River Finished
Date of collection.......	11-4-70	11-4-70	11-4-70	11-4-70
Copper (Cu)...............	-------	-------	0.002	0.008
Cobalt (Co)...............	-------	-------	.000	.000
Zinc (Zn).................	-------	-------	.040	.110
Chromium (Cr).............	-------	-------	.000	.000
Boron (B).................	-------	-------	.145	.140
Strontium (Sr)............	-------	-------	.030	.055
Barium (Ba)...............	-------	-------	.000	.000
Mercury (Hq)..............	-------	-------	<.0005	<.0005
Lead (Pb).................	-------	-------	.000	.000
Lithium (Li)..............	-------	-------	.000	.000
Cadmium (Cd)..............	-------	-------	.000	.000
Cyanide (CN)..............	-------	-------	.00	.00
Chloride (Cl).............	4.2	10	4.0	11
Manganese (Mn)............			.005	.010
Iron (Fe).................	.09	.00	.000	.017
Calcium (Ca)..............	6.3	6.7	-------	-------
Magnesium (Mg)............	2.6	2.3	-------	-------
Sodium (Na)...............	4.7	15	-------	-------
Potassium (K).............	2.5	2.6	-------	-------
Fluoride (F)..............	.1	.1	-------	-------
Silica (Si02).............	14	13	-------	-------
Bicarbonate (HCO3)........	34	38	-------	-------
Carbonate (CO3)...........	0	0	-------	-------
Sulfate (SO4).............	4.8	18	-------	-------
Nitrate (NO3).............	1.2	.3	-------	-------
Dissolved Solids..........	72	99	-------	-------
Hardness as CaCO3:				
Total..................	26	26	-------	-------
Noncarbonate...........	0	0	-------	-------
Alkalinity as CaCO3.......	28	31	-------	-------
Specific conductance (micromhos at 25° C)....	71	131	--- ---	-------
pH........................	6.9	6.9	-------	-------
Temperature...............	16	16	16	16

PERSON COUNTY

WATER-RESOURCES APPRAISAL

Person County is in the Piedmont Province in the north-central part of North Carolina. The topography of the county is characterized by rolling hills with gentle land slopes except in the headwaters of many streams, particularly in the northwestern section of the county, where the relief is more broken and steep. The northern and western sections of the county are drained by Hyco River and its tributaries; the southern section by Flat River and its tributaries; and a small area along the eastern boundary of the county by the headwaters of the Tar River. The average discharge of streams in the county ranges from 0.5 to 0.7 mgd per square mile. Minimum flows are generally small, in the range of 0 to 0.005 mgd per square mile. Streams with as much as 70 square miles drainage area have been observed to go dry. The 7-day, 2-year low flow of streams in the county averages 0.04 mgd per square mile. Roxboro obtains its municipal supply from surface sources, and serves about 10,000 people. Other domestic supplies in the county are obtained from ground-water sources. The county's total population in 1970 was 25,914.

Person County is underlain by seven rock units. The northwestern one-third of the county is underlain by gneiss and schist. Large bodies of granite occur in the southwest corner and central part, argillite and tuff underlie the northeastern and south-central part, and gabbro-diorite and slightly metamorphosed volcanic rocks are found between the larger units in almost all parts of the county.

The granitic rocks and the argillite form better aquifers in the county than the gneiss, schist, or metamorphosed volcanic rocks. Large variations in yield have been noted in the same rock unit. Indications are that there is a direct relation between depth of weathered material and well yield in the argillite and metamorphosed volcanic rocks. In the granitic rocks it appears that well yield is mainly influenced by topography.

The table below was compiled from available well data from Person County, and it shows the maximum and average reported well yields and the average well depth for each major rock unit.

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Gneiss & Schist	15+	5	85
Granitic rocks	25	8	82
Argillite	30	6	78
Metamorphosed volcanics	30	5	96

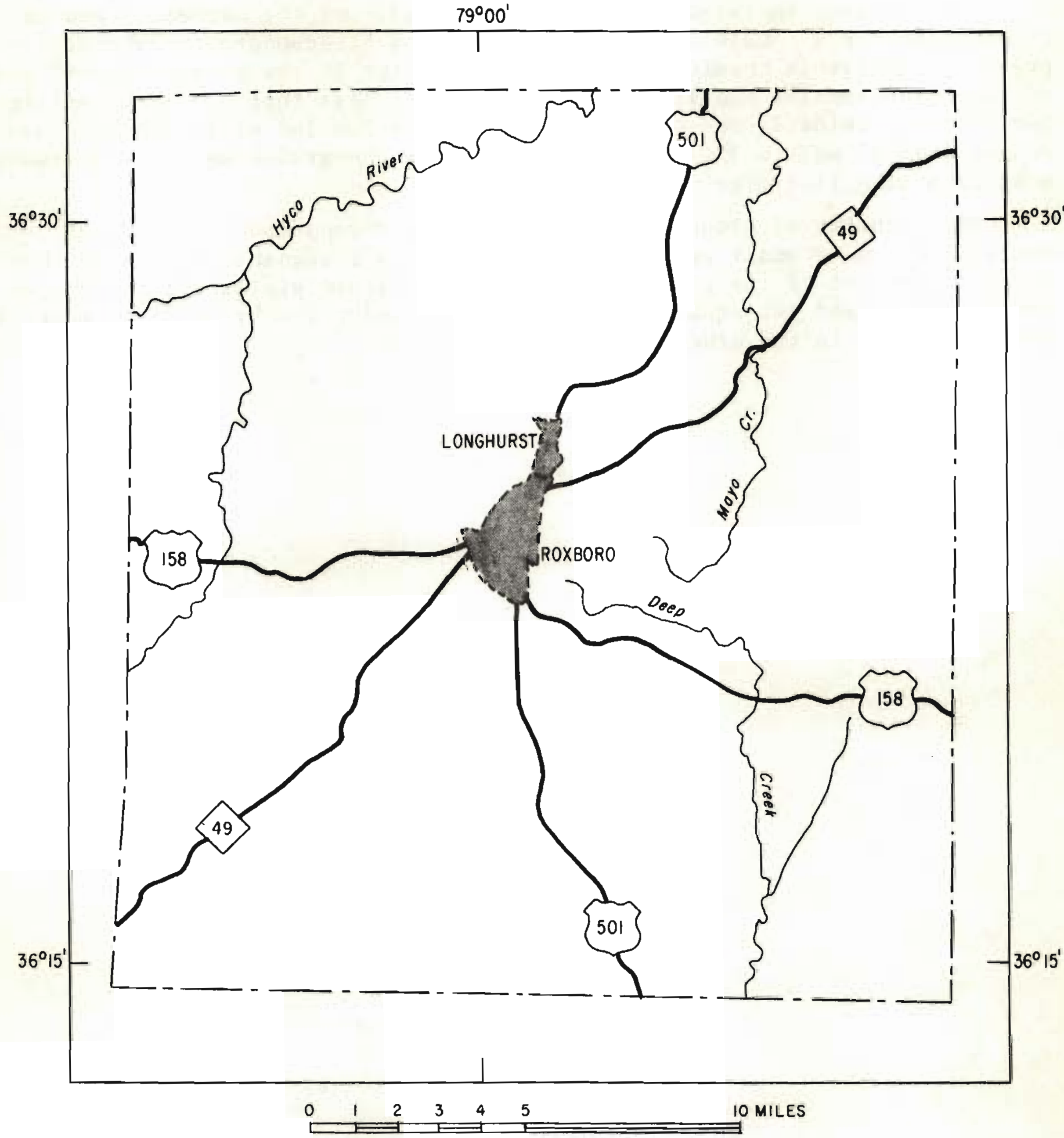
PERSON COUNTY

WATER-RESOURCES APPRAISAL

Ground water in Person County is principally of the magnesium and calcium bicarbonate types. Calcium chloride and sodium bicarbonate types also are present. Available chemical data on ground water in the county show 67 percent of the water samples had iron concentrations of less than 0.3 mg/l (milligrams per liter). Chloride concentrations were all below 140 mg/l, and hardness ranged from 12 mgl to 354 mg/l. In many cases the ground water is suitable for most uses with little or no treatment.

The quantity of ground water available in Person County is adequate for domestic and many small industrial needs. It is reasonable to assume that in about 50 percent of the wells drilled, the sustained yields will be on the order of 0.26 mgd per square mile in the area underlain by granitic rocks and about 0.13 mgd in the other parts of the county.

PERSON COUNTY



EXPLANATION

Areas served by municipal water systems in 1970

ROXBORO, PERSON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 10,000 in 1970 (3,000 metered customers, 1,200 of which are in suburban areas).

SOURCE:

Satterfield Creek impounded in Roxboro Lake. The intakes are 2-1/2 miles northwest of Roxboro at lat 36°25'20", long 79°00'50". Approximately 2 mgd are pumped from Hyco Lake to Roxboro Lake as an emergency supply.

RAW-WATER STORAGE:

Roxboro Lake, 800 million gallons.

ALLOWABLE DRAFT:

Not determined; carryover storage analysis required. Storage in Roxboro Lake has been supplemented at times (most years beginning in 1967) by pumping from Hyco Lake, Carolina Power & Light Company's cooling-water reservoir on Hyco River, at the rate of 2 mgd.

TOTAL USE:

Average (1970), 3.5 mgd, metered; maximum daily (10-15-70), 5.6 million gallons.

INDUSTRIAL USE:

2.6 mgd, estimated. Principal users include Crown Aluminum Industries, Inc., Collins and Aikman Corp., Eaton, Yale and Towne, Inc., and Indian Head Yarn Company.

TREATMENT:

Prechlorination, coagulation with alum and potassium permanganate, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with liquid caustic soda, post chlorination when necessary, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

4.5 mgd.

PUMPING CAPACITY:

Raw water, 5.8 mgd; finished water, 3.6 mgd. Finished water is also distributed through a 16 inch gravity-flow line.

FINISHED-WATER STORAGE:

One clear well, 1,500,000 gallons; one stand pipe, 2,000,000 gallons.

FUTURE PLANS:

No definite plans at present. Items under consideration include a new raw-water reservoir and an increase in capacity of treatment plant.

ROXBORO, PERSON COUNTY

WATER-RESOURCES APPRAISAL:

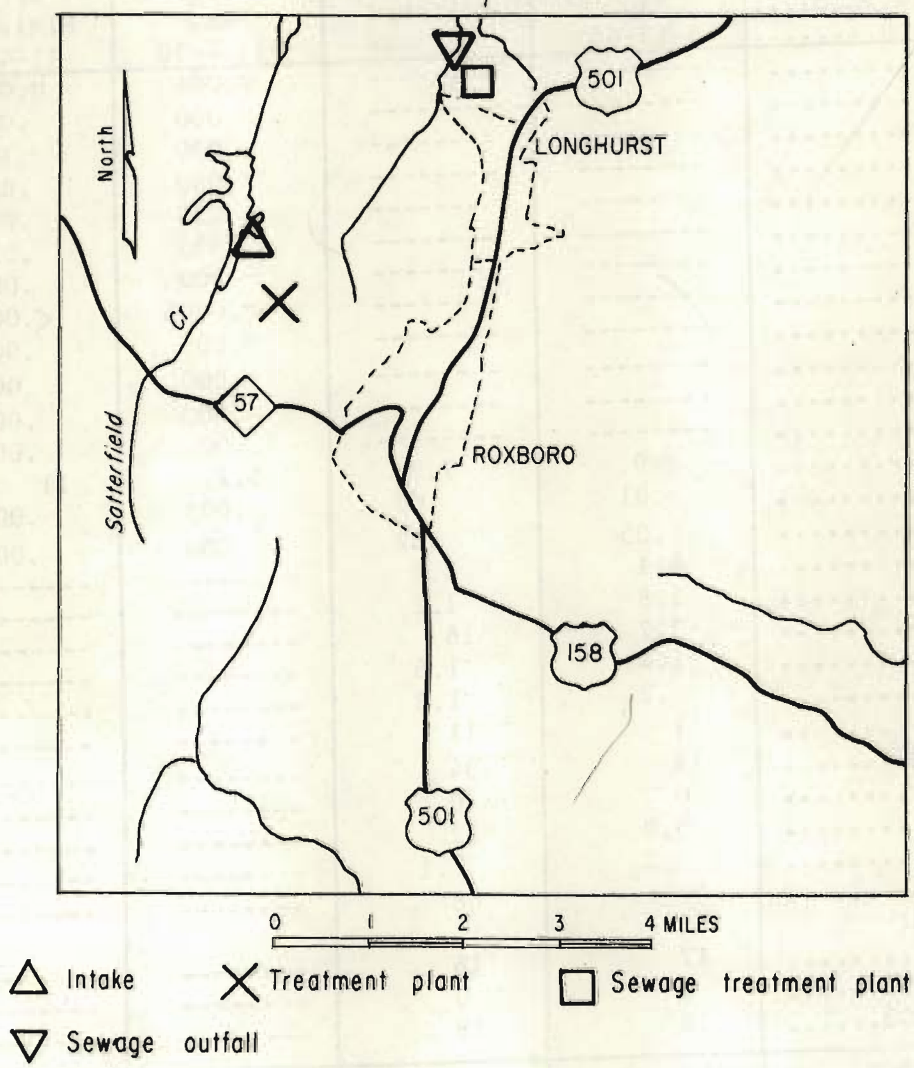
Surface water: Roxboro is in an upland area in central Pearson County. The area is drained by small streams. The largest nearby streams are South Hyco Creek, about 6 miles to the west, and South and North Flat Rivers to the south. The low-flow yield of streams in the immediate vicinity of Roxboro is small, in the range of 0.001 to 0.003 mgd per square mile, and streams with less than 20 square miles drainage area occasionally go dry. The average discharge of streams draining the area is 0.5 to 0.7 mgd per square mile. The 7-day, 2-year low flow is 0.04 mgd per square mile. Roxboro has experienced water shortages several times in the last few years and has obtained water at the rate of 2.0 mgd from Carolina Power & Light Company's Hyco Lake. Hyco Lake is possibly the best source for additional raw water provided such diversion could be depended upon on a long-term basis and would not interfere with cooling-water needs or water-release requirements specified for Carolina Power & Light Company's electric-generating plant installation.

Ground water: The town of Roxboro is underlain by granodiorite, a granitic rock. These rocks are weathered to depths up to 95 feet, but the average depth of weathering is about 40 feet. The yield of wells in this rock unit is influenced by the depth of weathered material, being higher where the weathered material is thickest.

Granitic rocks generally form good aquifers. In the Roxboro vicinity, the average reported well yield is about 9 gpm, and the highest yield reported is 25 gpm. It seems reasonable that yields greater than 25 gpm may be obtained from wells that are located in optimum geological and topographic situations. The average well depth in this vicinity is only about 82 feet which may contribute to the low average yield.

The chemical quality of water from the granitic rocks generally is good. Although sometimes slightly acidic, it is suitable for practically all domestic and many industrial uses without treatment.

CITY OF ROXBORO



ROXBORO, PERSON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)... Date of collection.......	Satterfield Creek Raw 5-13-66	Satterfield Creek Finished 5-13-66	Satterfield Cr.a/ Raw 11-4-70	Satterfield Cr.a/ Finished 11-4-70
Copper (Cu)..............	--------	--------	0.006	0.008
Cobalt (Co)..............	--------	--------	.000	.000
Zinc (Zn)................	--------	--------	.050	.100
Chromium (Cr)............	--------	--------	.000	.000
Boron (B)................	--------	--------	.025	.090
Strontium (Sr)...........	--------	--------	.030	.030
Barium (Ba)..............	--------	--------	.000	.000
Mercury (Hq).............	--------	--------	<.0005	<.0005
Lead (Pb)................	--------	--------	.000	.000
Lithium (Li).............	--------	--------	.000	.000
Cadmium (Cd).............	--------	--------	.000	.000
Cyanide (CN).............	--------	--------	.00	.00
Chloride (Cl)............	3.9	7.8	6.2	11
Manganese (Mn)...........	.01	.00	.005	.004
Iron (Fe)................	.05	.02	.000	.000
Calcium (Ca).............	4.1	3.9	--------	--------
Magnesium (Mg)...........	1.8	1.2	--------	--------
Sodium (Na)..............	3.7	16	--------	--------
Potassium (K)............	1.4	1.6	--------	--------
Fluoride (F).............	.2	1.3	--------	--------
Silica (Si02)............	11	11	--------	--------
Bicarbonate (HC03).......	19	34	--------	--------
Carbonate (C03)..........	0	0	--------	--------
Sulfate (S04)............	5.0	12	--------	--------
Nitrate (N03)............	.2	.1	--------	--------
Dissolved Solids.........	49	68	--------	--------
Hardness as CaC03:				
Total..................	17	16	--------	--------
Noncarbonate...........	2	0	--------	--------
Alkalinity as CaC03......	16	28	--------	--------
Specific conductance (micromhos at 25° C)....	60	116	--------	--------
pH.......................	6.0	7.1	--------	--------
Temperature..............	19	--------	17.5	17.1

a/ A mixture of Satterfield Creek and Hyco Lake water.

RANDOLPH COUNTY

WATER-RESOURCES APPRAISAL

Randolph County is in the central part of the Piedmont Province. The topography of the county varies from gently rolling to hilly and semi-mountainous. The Deep, Little, and Uwharrie Rivers and their tributaries drain all but the northeast corner of the county. Tributaries of the Haw River drain the northeast corner. For all streams in the county, the average discharge is from 0.6 to 0.65 mgd per square mile. Minimum flows are variable, ranging from 0 to 0.03 mgd per square mile and averaging 0.004 mgd per square mile. The 7-day, 2-year low flow ranges from 0.025 to 0.1 mgd per square mile and averages 0.054 mgd per sq mi. Asheboro, Ramseur, and Randleman obtain their municipal water supplies from surface sources. The county's population in 1970 was 76,358.

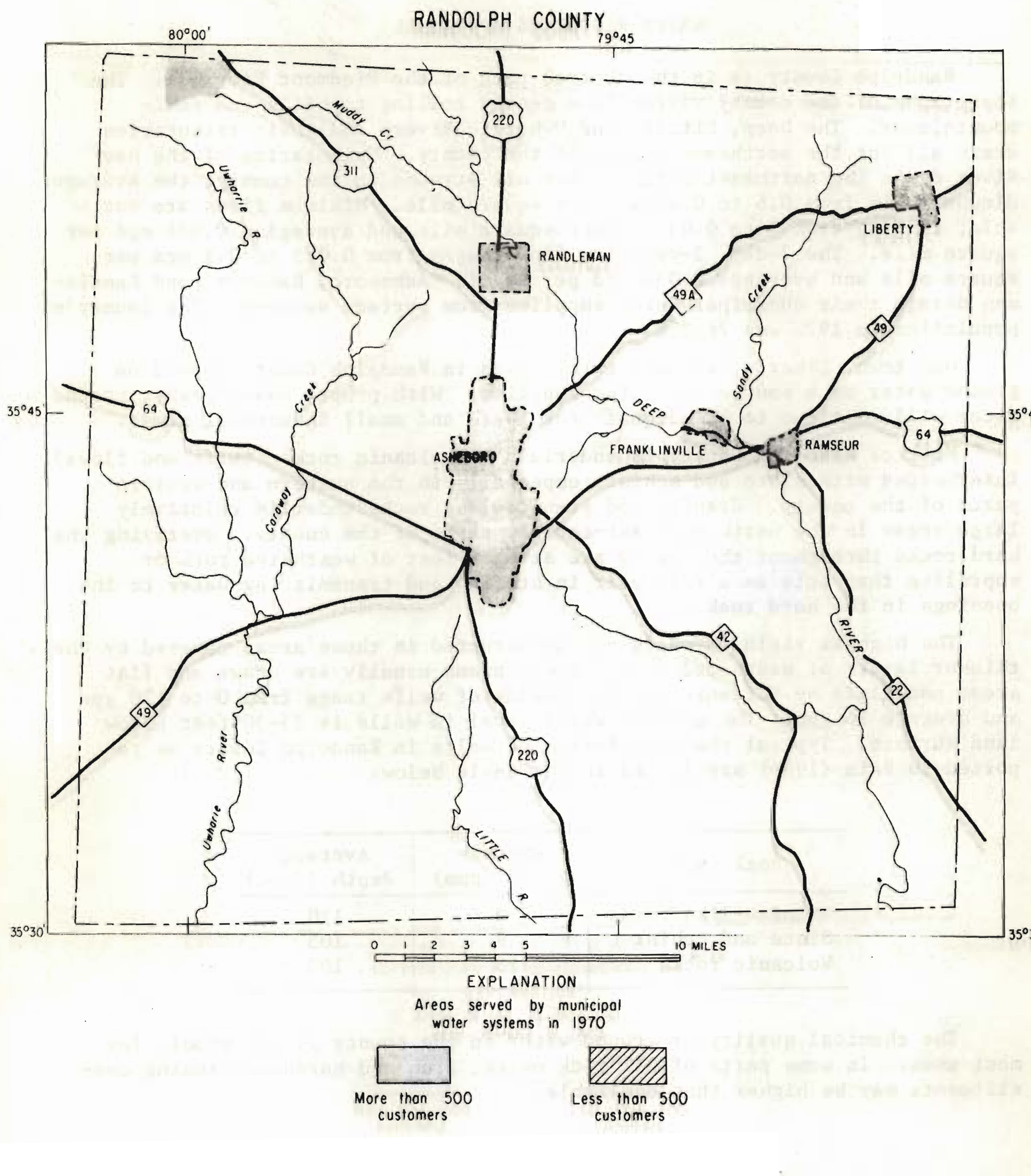
One town, Liberty, and all rural areas in Randolph County depend on ground water as a source for water supplies. With proper development, ground water will continue to be adequate for these and small industrial needs.

Most of Randolph County is underlain by volcanic rocks (tuffs and flows) interbedded with slate and schist, especially in the eastern and western parts of the county. Granite and granite-like rocks underlie relatively large areas in the north and east-central parts of the county. Overlying the hard rocks throughout the county are several feet of weathered rock or saprolite that acts as a reservoir in storing and transmitting water to the openings in the hard rock.

The highest yielding wells are constructed in those areas covered by the thicker layers of weathered rock. These areas usually are draws and flat areas underlain by volcanic rocks. Yields of wells range from 0 to 120 gpm and average 10 gpm. The average water level in wells is 25-30 feet below land surface. Typical characteristics of wells in Randolph County as reported to Bain (1966) are listed in the table below.

Rock type	Average yield (gpm)	Average depth (feet)
Granite-like rocks	8	110
Slate and schist	9	105
Volcanic rocks	13	100

The chemical quality of ground water in the county is acceptable for most uses. In some parts of all rock units, iron and hardness-causing constituents may be higher than desirable.



RANDOLPH COUNTY
80°00'
79°45
35°45'
35°30'
220
311
Muddy Cr.
Uwharrie R.
RANDLEMAN
LIBERTY
49A
Sandy Creek
49
64
Caraway Creek
DEEP
FRANKLINVILLE
RAMSEUR
ASHEBORO
42
RIVER
22
River
Uwharrie
LITTLE R.
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1970
More than 500 customers
Less than 500 customers

ASHEBORO, RANDOLPH COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 18,000 in 1970 (6,325 metered customers, 1,103 of which are in suburban areas).

SOURCE:

Back Creek tributaries impounded in (1) Lake Ross, (2) Lake McCrary, and (3) Lake Bunch, and Back Creek impounded in (4) Lake Lucas. Water from Lake Ross and Lake McCrary flow into Lake Bunch and is pumped from there to the city. The Lake Bunch intakes are 50 feet upstream from the dam, about 2.5 miles west of Asheboro at lat 35°43'18", long 79°51'37". The Lake Lucas intakes are at the dam about 3.5 miles west of Asheboro at lat 35°44'06", long 79°52'40".

RAW-WATER STORAGE: to Bunch 3 mgd pmp 45

Dry

Lake Ross, Lake McCrary, and Lake Bunch, total 160 million gallons; Lake Lucas, 1.25 billion gallons.

45 128" Reese

ALLOWABLE DRAFT:

Not determined, carryover storage analysis required.

TOTAL USE:

Average (1970), 2.64 mgd, metered; maximum daily (7-23-69), 3.30 million gallons.

INDUSTRIAL USE:

1.1 mgd, estimated. Principal users include Acme McCrary Hosiery Mill, Bossong Hosiery Mill, Burlington Socks, Klopman Mills, and Union Carbide.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor when necessary, rapid-sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd.

PUMPING CAPACITY:

Raw water, 9.0 mgd; finished water, 7.9 mgd.

FINISHED-WATER STORAGE:

One clear well, 1,000,000 gallons; one elevated tank, 500,000 gallons; three stand pipes, 1,500,000, 1,000,000, and 60,000 gallons.

FUTURE PLANS:

Filter plant presently being enlarged to increase capacity to 6.0 mgd (completion date April 1, 1972). Consideration is being given to construction of a raw-water reservoir on Caraway Creek below Back Creek within the next 10 years.

ASHEBORO, RANDOLPH COUNTY

WATER-RESOURCES APPRAISAL:

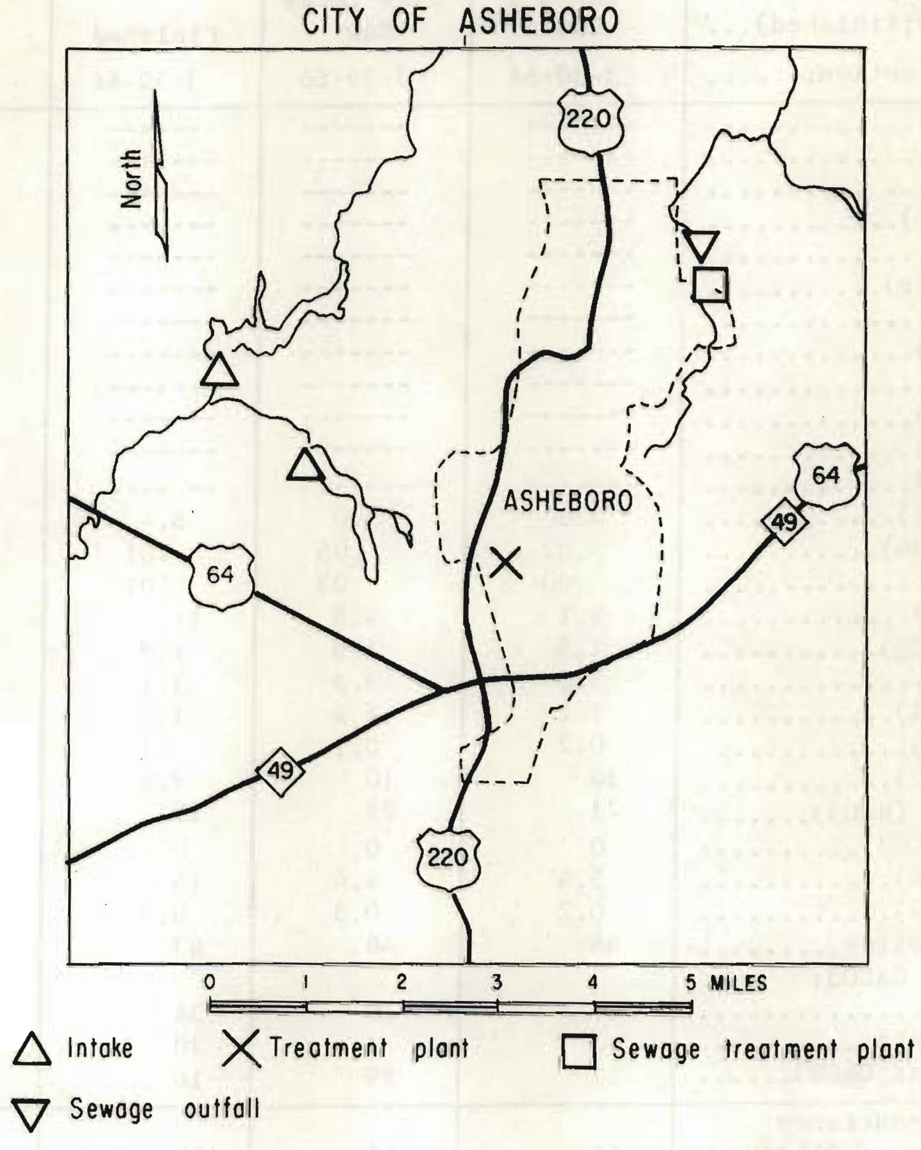
Surface water: Asheboro is on a north-south trending ridge in the center of Randolph County. The area is drained by small streams radiating generally to the east and west. The low-flow yield of streams in the Asheboro vicinity generally exceeds 0.004 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile, and the 7-day, 2-year low flow is 0.05 mgd per square mile. An analysis by consultants indicates that an additional raw-water supply will be needed in about 10 years and have recommended Caraway Creek as the best source.

Ground water: Asheboro is underlain by rocks of the metavolcanic unit except in the extreme north part of the town which is underlain by argillite. The rocks generally are deeply weathered. The average depth of well casing in the metavolcanic rocks at Asheboro is about 35 feet. In the argillite, at the north edge of the town, the weathered-rock zone is much deeper and extends to depths of 125 feet in some places.

A few wells in Asheboro probably are capable of yielding more than 30 gpm but the average yield is about 12 gpm. The better yielding wells are those located in topographically low areas where the zone of weathered rock is thickest. The depth of wells in the town average 100 feet. In some places, larger yields probably could be obtained by drilling as deep as 200 to 300 feet.

It is apparent that sufficient ground water is available for supplementary supplies for small industrial users in the Asheboro vicinity. With the wells drilled in the proper locations and spaced about one-half mile apart, sustained yields on the magnitude of 0.03 million gallons per day may be expected from each well.

The chemical quality of ground water in Asheboro is such that treatment may be desirable in some cases for industrial use and some domestic uses. Excessive hardness is the most common problem, and excessive iron and acidity occur in many cases.


CITY OF ASHEBORO
North
220
64
49
ASHEBORO
0
1
2
3
4
5 MILES
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

ASHEBORO, RANDOLPH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Lakes a/ Raw	Lake Lucas Raw	Finished	
Date of collection.......	3-30-66	3-30-66	3-30-66	
Copper (Cu)..............	-------	-------	-------	
Cobalt (Co)..............	-------	-------	-------	
Zinc (Zn)................	-------	-------	-------	
Chromium (Cr)............	-------	-------	-------	
Boron (B)................	-------	-------	-------	
Strontium (Sr)...........	-------	-------	-------	
Barium (Ba)..............	-------	-------	-------	
Mercury (Hg).............	-------	-------	-------	
Lead (Pb)................	-------	-------	-------	
Lithium (Li).............	-------	-------	-------	
Cadmium (Cd).............	-------	-------	-------	
Cyanide (CN).............	-------	-------	-------	
Chloride (Cl)............	3.0	3.0	8.4	
Manganese (Mn)...........	.02	.05	.01	
Iron (Fe)................	.00	.03	.01	
Calcium (Ca).............	5.1	4.8	11	
Magnesium (Mg)...........	1.5	1.8	1.8	
Sodium (Na)..............	3.0	3.2	3.2	
Potassium (K)............	1.2	1.2	1.5	
Fluoride (F).............	0.2	0.1	.1	
Silica (SiO2)............	10	10	9.9	
Bicarbonate (HCO3).......	21	23	19	
Carbonate (CO3)..........	0	0	0	
Sulfate (SO4)............	5.4	4.4	14	
Nitrate (NO3)............	0.2	0.3	0.3	
Dissolved Solids.........	48	46	63	
Hardness as CaCO3:				
Total..................	19	20	36	
Noncarbonate...........	2	1	20	
Alkalinity as CaCO3......	17	19	16	
Specific conductance (micromhos at 25° C)....	56	56	100	
pH.......................	6.4	6.8	6.9	
Temperature..............	13	14	-------	

a/ Source includes Lakes Ross, McCrary, and Bunch.

Note.--See additional analyses on next page.

ASHEBORO, RANDOLPH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Lakes a/ Raw	Finished		
Date of collection.......	12-8-70	12-8-70		
Copper (Cu)...........	0.160	0.000		
Cobalt (Co)...........	.000	.000		
Zinc (Zn)...........	.076	.210		
Chromium (Cr)...........	.000	.000		
Boron (B)...........	.022	.090		
Strontium (Sr)...........	.000	.030		
Barium (Ba)...........	.000	.000		
Mercury (Hq)...........	<.0005	<.0005		
Lead (Pb)...........	.000	.000		
Lithium (Li)...........	.000	.000		
Cadmium (Cd)...........	.000	.000		
Cyanide (CN)...........	.00	.00		
Chloride (Cl)...........	3.6	13		
Manganese (Mn)...........	.285	.000		
Iron (Fe)...........	.207	.017		
Calcium (Ca)...........	-------	-------		
Magnesium (Mg)...........	-------	-------		
Sodium (Na)...........	-------	-------		
Potassium (K)...........	-------	-------		
Fluoride (F)...........	-------	-------		
Silica (SiO2)...........	-------	-------		
Bicarbonate (HCO3)...........	-------	-------		
Carbonate (CO3)...........	-------	-------		
Sulfate (SO4)...........	-------	-------		
Nitrate (NO3)...........	-------	-------		
Dissolved Solids...........	-------	-------		
Hardness as CaCO3:				
Total...........	-------	-------		
Noncarbonate...........	-------	-------		
Alkalinity as CaCO3...........	-------	-------		
Specific conductance (micromhos at 25° C)....	-------	-------		
pH...........	-------	-------		
Temperature...........	-------	-------		

a/ Source includes all lakes: Lakes Ross, McCrary, Bunch, and Lucas.

LIBERTY, RANDOLPH COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,250 in 1970 (720 metered customers, 30 of which are in suburban areas).

SOURCE:

Seven wells (Nos. 1-7).

Well No. 1 (Greensboro Street), Ra-31, located at: lat 35°51'25", long 79°34'18". Driller: Virginia Machine and Well Co. Date drilled: 1927. Total depth: 292 ft. Diam: 10 in. Cased to: 125 ft. Type of finish: open hole. Topography: hillside. Aquifer: tuff. Static water level: 20 ft. Yield: 80 gpm. Pumping level: undetermined. Type pump: turbine. Pump setting: 160 ft.

Well No. 2 (Swannanoa Street), Ra-30, located at lat 35°51'25", long 79°34'18". Driller: Virginia Machine and Well Co. Date drilled: 1926. Total depth: 231 ft. Diam: 8 in. Cased to: 135 ft. Type of finish: open hole. Topography: High flat. Aquifer: tuff. Static water level: 30 ft. Yield: 80 gpm. Pumping level: undetermined. Type pump: turbine. Pump setting: 150 ft.

Well No. 3 (Frazier Street), Ra-32, located at: lat 35°50'30", long 79°34'05". Driller: Virginia Machine and Well Co. Date drilled: 1943. Total depth: 221 ft. Diam: 8 in. Cased to: 150 ft. Type of finish: open hole. Topography: near top of small hill. Aquifer: tuff. Static water level: 20 ft. Yield: 80 gpm. Pumping level: undetermined. Type pump: turbine. Pump setting 162 ft.

Well No. 4 (Brookwood Avenue), Ra-29, located at: lat 35°51'44", long 79°34'32". Driller: R. E. Faw and Son. Date drilled: 1951. Total depth: 399 ft. Diam: 8 in. Cased to: 65 ft. Type of finish: open hole. Topography: near top of hill. Aquifer: tuff. Static water level: 20 ft. Yield: 80 gpm. Pumping level: undetermined. Type pump: turbine. Pump setting: 220 ft.

Well No. 5 (Fairview Avenue), Ra-33, located at 35°50'55", long 79°34'24". Driller: Sydnor Pump and Well Co. Date drilled: 1950. Total depth: 600 ft. Diam: 10-8-6 in. (telescoped). Cased to: unknown. Type of finish: open hole. Topography: near top of small hill. Aquifer: tuff. Static water level: 20 ft. Yield: 100 gpm. Pumping level: undetermined. Type of pump: turbine. Pump setting: 300 ft.

Well No. 6 (Ridge Avenue), Ra-159, located at: lat 35°50'30", long 79°33'49". Driller: Heater Well Co. Date drilled: 1968. Total depth: 248 ft. Diam: 8 in. Cased to: 53 ft. Type of finish: open hole. Topography: side of small rolling hill. Aquifer: tuff. Static water level: 6 ft. Yield: 60 gpm. Pumping level: 107 ft. Type of pump: turbine. Pump setting: 170 ft.

LIBERTY, RANDOLPH COUNTY

Well No. 7 (SR 2419), Ra-160, located at: lat 35°52'05", long 79°33'49". Driller: Heater Well Co. Date drilled: 1970. Total depth: 347 ft. Diam: 8 in. Cased to: 51.5 ft. Type of finish: open hole. Topography: near top of small rolling hill. Aquifer: tuff. Static water level: 16 ft. Yield: 113 gpm. Pumping level: 170 ft. Type pump: turbine. Pump setting: 300 ft.

TOTAL USE:

Average (1970) 0.34 mgd, metered; maximum daily (date not recorded), 0.37 million gallons.

INDUSTRIAL USE:

0.15 mgd, estimated. Principal users include Textured Fiberes, Liberty Hosiery Mills, Inc., and Liberty Chair Co.

TREATMENT:

None.

RATED CAPACITY OF TREATMENT PLANT:

None.

PUMPING CAPACITY:

0.86 mgd, approximately equal to combined yield of wells.

RAW-WATER STORAGE:

One elevated tank, 275,000 gallons.

FUTURE PLANS:

Plan to drill one well in 1971.

WATER RESOURCES APPRAISAL:

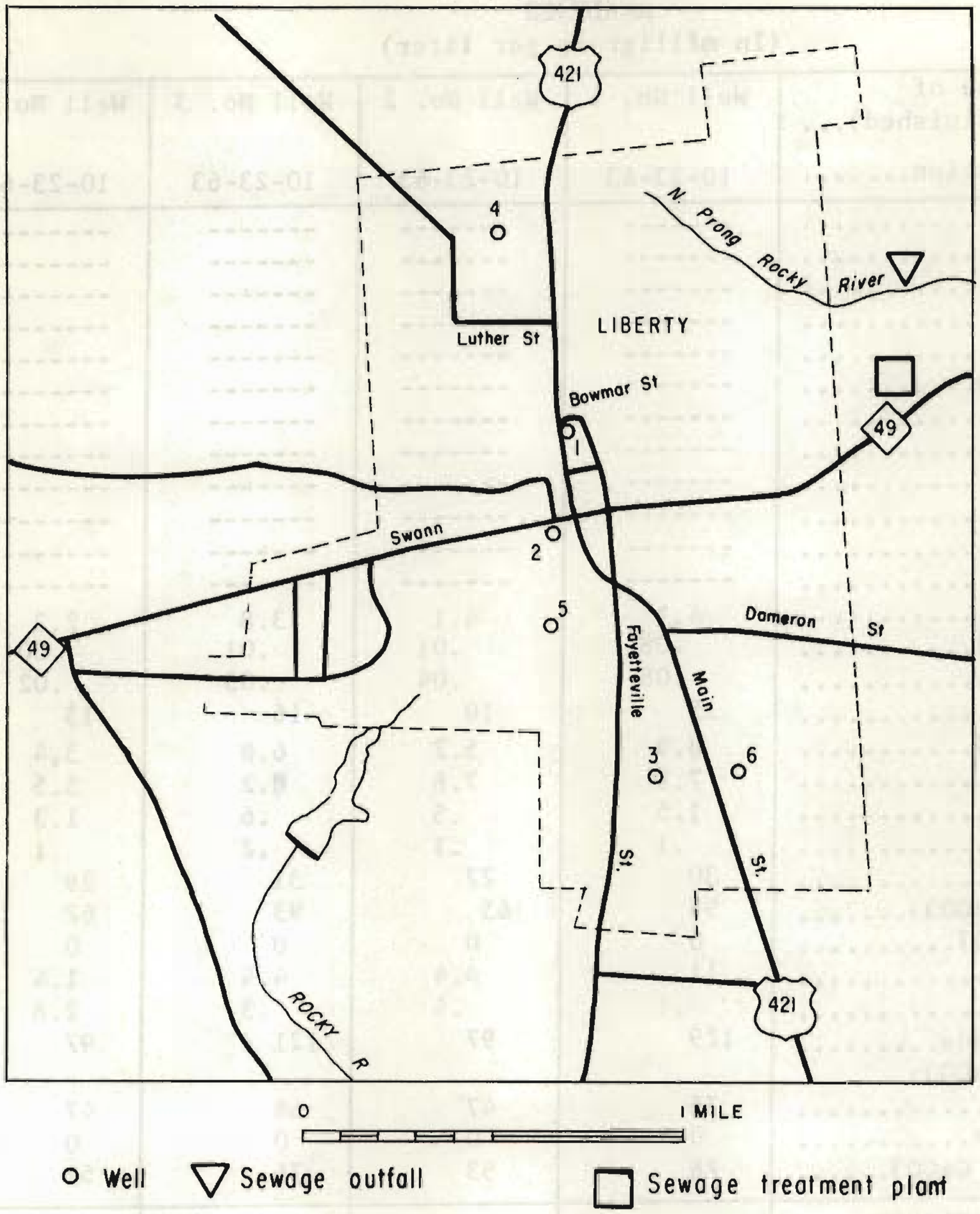
Surface water: Liberty is on the drainage divide between the Haw and Deep Rivers. Tributaries of these two rivers drain the immediate area. The low-flow yield of streams is small, in the range of 0.01 to 0.02 mgd per square mile. The average discharge of streams is 0.6 to 0.8 mgd per square mile, and the 7-day, 2-year low flow is 0.08 mgd per square mile. Sandy Creek, 3 miles to the west, appears to be the best surface-water source available if adequate storage is provided.

Ground water: Underlying the town of Liberty are crystalline volcanic rocks consisting mainly of tuff. These rocks apparently are well fractured and have pronounced bedding planes and joints as indicated by the number of relatively high-yielding wells that currently supply all water used by the town. Probably the most favorable geologic feature that influences the yield of wells is the thick mantle (about 100 feet) of weathered rock that overlies the hard rocks in the area. This mantle of weathered rock acts as a reservoir to store water in the ground, and a part of the water is drawn to wells under the influence of pumping.

LIBERTY, RANDOLPH COUNTY

The municipal water system was supplied by one well when put into service in 1926. Currently, seven wells including the original one are in use. These wells reportedly have yields ranging from 60 to 113 gpm and average 85 gpm. The total depths of the wells range from 221 feet to 600 feet, and the length of casing ranges from 65 feet to 150 feet. The casing-length range does not include well No. 5 which is cased to 600 feet partly with slotted casing. Static water levels in the wells reportedly stand 18 to 30 feet below land surface. The spacing of the existing wells is from 1,000 feet to 4,000 feet apart. Interference due to pumping has been noted between wells Nos. 2 and 5 which are 1,200 feet apart.

CITY OF LIBERTY



LIBERTY, RANDOLPH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 1	Well No. 2	Well No. 3	Well No. 4
Date of collection.......	10-23-63	10-23-63	10-23-63	10-23-63
Copper (Cu)..............	-------	-------	-------	-------
Cobalt (Co)..............	-------	-------	-------	-------
Zinc (Zn)................	-------	-------	-------	-------
Chromium (Cr)............	-------	-------	-------	-------
Boron (B)................	-------	-------	-------	-------
Strontium (Sr)...........	-------	-------	-------	-------
Barium (Ba)..............	-------	-------	-------	-------
Mercury (Hq).............	-------	-------	-------	-------
Lead (Pb)................	-------	-------	-------	-------
Lithium (Li).............	-------	-------	-------	-------
Cadmium (Cd).............	-------	-------	-------	-------
Cyanide (CN).............	-------	-------	-------	-------
Chloride (Cl)............	4.1	4.1	3.8	2.3
Manganese (Mn)...........	.08	.01	.01	.00
Iron (Fe)................	.08	.04	.05	.02
Calcium (Ca).............	15	10	16	13
Magnesium (Mg)...........	8.9	5.2	6.8	3.4
Sodium (Na)..............	7.8	7.8	8.2	5.5
Potassium (K)............	1.5	.5	.6	1.3
Fluoride (F).............	.1	.1	.2	.1
Silica (SiO2)............	30	27	31	29
Bicarbonate (HCO3).......	95	65	93	62
Carbonate (CO3)..........	0	0	0	0
Sulfate (SO4)............	11	4.4	4.4	1.4
Nitrate (NO3)............	.1	.4	.3	2.8
Dissolved Solids.........	129	97	121	97
Hardness as CaCO3:				
Total..................	75	47	68	47
Noncarbonate...........	0	0	0	0
Alkalinity as CaCO3......	78	53	76	51
Specific conductance (micromhos at 25° C)....	173	120	152	109
pH.......................	7.9	6.9	7.5	7.2
Temperature..............	-------	-------	17	-------

Note.--Additional analyses are on the next page.

LIBERTY, RANDOLPH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 5	Well No. 6		
Date of collection......	10-23-63	11-19-70		
Copper (Cu)............		0.005		
Cobalt (Co)............	-------	.000		
Zinc (Zn)...............	-------	.120		
Chromium (Cr)...........	-------	.000		
Boron (B)................	-------	.000		
Strontium (Sr)...........	-------	.030		
Barium (Ba)..............	-------	.000		
Mercury (Hq)............	-------	-------		
Lead (Pb)................	-------	.000		
Lithium (Li).............	-------	.000		
Cadmium (Cd)............	-------	.000		
Cyanide (CN)............	-------	.00		
Chloride (Cl)...........	0.9	2.2		
Manganese (Mn)..........	.00	.003		
Iron (Fe)...............	.07	.000		
Calcium (Ca)............	23	-------		
Magnesium (Mg)..........	5.4			
Sodium (Na).............	11			
Potassium (K)...........	1.6			
Fluoride (F)............	.2	-------		
Silica (SiO2)...........	24	-------		
Bicarbonate (HCO3).......	121	-------		
Carbonate (CO3)..........	0	-------		
Sulfate (SO4)............	2.8	-------		
Nitrate (NO3)............	.3			
Dissolved Solids.........	131	-------		
Hardness as CaCO3:				
Total..................	80			
Noncarbonate...........	0	-------		
Alkalinity as CaCO3......	99	-------		
Specific conductance (micromhos at 25°C)......	190	-------		
pH.......................	7.6	-------		
Temperature..............	17	16.5		

RAMSEUR, RANDOLPH COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,500 in 1970 (675 metered customers, 100 of which are in suburban areas).

SOURCE:

Sandy Creek impounded by a low dam: The intakes are 1/4 mile west of Ramseur at lat 35°44'24", long 79°40'42". Deep River used as an emergency source, but the water is of poor quality and difficult to treat.

RAW-WATER STORAGE:

Negligible. Dam on Sandy Creek forms a pool for pumping only.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.6 mgd without storage.

TOTAL USE:

Average (1970) 0.28 mgd, metered; maximum daily (date not recorded), 0.35 million gallons.

INDUSTRIAL USE:

0.19 mgd, estimated.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.50 mgd.

PUMPING CAPACITY:

Raw water, 1.4 mgd; finished water, 4.0 mgd.

FINISHED-WATER STORAGE:

One clear well, 100,000 gallons; two elevated tanks, 500,000 and 200,000 gallons.

FUTURE PLANS:

Fluoridation will be added to treatment process in near future. Possible sites and methods for providing raw-water storage are presently under investigation.

RAMSEUR, RANDOLPH COUNTY

WATER-RESOURCES APPRAISAL:

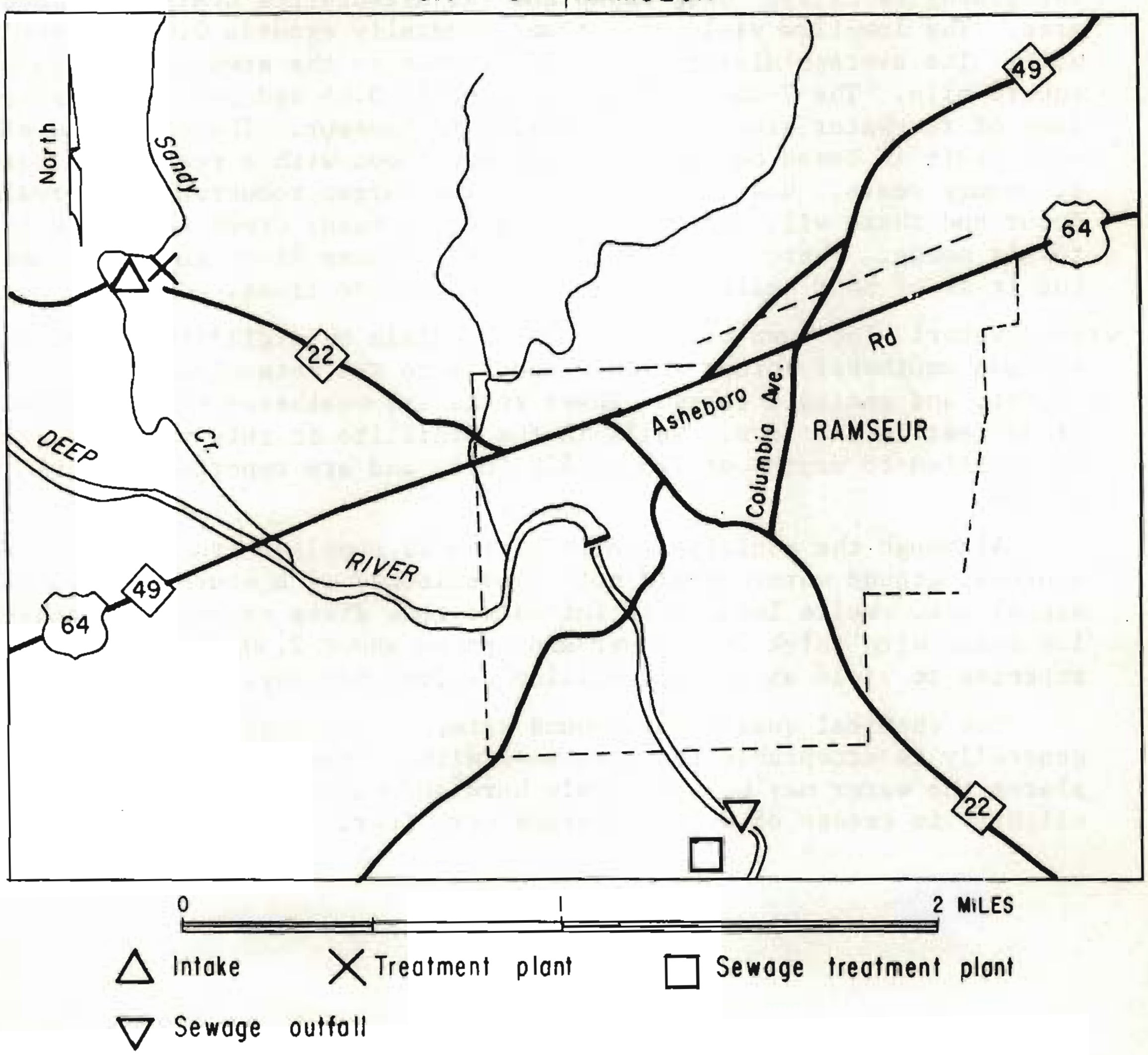
Surface water: Ramseur is in the eastern part of Randolph County where the topography is hilly. Deep River and its tributaries drain the immediate area. The low-flow yield of streams generally exceeds 0.01 mgd per square mile. The average discharge of all streams in the area is 0.8 mgd per square mile. The 7-day, 2-year low flow is 0.05 mgd per square mile. The lack of raw-water storage is a problem in Ramseur. The estimated allowable draft is based on average seven-day flows with a recurrence interval of twenty years. However, low-flows with larger recurrence intervals will occur and there will not be enough water in Sandy Creek to supply the town's needs. There is sufficient water in Deep River to supply the town but it is of poor quality and more difficult to treat.

Ground water: The town of Ramseur is underlain by argillite except in the extreme southwest corner which extends into the metavolcanic unit of tuff, schist, and gneissic rocks. These rocks are weathered to an average depth of 30 feet in the town. Wells in the argillite in this vicinity generally are drilled to depths of 120 to 150 feet, and are reported to yield up to 25 gpm.

Although the municipal water system is supplied from surface-water sources, ground water should not be overlooked as a source for supplemental use. Wells located in intrusive-rock dikes or in topographically low areas with thick soil cover and spaced about 2,500 feet apart may be expected to yield about 0.02 million gallons per day.

The chemical quality of ground water in the argillite at Ramseur generally is acceptable for most uses with no treatment. However, in some places the water may be moderately hard and may contain dissolved iron slightly in excess of 0.3 milligrams per liter.

CITY OF RAMSEUR



RAMSEUR, RANDOLPH COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Sandy Cr. Raw	Finished	Sandy Cr. Raw	Finished
Date of collection.......	3-30-66	3-30-66	12-8-70	12-8-70
Copper (Cu)...............	-------	-------	0.005	0.000
Cobalt (Co)...............	-------	-------	.000	.000
Zinc (Zn).................	-------	-------	.070	.100
Chromium (Cr)............	-------	-------	.000	.000
Boron (B).................	-------	-------	.026	.017
Strontium (Sr)...........	-------	-------	.055	.000
Barium (Ba)...............	-------	-------	.000	.000
Mercury (Hq)..............	-------	-------	<.0005	<.0005
Lead (Pb).................	-------	-------	.000	.000
Lithium (Li)..............	-------	-------	.000	.000
Cadmium (Cd)..............	-------	-------	.000	.000
Cyanide (CN)..............	-------	-------	.00	.00
Chloride (Cl).............	4.6	7.6	5.2	7.2
Manganese (Mn)............	.02	.02	.030	.015
Iron (Fe).................	.17	.00	.224	.117
Calcium (Ca)..............	6.1	7.4	-------	-------
Magnesium (Mg)............	2.2	2.4	-------	-------
Sodium (Na)...............	4.8	4.7	-------	-------
Potassium (K).............	.7	.6	-------	-------
Fluoride (F)..............	.0	.1	-------	-------
Silica (SiO2)............	17	16	-------	-------
Bicarbonate (HCO3).......	35	23	-------	-------
Carbonate (CO3)..........	0	0	-------	-------
Sulfate (SO4)............	4.0	9.8	-------	-------
Nitrate (NO3)............	.3	.2	-------	-------
Dissolved Solids.........	53	63	-------	-------
Hardness as CaCO3:				
Total..................	24	29	-------	-------
Noncarbonate...........	0	10	-------	-------
Alkalinity as CaCO3......	29	19	-------	-------
Specific conductance (micromhos at 25° C)....	72	89	-------	-------
pH.......................	6.9	6.8	-------	-------
Temperature..............	-------	15	5.5	7.5

RANDLEMAN, RANDOLPH COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,000 in 1970 (900 metered customers, 75-100 of which are in suburban areas).

SOURCE:

Polecat Creek impounded in Randleman City Lake: The intakes are approximately 1-1/2 miles east of Randleman at lat 35°48'56", long 79°46'37".

RAW-WATER STORAGE:

Randleman City Lake, 40 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.7 mgd with a storage of 40 million gallons.

TOTAL USE:

Average (1970), 0.29 mgd, metered; maximum daily (May 1967), 0.58 million gallons.

INDUSTRIAL USE:

0.15 mgd, estimated. Principal users include Laughlin Hosiery Mills, Inc., and J. P. Stevens and Company, Inc.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, and adjustment of pH with soda ash.

RATED CAPACITY OF TREATMENT PLANT:

0.50 mgd.

PUMPING CAPACITY:

Raw water, 0.65 mgd; finished water, 1.9 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 25,000 and 100,000 gallons; two elevated tanks 75,000 and 200,000 gallons.

FUTURE PLANS:

No plans for expansion of system as it is considered adequate. Modernization of plant is the only work anticipated at the present time.

RANDLEMAN, RANDOLPH COUNTY

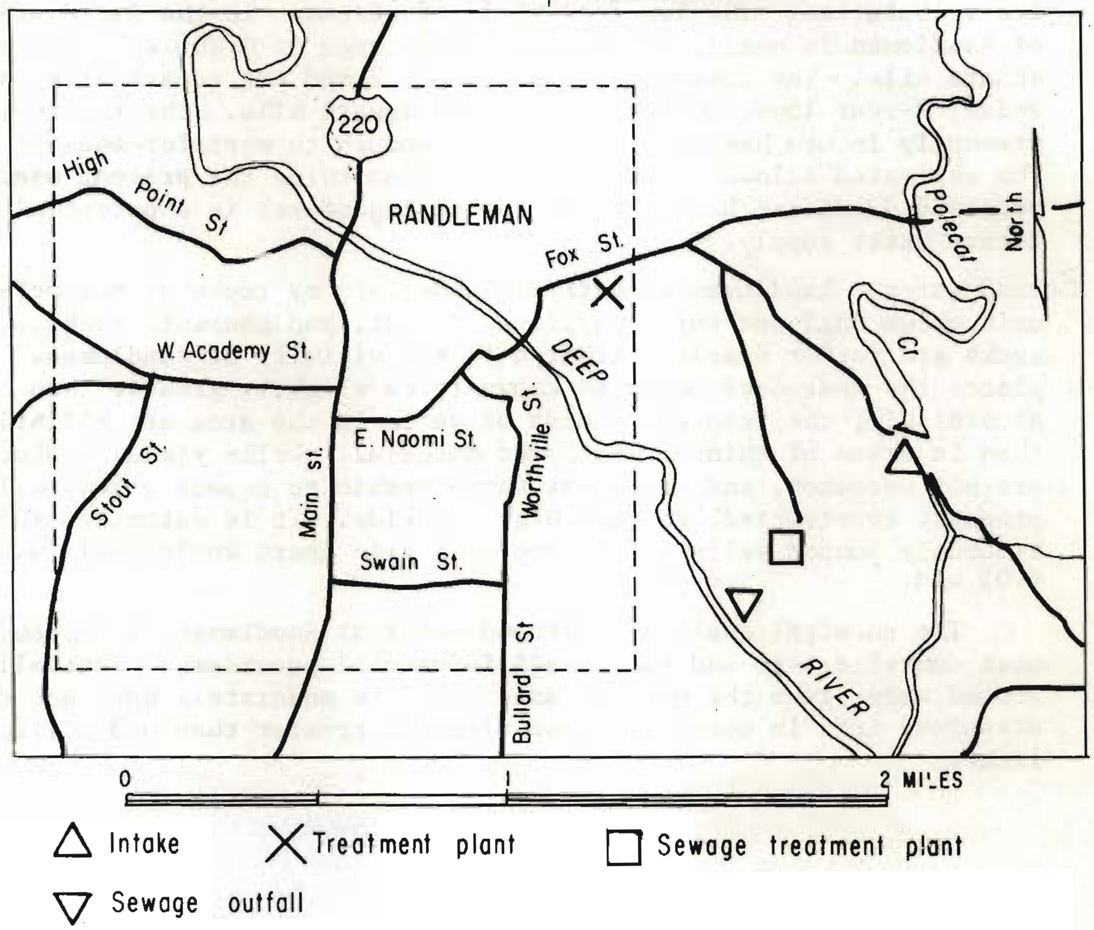
WATER-RESOURCES APPRAISAL:

Surface water: Randleman is in north-central Randolph County. The topography in the immediate area is hilly. The town is drained by Deep River and its tributaries. The low-flow yield of streams in the immediate vicinity of Randleman is small, generally in the range of 0.001 to 0.003 mgd per square mile. The average discharge is 0.7 mgd per square mile, and the 7-day, 2-year low-flow is 0.05 mgd per square mile. The reservoir presently in use has a capacity large enough to meet foreseeable needs. The estimated allowable draft is more than twice the present use. The proposed Randleman Reservoir (Corps of Engineers) is a potential source of future water supply.

Ground water: Randleman is entirely underlain by rocks of the metavolcanic unit which includes tuff, phyllite, schist, and gneissic rocks. These rocks are rather deeply weathered in the vicinity of Randleman. In some places the weathered depth is known to be slightly greater than 100 feet. Accordingly, the reported yields of wells in the area are slightly higher than in areas of thinner weathered material. Wells yielding about 20 gpm are not uncommon, and it is not unreasonable to expect a few wells, properly constructed, to have higher yields. It is estimated that continuously pumped wells spaced one-half mile apart would yield 0.02 to 0.03 mgd.

The chemical quality of ground water at Randleman is suitable for most domestic uses and some small industrial processes. Generally the ground water from the metavolcanic rocks is moderately hard and contains dissolved iron in concentrations slightly greater than 0.3 milligrams per liter.

CITY OF RANDLEMAN



RANDLEMAN, RANDOLPH COUNTY

ANALYSES

(In milligrams per liter)

Source, or type of water (raw;finished)...	Polecat Cr. Raw	Finished	Polecat Cr. Raw	Finished
Date of collection.............	10-23-63	10-23-63	1-6-71	1-6-71
Copper (Cu).................	-------	-------	0.040	0.015
Cobalt (Co).................	-------	-------	.000	.000
Zinc (Zn)...................	-------	-------	.042	.050
Chromium (Cr)...............	-------	-------	.000	.000
Boron (B)...................	-------	-------	.019	.024
Strontium (Sr)..............	-------	-------	.000	.030
Barium (Ba).................	-------	-------	.000	.000
Mercury (Hq)................	-------	-------	<.0005	<.0005
Lead (Pb)...................	-------	-------	.000	.000
Lithium (Li)................	-------	-------	.000	.000
Cadmium (Cd)................	-------	-------	.000	.000
Cyanide (CN)................	-------	-------	.00	.00
Chloride (Cl)...............	3.0	11	6.8	9.3
Manganese (Mn)..............	.00	.00	.005	.005
Iron (Fe)...................	.01	.01	.172	.017
Calcium (Ca)................	5.1	17		
Magnesium (Mg)..............	1.7	1.8		
Sodium (Na).................	3.5	3.5	-------	-------
Potassium (K)...............	2.1	2.1	-------	-------
Fluoride (F)................	.1	.0	-------	-------
Silica (SiO2)...............	9.9	8.9	-------	-------
Bicarbonate (HCO3)..........	25	38	-------	-------
Carbonate (CO3).............	0	0	-------	-------
Sulfate (SO4)...............	6.8	15	-------	-------
Nitrate (NO3)...............	.5	.2	-------	-------
Dissolved Solids............	55	93	-------	-------
Hardness as CaCO3:				
Total.......................	20	52	-------	-------
Noncarbonate................	0	21	-------	-------
Alkalinity as CaCO3.........	20	31	-------	-------
Specific conductance (micromhos at 25° C)....	61	130	-------	-------
pH..........................	6.9	7.6		
Temperature.................	15	-------	6	5.5

ROCKINGHAM COUNTY
WATER-RESOURCES APPRAISAL

Rockingham County is on the North Carolina-Virginia State line in the north-central part of the Piedmont Province. The topography is characterized by gentle to strongly rolling hills with broken and steep areas along the headwaters of streams. The Dan River and its tributaries drain the northern two-thirds of the county and the Haw River and its tributaries drain the southern and eastern part. The average discharge of streams in the county ranges from 0.6 to 0.9 mgd per square mile, and averages 0.8 mgd per square mile. Minimum flows are variable, ranging from 0.01 to 0.15 mgd per square mile and averaging 0.05 mgd per square mile. The 7-day, 2-year low-flow averages 0.15 mgd per square mile. Eden, Mayodan, Madison, and Reidsville obtain their water supply from surface sources. Dan River, Inc., obtains its water from Eden and supplies rural areas in the north-central part of the county. The county's population in 1970 was 72,402.

A wide variety of rocks underlie the county, with the most widespread rock unit being gneiss. A belt of Triassic age sediments (bedded sandstone, shale, clay, and cemented gravel) as much as 8,000 feet thick extends across the northwest corner of the county, and a small belt of schist underlies the southeast corner. Several small areas along the southern boundary and in the extreme northwest corner are underlain by granite. Dug wells in the gneiss as deep as 80 feet indicate that the gneiss is rather deeply weathered. The depth to water level ranges from 15 to 75 feet. The Triassic rocks are not deeply weathered and water is closer to the land surface.

Drilled wells are used for many domestic, industrial, and public ground-water supplies. The following table shows typical reported yields and average depth of drilled wells in the various rock units in the county:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Gneiss	38	7	130
Schist	25	16	95
Granite	3	2	160
Triassic	75	16	160

Available records indicate that the yield of wells in the Triassic is about twice as great as those in the gneiss. However, the difference in yield is probably not as great as the figures indicate since those in the gneiss are mainly domestic wells. Wells in the Triassic reportedly have a tendency toward decreasing yields with continuous pumping.

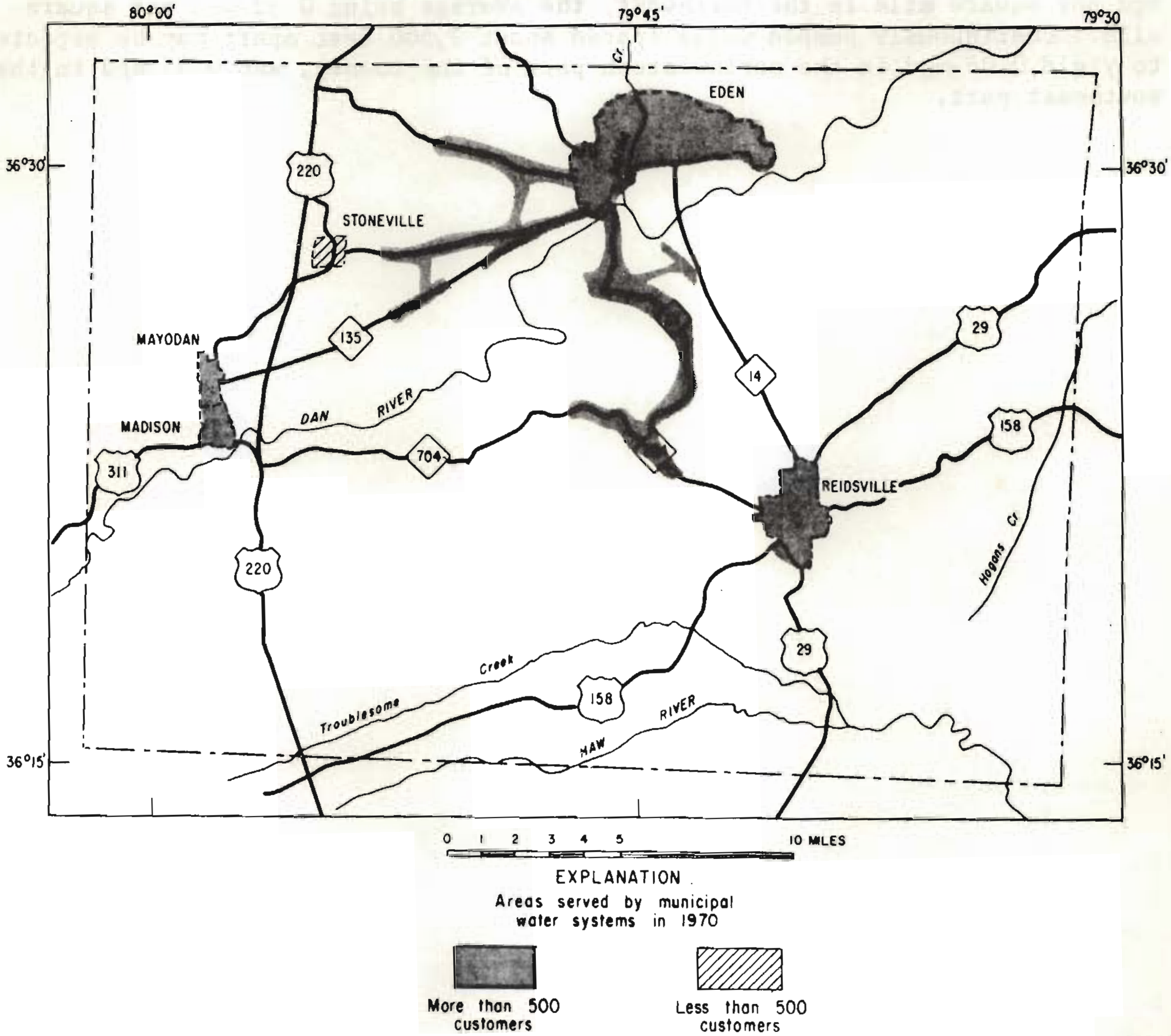
The chemical quality of ground water is acceptable for most uses; however, in some locations in each rock unit the concentrations of iron, manganese, and fluoride are higher than desirable. Water from some wells in the Triassic is very hard.

ROCKINGHAM COUNTY

WATER-RESOURCES APPRAISAL

Ground water will continue to be an important source of supply for rural users except in areas served by water district systems. Adequate ground-water supplies are available, with proper planning and management, for small industrial and municipal needs. The amount of ground water available is estimated to range from 0.26 mgd per square mile in the southeast corner to 0.38 mgd per square mile in the northwest, the average being 0.32 mgd per square mile. Continuously pumped wells spaced about 2,500 feet apart may be expected to yield 0.08 mgd in the northwestern part of the county, and 0.05 mgd in the southeast part.

ROCKINGHAM COUNTY



EDEN, ROCKINGHAM COUNTY

OWNERSHIP:

Municipal and Fieldcrest Mills, Inc. Total population supplied about 20,000 in 1970 (5,435 metered customers, 297 of which are in suburban areas). In addition, finished water is supplied to Dan River, Inc., which has 1,213 metered customers.

SOURCE:

Raw water for municipal treatment plant is taken from Dan River. The intake is approximately 1.0 mile upstream from the bridge on N. C. Highway 87 at lat 36°29'00", long 79°45'53". Raw water for the Fieldcrest Mills treatment plant is taken from Smith River approximately 0.1 mile downstream from the bridge on N. C. Highway 700 at lat 36°30'12", long 79°45'28".

RAW-WATER STORAGE:

Municipal plant; 9 million gallon storage reservoir. Fieldcrest Mills Plant; none.

ALLOWABLE DRAFT:

Estimated allowable draft of Smith River at the intake is 77 mgd and of Dan River at the intake is 116 mgd.

TOTAL USE:

Average (1968), 3.78 mgd, metered; maximum daily (6-18-70), 5.65 mgd.

INDUSTRIAL USE:

Not available.

TREATMENT:

Municipal plant: coagulation with alum and soda ash, sedimentation, rapid sand filtration, post chlorination, and fluoridation.

Fieldcrest Mill plant: prechlorination, coagulation with alum and soda ash, addition of carbon for control of taste and odor when necessary, rapid anthracite filtration, adjustment of pH with soda ash, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

Municipal, 2.0 mgd; Fieldcrest Mills, 4.0 mgd.

PUMPING CAPACITY:

Raw water: Municipal, 3.7 mgd; Fieldcrest Mills, 8.6 mgd. Finished water: Municipal, 2.5 mgd; Fieldcrest Mills, 10.1 mgd.

FINISHED-WATER STORAGE:

Finished-water storage (combined from both treatment plants) consists of: two clear wells, 150,000 and 500,000 gallons; four elevated tanks, 150,000, 500,000, 250,000, and 75,000 gallons; and one stand pipe, 100,000 gallons.

EDEN, ROCKINGHAM COUNTY

FUTURE PLANS:

General expansion of distribution system is first priority at present. Bond issue for expansion of system was defeated.

WATER RESOURCES APPRAISAL:

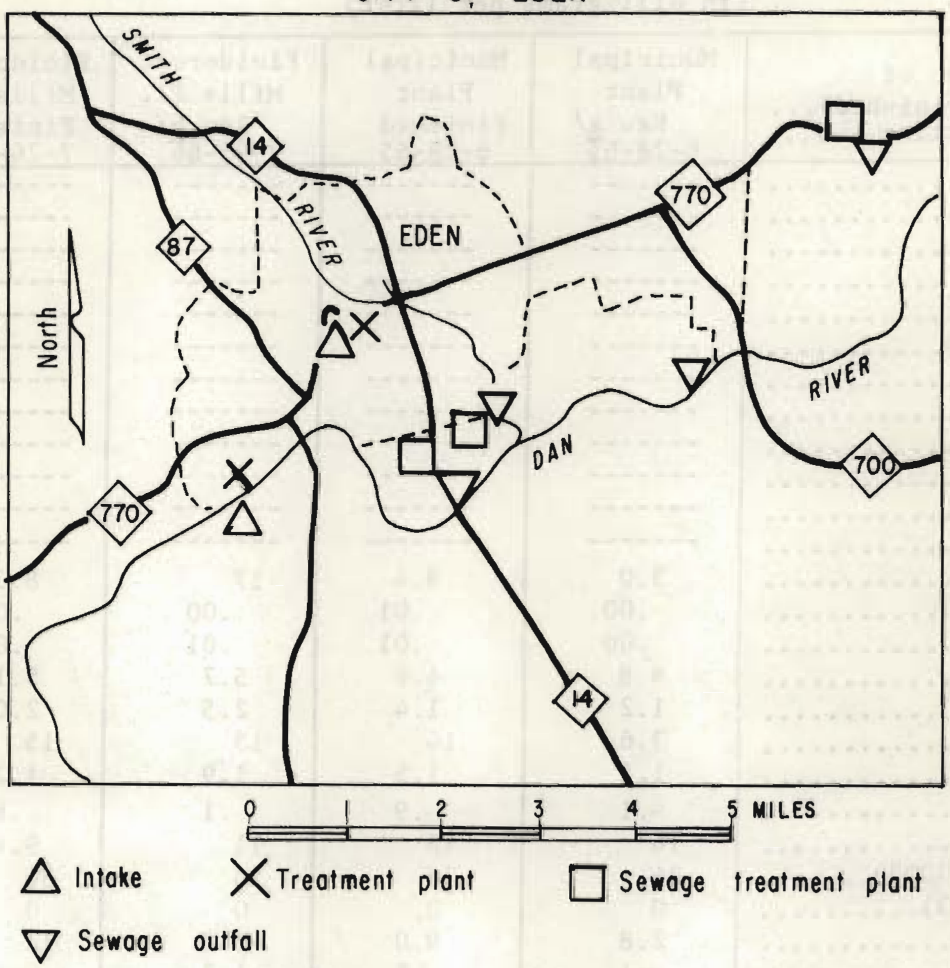
Surface Water: Eden is in the north-central part of Rockingham County. The Smith and Dan Rivers flow through town. The minimum flow of these two rivers is sufficient to meet the town's needs in the foreseeable future.

Ground water: The Town of Eden is underlain by beds of sedimentary rocks (sandstone, shale, mudstone, and conglomerate) of Triassic age. The Triassic rocks thin to a featheredge on the southeast side of the Dan River near the outskirts of Eden, and thicken to 7,000 to 8,000 feet at the fault that marks the edge of the Triassic belt near Eden's northwest boundary. Some wells dug in these soft rocks are as much as 80 feet deep. Most wells in the Triassic are drilled to depths of 70 to 150 feet, and are reported to yield as much as 50 gpm.

With the abundance of surface water available for municipal supply it is not likely that ground water will be used to supplement the municipal supply; however, ground water could be used for small industrial or supplemental supplies.

The chemical quality of ground water at Eden is suitable for most domestic use and some industrial processes, but the water may locally be very hard and contain iron concentrations slightly in excess of 0.3 milligrams per liter.

CITY OF EDEN


SMITH
RIVER
EDEN
DAN
RIVER
14
87
770
770
700
14
North
0
1
2
3
4
5 MILES
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

EDEN, ROCKINGHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)... Date of collection.......	Municipal Plant Raw a/ 6-28-65	Municipal Plant Finished 6-28-65	Fieldcrest Mills Pl. Raw b/ 7-26-66	Fieldcrest Mills Pl. Finished 7-26-66
Copper (Cu)..............	-------	-------	-------	-------
Cobalt (Co)..............	-------	-------	-------	-------
Zinc (Zn)................	-------	-------	-------	-------
Chromium (Cr)............	-------	-------	-------	-------
Boron (B)................	-------	-------	-------	-------
Strontium (Sr)...........	-------	-------	-------	-------
Barium (Ba)..............	-------	-------	-------	-------
Mercury (Hq).............	-------	-------	-------	-------
Lead (Pb)................	-------	-------	-------	-------
Lithium (Li).............	-------	-------	-------	-------
Cadmium (Cd).............	-------	-------	-------	-------
Cyanide (CN).............	-------	-------	-------	-------
Chloride (Cl)............	3.0	8.4	17	8.3
Manganese (Mn)...........	.00	.01	.00	.01
Iron (Fe)................	.00	.01	.01	.04
Calcium (Ca).............	4.8	4.6	5.7	5.1
Magnesium (Mg)...........	1.2	1.4	2.5	2.0
Sodium (Na)..............	3.6	14	15	15
Potassium (K)............	1.1	1.5	1.9	1.2
Fluoride (F).............	.1	.9	.1	.8
Silica (SiO2)............	16	15	11	9.4
Bicarbonate (HCO3).......	26	36	33	36
Carbonate (CO3)..........	0	0	0	0
Sulfate (SO4)............	2.8	9.0	6.2	12
Nitrate (NO3)............	.1	.2	1.2	.4
Dissolved Solids.........	46	73	78	72
Hardness as CaCO3:				
Total..................	18	18	25	22
Noncarbonate...........	0	0	0	0
Alkalinity as CaCO3......	21	30	27	30
Specific conductance (micromhos at 25° C)....	51	102	132	115
pH.......................	6.6	7.5	6.2	7.1
Temperature..............	22	24	22	21

a/ Dan River is source of water used in the Municipal Plant.

b/ Smith River is source of water used in Fieldcrest Mills Plant.

EDEN, ROCKINGHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished).. Date of collection.......	Municipal Plant Raw a/ 1-13-71	Municipal Plant Finished 1-13-71	Fieldcrest Mills Pl. Raw b/ 1-13-71	Fieldcrest Mills Pl. Finished 1-13-71
Copper (Cu)............	0.000	0.000	0.010	0.010
Cobalt (Co)............	.000	.000	.000	.000
Zinc (Zn)............	.194	.039	.063	.055
Chromium (Cr)............	.000	.000	.000	.000
Boron (B)............	.012	.108	.573	.029
Strontium (Sr)............	.030	.000	.000	.030
Barium (Ba)............	.000	.000	.000	.000
Mercury (Hg)............	<.0005	<.0005	<.0005	<.0005
Lead (Pb)............	.000	.000	.000	.000
Lithium (Li)............	.000	.000	.000	.000
Cadmium (Cd)............	.000	.000	.000	.000
Cyanide (CN)............	.00	.00	.00	.00
Chloride (Cl)............	4.4	6.4	9.0	9.7
Manganese (Mn)............	.000	.005	.020	.000
Iron (Fe)............	.052	.017	.069	.017
Calcium (Ca)............	-------	-------	-------	-------
Magnesium (Mg)............	-------	-------	-------	-------
Sodium (Na)............	-------	-------	-------	-------
Potassium (K)............	-------	-------	-------	-------
Fluoride (F)............	-------	-------	-------	-------
Silica (SiO2)............	-------	-------	-------	-------
Bicarbonate (HCO3)............	-------	-------	-------	-------
Carbonate (CO3)............	-------	-------	-------	-------
Sulfate (SO4)............	-------	-------	-------	-------
Nitrate (NO3)............	-------	-------	-------	-------
Dissolved Solids.........	-------	-------	-------	-------
Hardness as CaCO3:				
Total............	-------	-------	-------	-------
Noncarbonate............	-------	-------	-------	-------
Alkalinity as CaCO3......	-------	-------	-------	-------
Specific conductance (micromhos at 25° C)....	-------	-------	-------	-------
pH............	-------	-------	-------	-------
Temperature............	8.0	4.5	6.5	6.5

a/ Dan River is source of water used in the Municipal Plant.

b/ Smith River is source of water used in Fieldcrest Mills Plant.

MAYODAN AND MADISON, ROCKINGHAM COUNTY

OWNERSHIP

Washington Mills Company. Distribution systems are municipally-owned. Total population supplied about 5,700 in 1970 (1,850 metered customers, 75 of which are in suburban areas).

SOURCE:

Mayo River: There are two separate intakes; one is in a diversion canal and the other is on the river. Both intakes and treatment plant are on the grounds of Washington Mills Company in Mayodan.

RAW-WATER STORAGE:

Negligible.

ALLOWABLE DRAFT:

Estimated allowable draft is 46 mgd without storage.

TOTAL USE:

Average (1970) 1.0 mgd, estimated; maximum daily not available.

INDUSTRIAL USE:

0.5 mgd, estimated. Principal users include Washington Mills Company, Gem-Dandy, Inc., and Madison Throwing Company.

TREATMENT:

Prechlorination, coagulation with alum and soda ash, sedimentation, rapid sand filtration, adjustment of pH with soda ash, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

1.008 mgd.

PUMPING CAPACITY:

Raw water, 2.5 mgd, finished water, 1.2 mgd.

FINISHED-WATER STORAGE:

One clear well, 350,000 gallons at treatment plant. At Mayodan: one ground storage tank, 250,000 gallons. At Madison: one stand pipe, 200,000 gallons: one underground tank, 200,000 gallons.

FUTURE PLANS:

Washington Mill Company plans to abandon the raw water intake in the canal and pump only from the river. Madison has a 3.0 mgd treatment plant and a 500,000-gallon clear well under construction. Completion date November 1971.

MAYODAN AND MADISON, ROCKINGHAM COUNTY

WATER-RESOURCES APPRAISAL:

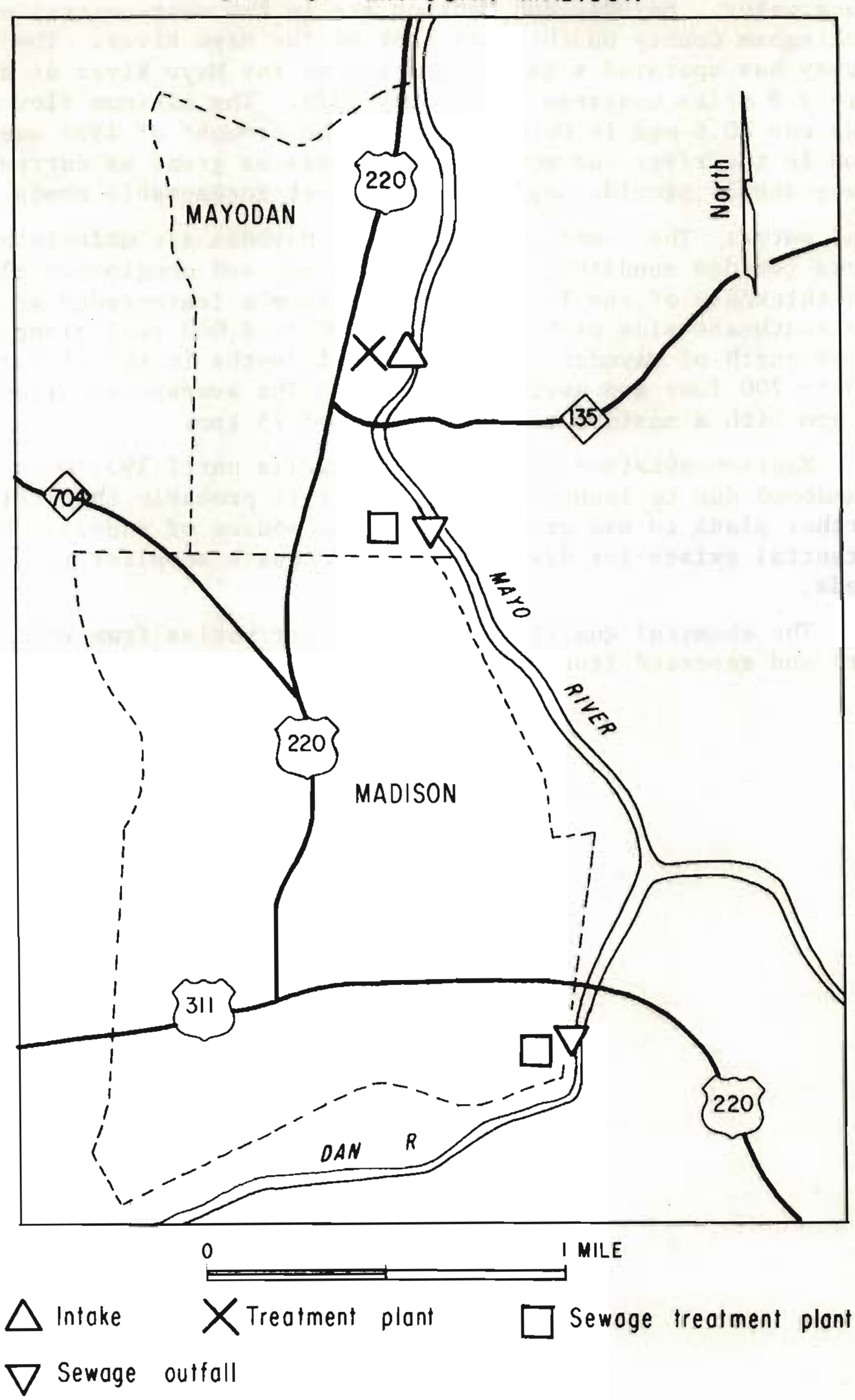
Surface water: Mayodan and Madison are in the west-central part of Rockingham County on the west bank of the Mayo River. The U. S. Geological Survey has operated a gaging station on the Mayo River at a site approximately 9 miles upstream since July 1929. The minimum flow recorded at this gage was 20.6 mgd in October 1954. The drought of 1954 was severe yet the flow in the river was more than 20 times as great as current use. The Mayo River should provide ample water to meet foreseeable needs.

Ground water: The towns of Madison and Mayodan are underlain by sedimentary rocks (bedded sandstone, shale, mudstone, and conglomerate) of Triassic age. The thickness of the Triassic ranges from a featheredge at the Dan River on the southeast side of Madison to 7,000 to 8,000 feet along a fault 3 to 5 miles north of Mayodan. Reported well depths in the vicinity range from 100 to 700 feet and average 160 feet. The average reported well yield is 15 gpm with a maximum reported yield of 75 gpm.

Madison obtained its water from wells until 1937 when they were abandoned due to inadequate yield. It is probable that neither town has further plans to use ground water as a source of supply. However, the potential exists for development of adequate supplies for small industrial needs.

The chemical quality of ground water varies from soft to extremely hard and reported iron concentrations range from 0.06 to 0.36 mg/l.

CITY OF MAYODAN-MADISON



MAYODAN AND MADISON, ROCKINGHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Mayo River Raw	Finished	Mayo River Raw	Finished
Date of collection........	7-26-66	7-26-66	1-13-71	1-31-71
Copper (Cu)............	-------	-------	0.000	0.000
Cobalt (Co)............	-------	-------	.000	.000
Zinc (Zn)............	-------	-------	.006	.040
Chromium (Cr)............	-------	-------	.000	.000
Boron (B)............	-------	-------	.009	.019
Strontium (Sr)............	-------	-------	.000	.000
Barium (Ba)............	-------	-------	.000	.000
Mercury (Hq)............	-------	-------	<.0005	<.0005
Lead (Pb)............	-------	-------	.000	.000
Lithium (Li)............	-------	-------	.000	.000
Cadmium (Cd)............	-------	-------	.000	.000
Cyanide (CN)............	-------	-------	.00	.00
Chloride (Cl)............	1.4	2.8	2.8	3.4
Manganese (Mn)............	.01	.00	.004	.008
Iron (Fe)............	.12	.01	.052	.014
Calcium (Ca)............	4.6	4.5	-------	-------
Magnesium (Mg)............	1.9	1.9	-------	-------
Sodium (Na)............	3.8	18	-------	-------
Potassium (K)............	1.2	1.3	-------	-------
Fluoride (F)............	.1	.1	-------	-------
Silica (SiO2)............	14	13	-------	-------
Bicarbonate (HCO3)............	30	48	-------	-------
Carbonate (CO3)............	0	0	-------	-------
Sulfate (SO4)............	2.2	16	-------	-------
Nitrate (NO3)............	.2	.2	-------	-------
Dissolved Solids............	45	82	-------	-------
Hardness as CaCO3:				
Total............	20	20	-------	-------
Noncarbonate............	0	0	-------	-------
Alkalinity as CaCO3............	25	39	-------	-------
Specific conductance (micromhos at 25° C)............	57	123	-------	-------
pH............	6.8	7.5	-------	-------
Temperature............	25	25	6.6	5.5

REIDSVILLE, ROCKINGHAM COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 15,000 in 1970 (4,600 metered customers, 50 of which are in suburban areas).

SOURCE:

Troublesome Creek. Flow in Troublesome Creek supplemented by water released from Lake Hunt, an impoundment on an upstream tributary. The intakes are about 3 miles southwest of Reidsville at lat 36°17'25", long 79°41'16".

RAW-WATER STORAGE:

Lake Hunt, 700 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft of Troublesome Creek is 2.7 mgd. Additional draft from Lake Hunt is estimated to be at least 2.2 mgd.

TOTAL USE:

Average (1970) 1.75 mgd, metered; maximum daily (8-12-68), 2.73 million gallons.

INDUSTRIAL USE:

0.8 mgd, estimated. Principal users include American Brands, Inc., Bush Brothers Platting, Inc., and Burlington Industries.

TREATMENT:

Prechlorination, coagulation with alum and soda ash, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, post chlorination,and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd.

PUMPING CAPACITY:

Raw water, 7.0 mgd; finished water, 7.2 mgd.

FINISHED-WATER STORAGE:

One clear well, 1,000,000 gallons; two elevated tanks, 500,000 and 175,000 gallons; one stand pipe, 800,000 gallons.

FUTURE PLANS:

A new raw-water reservoir with 2.6 billion gallons storage on Troublesome Creek is planned. Construction to begin in the fall of 1971 if bond referendum is approved by voters. Also, there are plans to increase the treatment plant capacity to 7.5 mgd.

REIDSVILLE, ROCKINGHAM COUNTY

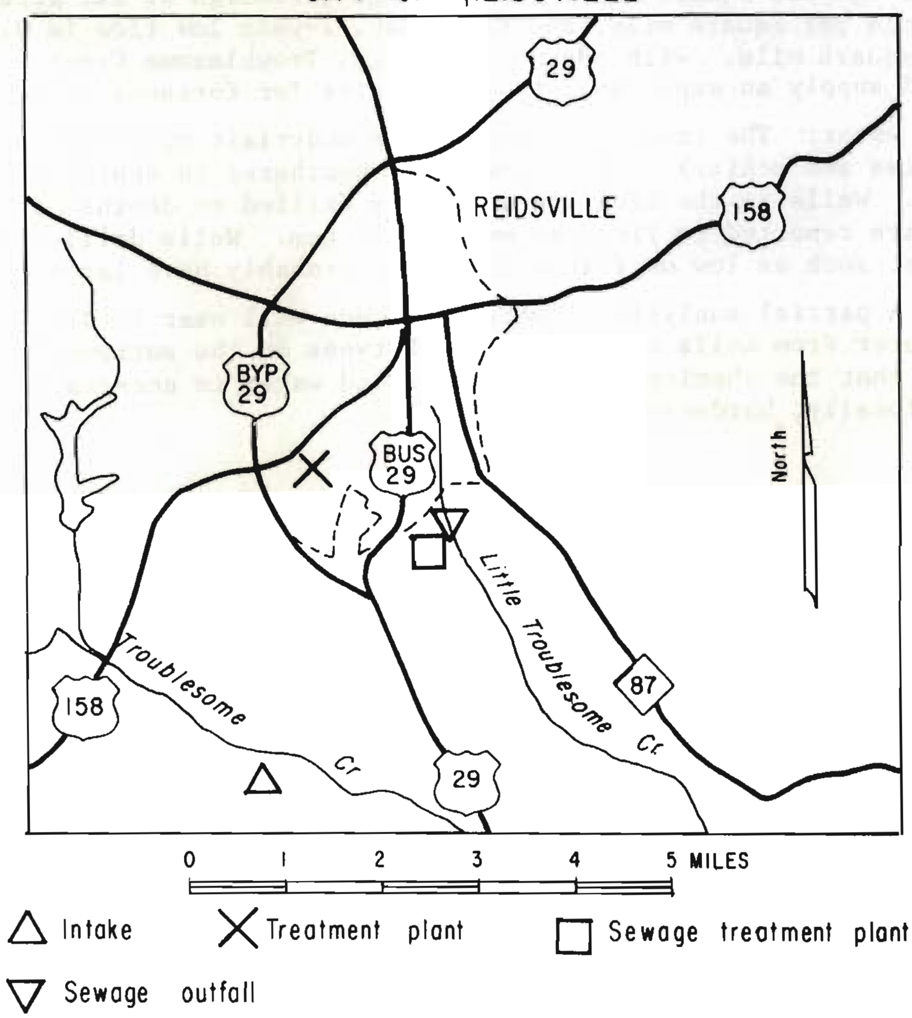
WATER-RESOURCES APPRAISAL:

Surface water: Reidsville is in the southeastern part of Rockingham County where the topography is characterized by moderately rolling hills. The south and west parts of Reidsville are drained by Little Troublesome and Troublesome Creeks of the Haw River basin and the north and east parts are drained by Wolf Island, Lick, and Jones Creeks of the Dan River basin. The low-flow yield of streams in the immediate vicinity of Reidsville is 0.025 mgd per square mile. The average discharge of all streams is 0.8 mgd per square mile, and the 7-day, 2-year low flow is 0.10 mgd per square mile. With adequate storage, Troublesome Creek would supply an ample amount of raw water for foreseeable needs.

Ground water: The town of Reidsville is underlain by metamorphic rocks (gneiss and schist). These rocks are weathered to depths of as much as 50 feet. Wells in the area are generally drilled to depths of 75 to 250 feet, and are reported to yield as much as 30 gpm. Wells drilled in favorable sites, such as low or flat areas would probably have larger yields.

A partial analysis of water from one well near Reidsville and analyses of water from wells in the same rock types in the surrounding area, indicate that the chemical quality of ground water is acceptable for most uses, but locally, hardness may be a problem.

CITY OF REIDSVILLE



REIDSVILLE, ROCKINGHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	a/ Raw	Finished	b/ Raw
Date of collection.......	11-9-61	11-9-61	11-9-61
Copper (Cu).............	-------	-------	-------
Cobalt (Co).............	-------	-------	-------
Zinc (Zn)................	-------	-------	-------
Chromium (Cr)...........	-------	-------	-------
Boron (B)................	-------	-------	-------
Strontium (Sr)...........	-------	-------	-------
Barium (Ba)..............	-------	-------	-------
Mercury (Hq).............	-------	-------	-------
Lead (Pb)................	-------	-------	-------
Lithium (Li).............	-------	-------	-------
Cadmium (Cd).............	-------	-------	-------
Cyanide (CN).............	-------	-------	-------
Chloride (Cl)............	7.5	8.1	2.2
Manganese (Mn)...........	.03	.00	.01
Iron (Fe)................	.04	.09	.01
Calcium (Ca).............	5.0	12	5.0
Magnesium (Mg)...........	2.1	2.2	1.5
Sodium (Na)..............	2.9	4.0	3.7
Potassium (K)............	2.9	3.1	2.4
Fluoride (F).............	.1	1.2	.1
Silica (SiO2)............	17	17	7.4
Bicarbonate (HCO3).......	24	32	32
Carbonate (CO3)..........	0	0	0
Sulfate (SO4)............	1.2	9.8	.6
Nitrate (NO3)............	.4	.2	.5
Dissolved Solids.........	54	80	41
Hardness as CaCO3:			
Total...................	22	40	19
Noncarbonate............	2	13	0
Alkalinity as CaCO3......	20	26	26
Specific conductance (micromhos at 25° C)....	72	113	66
pH.......................	6.7	7.1	6.9
Temperature..............	-------	-------	-------

a/ Source is Troublesome Creek.

b/ Sample collected from Lake Hunt on upstream tributary of Troublesome Creek.

REIDSVILLE, ROCKINGHAM COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	a/ Raw	Finished	
Date of collection.......	1-12-71	1-12-71	
Copper (Cu).............	0.050	0.000	
Cobalt (Co).............	.000	.000	
Zinc (Zn)...............	.080	.060	
Chromium (Cr)...........	.000	.000	
Boron (B)...............	.019	.056	
Strontium (Sr)..........	.000	.000	
Barium (Ba).............	.000	.000	
Mercury (Hq)............	<.0005	<.0005	
Lead (Pb)...............	.000	.000	
Lithium (Li)............	.000	.000	
Cadmium (Cd)............	.000	.000	
Cyanide (CN)............	.00	.00	
Chloride (Cl)...........	3.4	7.2	
Manganese (Mn)..........	.040	.005	
Iron (Fe)...............	.121	.028	
Calcium (Ca)............	-------	-------	
Magnesium (Mg)..........	-------	-------	
Sodium (Na).............	-------	-------	
Potassium (K)...........	-------	-------	
Fluoride (F)............	-------	-------	
Silica (SiO2)...........	-------	-------	
Bicarbonate (HCO3)......	-------	-------	
Carbonate (CO3).........	-------	-------	
Sulfate (SO4)...........	-------	-------	
Nitrate (NO3)...........	-------	-------	
Dissolved Solids........	-------	-------	
Hardness as CaCO3:			
Total.................	-------	-------	
Noncarbonate..........	-------	-------	
Alkalinity as CaCO3.....	-------	-------	
Specific conductance (micromhos at 25° C)....	-------	-------	
pH......................	-------	-------	
Temperature.............	5.0	5.0	

a/ Source is Troublesome Creek.

STOKES COUNTY

WATER-RESOURCES APPRAISAL

Stokes County is in northwestern North Carolina and lies wholly within the Piedmont Province. The topography is characterized by rolling, undulating hills with a mountainous area in the west-central part of the county. The Dan River flows diagonally across the county from the northwest corner and drains about 90 percent of the county. The southwest corner of the county is drained by the Little Yadkin River and its tributaries. Minimum flow of the Dan River generally exceeds 0.15 mgd per square mile while minimum flow of its tributaries in the county averages 0.05 mgd per square mile. Minimum flows of the Little Yadkin River and its tributaries are in the range of 0.02 to 0.1 mgd per square mile. The average discharge of all streams is 0.8 mgd per square mile, and the 7-day, 2-year low flow ranges from 0.1 to 0.4 mgd per square mile and averages 0.2 mgd per square mile. King District Water Systems, Inc., obtains its water from the Yadkin River. Other municipal and most industrial and domestic supplies are obtained from springs or ground-water sources. The county's population in 1970 was 23,782.

A wide variety of rocks underlie the county, but they may be grouped into three major units: granite-gneiss, quartzite and schist, and bedded sediments of Triassic age. The granite-gneiss crops out in nearly all parts of the county and occupies about half of the total area. Included in this unit are several bodies of granite especially along the north edge of the county. The quartzite and schist underlie a belt in the central part, and the Triassic sediments extend across the southeast corner. The depth of weathering ranges from a few inches to about 100 feet. The reported yields of wells are low (20 gpm or less) except for public supply wells at the Town of Walnut Cove, where wells reportedly yield as much as 150 gpm. Available well-yield records are almost all on wells used for domestic supplies. Generally, domestic wells are located near the point of use instead of locations where conditions are favorable for high yields, and the reported yields often reflect the pump capacity rather than the available yield. However, in adjacent Surry County several wells in the granite-gneiss are reported to yield from 100 to 250 gpm, and one well in the quartzite and schist is reported to yield 200 gpm. A yield of 125 gpm was reported from a well in the gneiss unit at the Town of Rural Hall in Forsyth County. That similar yields might be obtained from wells tapping these units in Stokes County seems reasonable. The following table shows typical reported yields and average depths of drilled wells in the county.

STOKES COUNTY

WATER-RESOURCES APPRAISAL

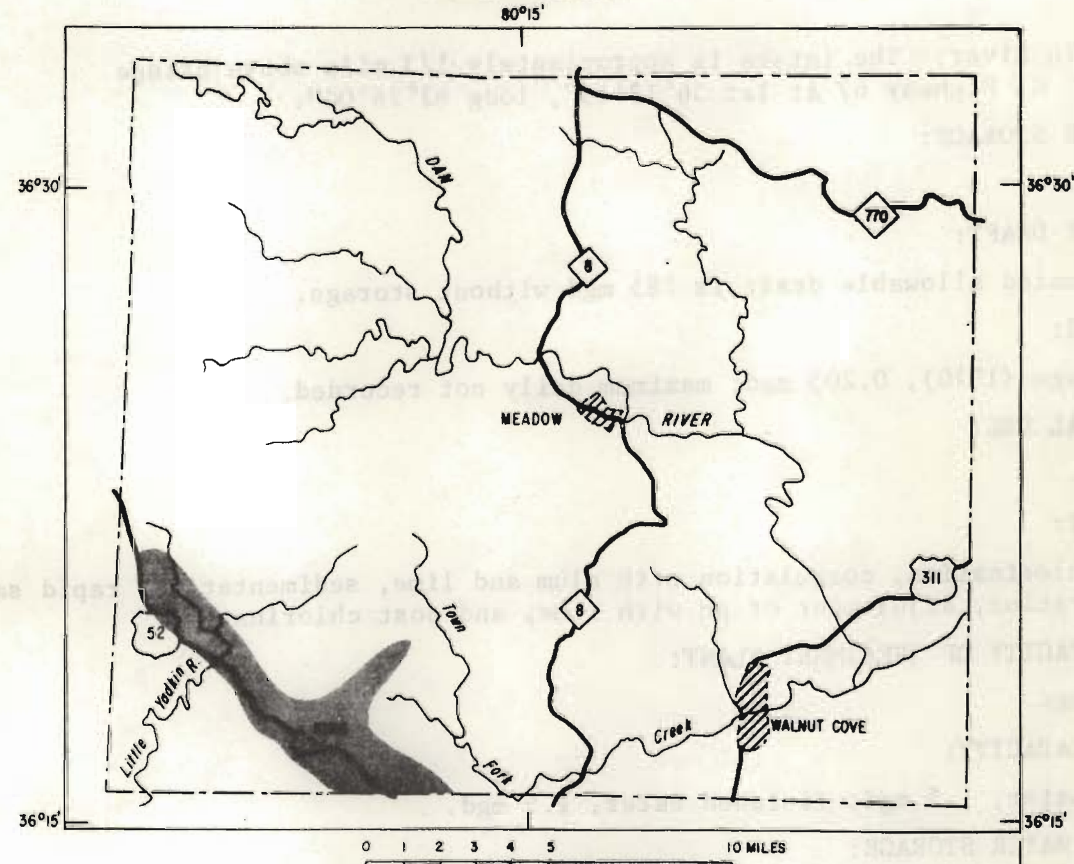
Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Granite-gneiss	20	5	112
Quartzite-schist	20	5	126
Granite	10	4	104
Triassic	150	25	210

Ground water is used as a source of supply for the towns of Danbury, and Walnut Cove, a few small industries, and the majority of rural domestic users.

The chemical quality of ground water is acceptable for most uses, although in some parts of each rock unit concentrations of iron and hardness-causing constituents are higher than desired.

Ground water will continue to be the main source of supply for rural users except in areas served by water districts. Adequate ground-water supplies may be developed, with proper planning and management for small industrial and small municipal needs. Higher yields are to be expected in the more favorable areas such as topographic lows or low flat areas where weathered rock is thicker. It is estimated that in these areas 0.5 mgd per square mile of ground water is available in the northwest part and 0.3 mgd per square mile is available in the southeast part. Continuously pumped wells spaced 2,500 feet apart would probably yield 0.1 mgd in the northwest and 0.06 mgd in the southeast.

STOKES COUNTY



EXPLANATION
Areas served by municipal water systems in 1970

More than 500 customers

Less than 500 customers

02-1145

KING DISTRICT WATER SYSTEMS, INC., STOKES COUNTY

OWNERSHIP:

King District Water Systems, Inc. Supplies King, Tobaccoville, Pinnacle, and a portion of rural Stokes County. Total population supplied, about 6,300 in 1970 (1,800 metered customers).

SOURCE:

Yadkin River: The intake is approximately 1/3 mile above bridge on N. C. Highway 67 at lat 36°13'15", long 82°26'00".

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft is 285 mgd without storage.

TOTAL USE:

Average (1970), 0.205 mgd; maximum daily not recorded.

INDUSTRIAL USE:

None.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, adjustment of pH with lime, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

1.5 mgd.

PUMPING CAPACITY:

Raw water, 1.5 mgd; finished water, 1.5 mgd.

FINISHED-WATER STORAGE:

One clear well, 150,000 gallons; one elevated tank, 250,000 gallons; two stand pipes, 500,000 and 150,000 gallons.

FUTURE PLANS:

Plant is new and considered adequate to meet foreseeable needs. Distribution system will be expanded as necessary.

KING DISTRICT WATER SYSTEMS, INC., STOKES COUNTY

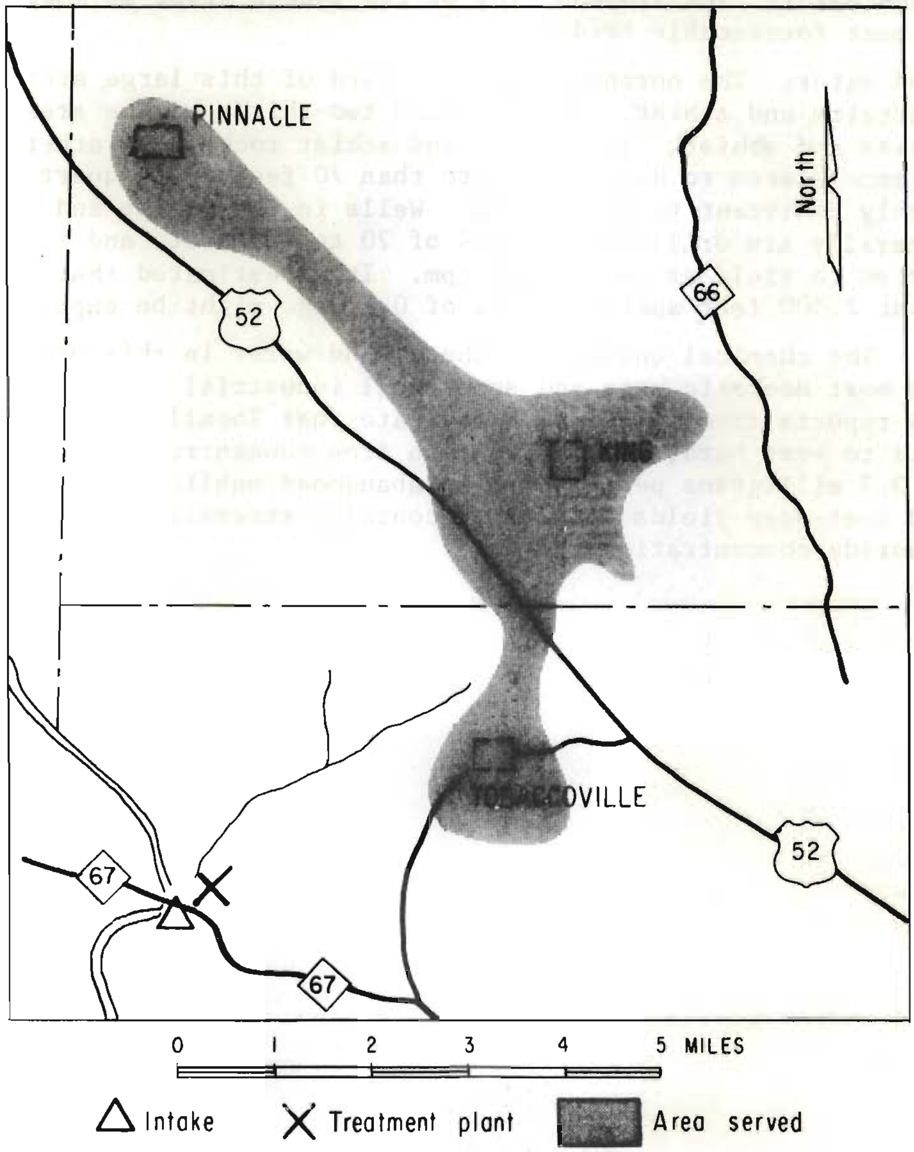
WATER-RESOURCES APPRAISAL:

Surface water: The minimum flow of the Yadkin River is more than adequate to meet foreseeable needs.

Ground water: The northwestern one-third of this large area is underlain by quartzite and schist. The southern two-thirds of the area is underlain by gneiss and schist. The gneiss and schist rocks are rather deeply weathered, in some places to depths of more than 70 feet. The quartzite rock is highly resistant to weathering. Wells in the gneiss and schist generally are drilled to depths of 70 to 180 feet, and are reported to yield as much as 20 gpm. It is estimated that with wells spaced about 2,500 feet apart, yields of 0.07 mgd might be expected.

The chemical quality of the ground water in this vicinity is suitable for most domestic uses and some small industrial processes. A few analyses and reports from well owners indicate that locally water may be moderately hard to very hard, and may contain iron concentrations slightly in excess of 0.3 milligrams per liter. An abandoned public supply well at King, 330 feet deep yields water that contains excessive iron, manganese, and fluoride concentrations.

KING DISTRICT WATER SYSTEMS INC.



KING DISTRICT WATER SYSTEMS, INC., STOKES COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)...	Yadkin R. Raw	Finished	Yadkin R. Raw	Finished
Date of collection......	1-26-71	1-26-71	1-26-72	1-26-72
Copper (Cu).............	0.002	0.000	-------	-------
Cobalt (Co).............	.000	.000	-------	-------
Zinc (Zn)...............	.020	.070	-------	-------
Chromium (Cr)...........	.000	.000	-------	-------
Boron (B)...............	.020	.012	-------	-------
Strontium (Sr)..........	.000	.000	-------	-------
Barium (Ba).............	.000	.000	-------	-------
Mercury (Hg)............	<.0005	<.0005	-------	-------
Lead (Pb)...............	.000	.000	-------	-------
Lithium (Li)............	.000	.000	-------	-------
Cadmium (Cd)............	.000	.000	-------	-------
Cyanide (CN)............	.00	.00	-------	-------
Chloride (Cl)...........	3.5	5.9	4.1	5.5
Manganese (Mn)..........	.005	.005	.000	.024
Iron (Fe)...............	.052	.000	.000	.279
Calcium (Ca)............	-------	-------	3.1	7.7
Magnesium (Mg)..........	-------	-------	1.1	1.1
Sodium (Na).............	-------	-------	3.8	3.0
Potassium (K)...........	-------	-------	1.1	1.1
Fluoride (F)............	-------	-------	.0	0.1
Silica (SiO2)...........	-------	-------	9.7	9.6
Bicarbonate (HCO3)......	-------	-------	17	21
Carbonate (CO3).........	-------	-------	0	0
Sulfate (SO4)...........	-------	-------	1.6	6.2
Nitrate (NO3)...........	-------	-------	0.2	0.4
Dissolved Solids........	-------	-------	40	57
Hardness as CaCO3:				
Total.................	-------	-------	12	24
Noncarbonate..........	-------	-------	0	7
Alkalinity as CaCO3.....	-------	-------	14	17
Specific conductance (micromhos at 25° C).....	-------	-------	50	72
pH......................	-------	-------	6.5	7.5
Temperature.............	-------	-------	-------	-------

SURRY COUNTY

WATER-RESOURCES APPRAISAL

Surry County is adjacent to the North Carolina-Virginia State line in the northwestern part of the State. About 85 percent of the county is in the Piedmont Province and the remainder is mountainous. Stream slopes are steep and drainage is good. The Yadkin River and its tributaries drain the county. The average discharge of streams ranges from 0.7 to 1.1 mgd per square mile. Minimum flows range from 0.2 mgd per square mile in the western part of the county to 0.09 in the southeastern corner. The 7-day, 2-year low flow varies from 0.2 to 0.4 mgd per square mile. Mount Airy, Elkin, Dobson, and Pilot Mountain obtain their municipal supplies from surface sources. Other municipal and most domestic and industrial supplies are obtained from ground-water sources. The county's population in 1970 was 51,415.

A large variety of rocks underlie the county, but they may be grouped into five major units that form northeast-southwest trending belts. In the extreme northwest corner is a belt of granite-gneiss-schist adjacent to a large belt of schist that extends to the center of the county. The southeast is underlain by granite and gneiss, and a belt of quartzite and schist. A large area of relatively pure granite crops out in the vicinity of Mt. Airy. The upper layer of weathered rock present in all rock units ranges from a few inches to more than 100 feet thick in Surry County. Yields of as much as 400 gpm have been reported from wells in the schist unit and 250 gpm from wells in the granite-gneiss unit. The following table indicates the range in reported yields and the average depths of drilled wells in various rocks in the county:

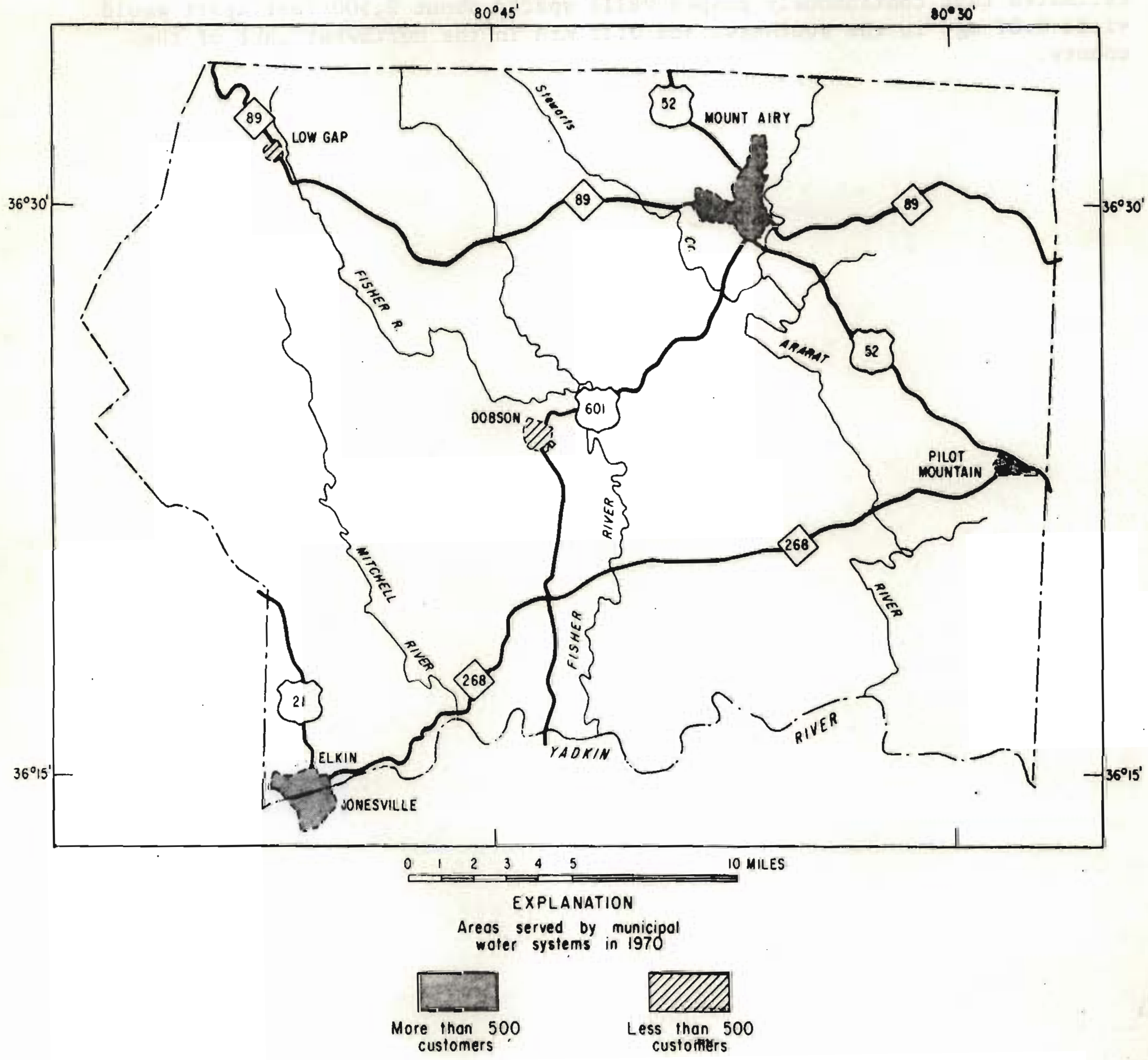
Rock unit	Range in yield (gpm)	Average depth (feet)
Granite	3-30	140
Schist	0-400	190
Granite-gneiss	2-250	200
Quartzite-schist	3-200	220
Granite-gneiss-schist	2-40	140

Wells are not used as a source of public water supply except for supplementary or emergency use at Pilot Mountain, but most rural domestic and small industrial users rely entirely on ground water for their supplies.

The chemical quality of ground water in Surry County is acceptable for most uses; however, iron concentrations in the water from some wells are higher than desirable and the water from some wells is slightly hard.

Ground water will continue to be an important source of supply for rural users. The potential ground-water supply is also adequate, with proper planning and management, for small industrial and municipal needs. Where higher yielding wells are needed, the most favorable sites are where the weathered rock is thickest, such as topographic low or flat areas. It is estimated that where favorable sites are selected, the amount of ground water available ranges from 0.37 mgd per square mile in the southeastern part of the county to about 0.65 mgd per square mile in the northwestern part. It is also estimated that continuously pumped wells spaced about 2,500 feet apart would yield 0.07 mgd in the southeast and 0.13 mgd in the northwest part of the county.

SURRY COUNTY



ELKIN, SURRY COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,000 in 1970 (1,350 metered customers, 250 of which are in suburban areas).

SOURCE:

Elkin River: The intakes are approximately 3/4 mile northwest of Elkin at lat 36° 15'18", long 80° 51'54". Water is pumped to a storage lake and flows by gravity to the treatment plant.

RAW-WATER STORAGE:

62 million gallons in the storage lake.

ALLOWABLE DRAFT:

Estimated allowable draft is 13.5 mgd with a storage of 62 million gallons.

TOTAL USE:

Average (1970), 0.63 mgd, metered; maximum daily (7-2-70), 1.27 million gallons.

INDUSTRIAL USE:

0.15 mgd, estimated. Principal users include Chatham Manufacturing Company, Vaughn-Bassett Furniture Company, and the Salem Company.

TREATMENT:

Prechlorination, coagulation with alum and soda ash, sedimentation, addition of carbon for control of taste and odor when necessary, rapid sand filtration, adjustment of pH with soda ash, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd.

PUMPING CAPACITY:

Raw water, 6.0 mgd; finished water, 6.8 mgd.

FINISHED-WATER STORAGE:

One clear well, 1,000,000 gallons; two elevated tanks, 300,000 and 125,000 gallons: one stand pipe, 1,000,000 gallons.

FUTURE PLANS:

None. Treatment plant completed in November 1969 and should be adequate for the foreseeable needs.

ELKIN, SURRY COUNTY

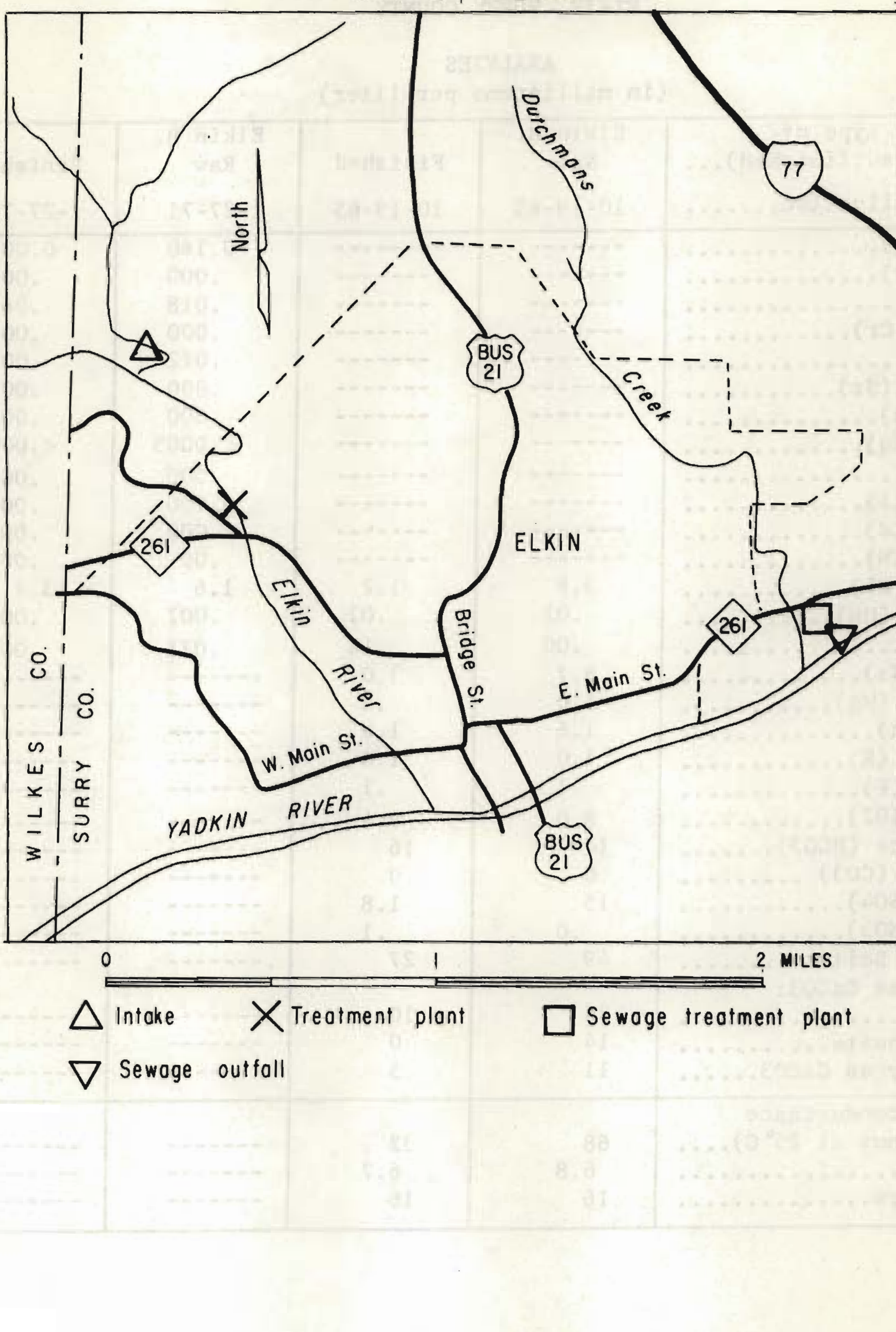
WATER-RESOURCES APPRAISAL:

Surface water: Elkin is in the southwest corner of Surry County. The Elkin and Yadkin Rivers flow through the town limits. The low-flow yield of these rivers generally exceeds 0.2 mgd per square mile. The average discharge is 1.1 mgd per square mile and the 7-day, 2-year low flow is 0.4 mgd per square mile. There is an abundance of surface water available for water supply, the only limitation being treatment capacity.

Ground water: The Town of Elkin is underlain by a complex rock unit composed mainly of granitic gneiss and granite. The weathered zone in these rocks averages about 70 feet in thickness. Wells in the granite-gneiss in this vicinity range greatly in depth and yield. The depths range from 50 feet to nearly 500 feet, and the yields range from 20 gpm to 100 gpm. These ranges probably indicate that the weathered zone changes greatly in thickness from one place to another, and that the deeper unweathered rock may not be highly fractured.

The chemical quality of ground water at Elkin is acceptable for most uses without treatment, but may contain dissolved iron or manganese in excess of recommended limits.

CITY OF ELKIN



ELKIN, SURRY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Elkin R. Raw	Finished	Elkin R. Raw	Finished
Date of collection.......	10-19-65	10-19-65	1-27-71	1-27-71
Copper (Cu).............	-------	-------	0.160	0.000
Cobalt (Co).............	-------	-------	.000	.000
Zinc (Zn)...............	-------	-------	.018	.066
Chromium (Cr)...........	-------	-------	.000	.000
Boron (B)...............	-------	-------	.022	.003
Strontium (Sr)..........	-------	-------	.000	.000
Barium (Ba).............	-------	-------	.000	.000
Mercury (Hq)............	-------	-------	$<.0005$	$<.0005$
Lead (Pb)...............	-------	-------	.000	.000
Lithium (Li)............	-------	-------	.000	.000
Cadmium (Cd)............	-------	-------	.000	.000
Cyanide (CN)............	-------	-------	.00	.00
Chloride (Cl)...........	3.8	1.2	1.6	3.4
Manganese (Mn)..........	.02	.01	.007	.003
Iron (Fe)...............	.00	.16	.021	.000
Calcium (Ca)............	8.7	3.0	-------	-------
Magnesium (Mg)..........	1.0	.5	-------	-------
Sodium (Na).............	1.6	1.9	-------	-------
Potassium (K)...........	1.0	1.0	-------	-------
Fluoride (F)............	.1	.1	-------	-------
Silica (SiO2)...........	8.0	9.4	-------	-------
Bicarbonate (HCO3).......	14	16	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)...........	15	1.8	-------	-------
Nitrate (NO3)...........	.0	.1	-------	-------
Dissolved Solids.........	49	27	-------	-------
Hardness as CaCO3:				
Total..................	26	10	-------	-------
Noncarbonate..........	14	0	-------	-------
Alkalinity as CaCO3......	11	5	-------	-------
Specific conductance (micromhos at 25° C)....	68	32	-------	-------
pH......................	6.8	6.7	-------	-------
Temperature.............	16	16	-------	-------

MOUNT AIRY, SURRY COUNTY

OWNERSHIP:

Municipal. Total population supplied about 7,000 in 1970 (2,400 metered customers, 50 of which are in suburban areas).

SOURCE:

Lovills Creek and Stewarts Creek. The Lovills Creek intake supplies the old water plant and is inside the city limits of Mount Airy at lat 36°31'28", long 80°36'59". The Stewarts Creek intake supplies the new water plant and is about 1/2 mile west of Mount Airy at lat 36°29'36", long 80°39'10".

RAW-WATER STORAGE:

Water pumped from Lovills Creek is impounded in a 8 million gallon reservoir.

Water pumped from Stewarts Creek is impounded in a 25 million gallon reservoir.

ALLOWABLE DRAFT:

Estimated combined allowable draft is 18.0 mgd with a storage of 33 million gallons.

TOTAL USE:

Average (1970), 2.73 mgd, metered; maximum daily (6-19-70), 3.7 million gallons.

INDUSTRIAL USE:

2.0 mgd, estimated. Principal users include Proctor-Silex, Inc., Quality Mills, Pine State Knitwear Company, Renfro Hosiery Mills Company, Inc., Oakdale Knitting Company, and Spencer's Inc. of Mount Airy, N. C.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

Old plant, 2.5 mgd; new plant, 6.0 mgd.

PUMPING CAPACITY:

Raw water: old plant, 5.0 mgd; new plant, 6.0 mgd.

Finished water: old plant, 5.5 mgd; new plant, 8.0 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 165,000 and 500,000 gallons; two elevated tanks, 150,000 and 500,000 gallons; one stand pipe, 200,000 gallons.

MOUNT AIRY, SURRY COUNTY

FUTURE PLANS:

Soil Conservation Service, U. S. Department of Agriculture is constructing a flood-control dam on Stewarts Creek above the Mount Airy intake. Storage of 300 million gallons in this reservoir is reserved for Mount Airy water supply. The city plans to erect an elevated tank with a storage of 150,000 - 200,000 gallons if annexation plans are approved.

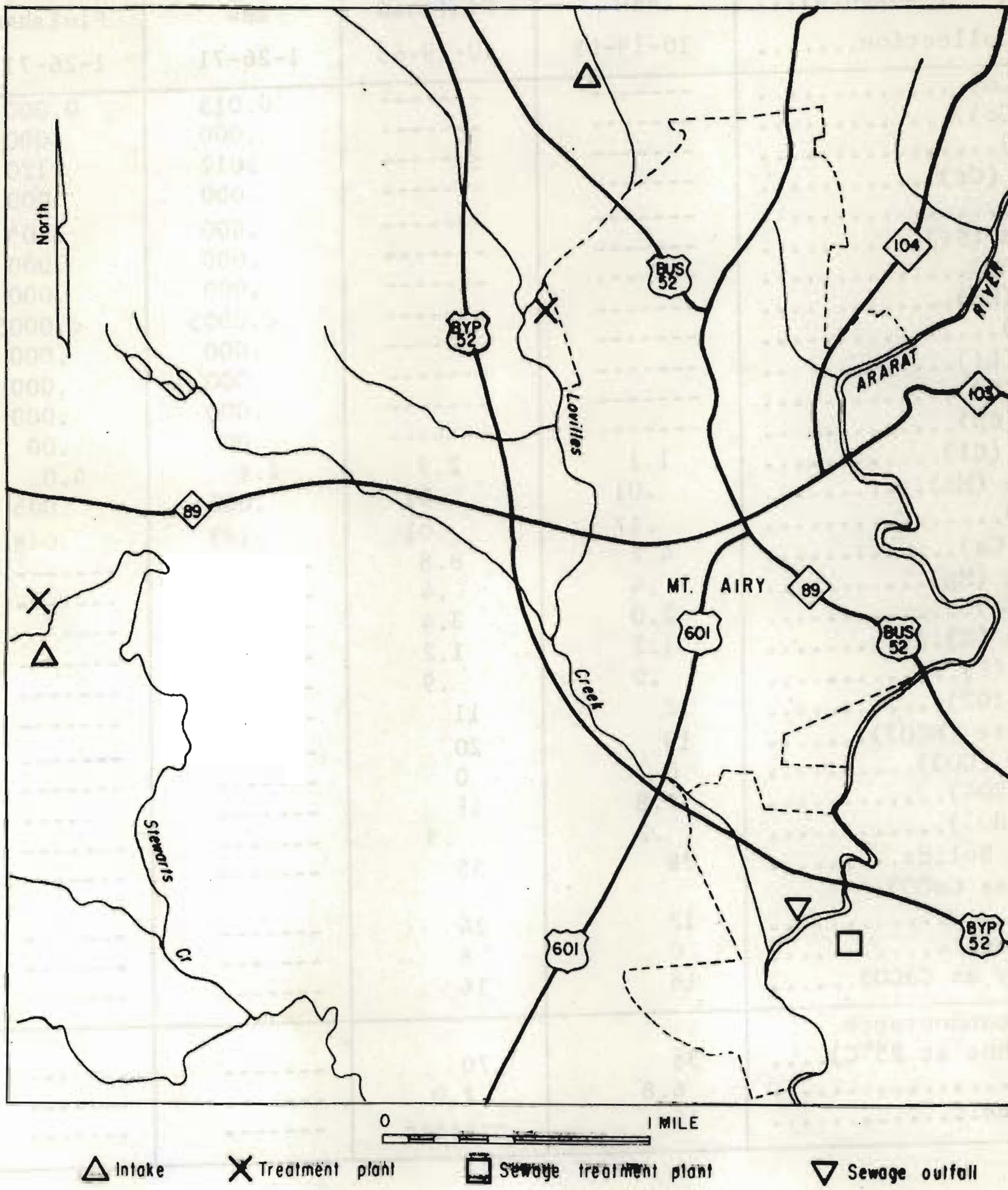
WATER-RESOURCES APPRAISAL:

Surface water: Mount Airy is in the Piedmont section in northern Surry County where the topography is generally hilly. Ararat River, Lovills Creek, Stewarts Creek and their tributaries drain the immediate area. The low-flow yield of streams generally exceeds 0.15 mgd per square mile. The average discharge of all streams is 0.9 mgd per square mile and the 7-day, 2-year low flow is 0.35 mgd per square mile. The raw-water storage presently available is adequate to meet foreseeable needs. The estimated allowable draft is more than six times present use.

Ground water: The Town of Mount Airy is underlain by granite rocks except in the extreme northwest and southeast edges where mica-schist rocks crop out. The granite is not extensively fractured or jointed, and the overlying mantle of weathered rock is not deep in most places. Wells in the granite in this vicinity generally are drilled to depths of 50 to 150 feet, and are reported to yield as much as 30 gpm.

The chemical quality of ground water at Mount Airy generally is acceptable for most uses with no treatment, although the water is somewhat acid and may be corrosive.

CITY OF MT. AIRY



MOUNT AIRY, SURRY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Lovills Cr. Raw	Lovills Cr. Finished	Lovills Cr. Raw	Lovills Cr. Finished
Date of collection.......	10-19-65	10-19-65	1-26-71	1-26-71
Copper (Cu)...............	-------	-------	0.015	0.000
Cobalt (Co)...............	-------	-------	.000	.000
Zinc (Zn).................	-------	-------	.012	.120
Chromium (Cr).............	-------	-------	.000	.000
Boron (B).................	-------	-------	.000	.005
Strontium (Sr)............	-------	-------	.000	.000
Barium (Ba)...............	-------	-------	.000	.000
Mercury (Hq)..............	-------	-------	<.0005	<.0005
Lead (Pb).................	-------	-------	.000	.000
Lithium (Li)..............	-------	-------	.000	.000
Cadmium (Cd)..............	-------	-------	.000	.000
Cyanide (CN)..............	-------	-------	.00	.00
Chloride (Cl).............	1.1	2.9	2.6	4.0
Manganese (Mn)............	.01	.01	.005	.005
Iron (Fe).................	.17	.01	.183	.048
Calcium (Ca)..............	4.2	8.8	-------	-------
Magnesium (Mg)............	.4	.4	-------	-------
Sodium (Na)...............	2.0	3.4	-------	-------
Potassium (K).............	1.2	1.2	-------	-------
Fluoride (F)..............	.0	.9	-------	-------
Silica (SiO2).............	12	11	-------	-------
Bicarbonate (HCO3)........	19	20	-------	-------
Carbonate (CO3)...........	0	0	-------	-------
Sulfate (SO4).............	1.8	11	-------	-------
Nitrate (NO3).............	.2	.3	-------	-------
Dissolved Solids..........	38	55	-------	-------
Hardness as CaCO3:				
Total.................	12	24	-------	-------
Noncarbonate..........	0	8	-------	-------
Alkalinity as CaCO3.......	16	16	-------	-------
Specific conductance (micromhos at 25° C)....	38	70	-------	-------
pH........................	6.8	7.0	-------	-------
Temperature...............	16	-------	-------	-------

PILOT MOUNTAIN, SURRY COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,600 in 1970 (570 metered customers, 25 of which are in suburban areas).

SOURCE:

Toms Creek: The intake is about 1/4 mile northwest of Pilot Mountain at lat 36°24'00", long 80°28'54". One water well with a reported yield of 175 gpm is used as auxiliary supply.

RAW-WATER STORAGE:

None. A 70-million gallon off-river reservoir is presently (1971) under construction. Water will be pumped from Toms Creek to the reservoir.

ALLOWABLE DRAFT:

Estimated allowable draft is 2.7 mgd without storage.

TOTAL USE:

Average (1970), 0.75 mgd, metered; maximum daily, about 1.0 million gallons.

INDUSTRIAL USE:

0.55 mgd, estimated. Principal users include Armtex, Inc., Surry Industries, Inc., and Amos & Smith, Inc.

TREATMENT:

Aeration, prechlorination, coagulation with alum and lime, rapid sand filtration, and adjustment of pH with lime.

RATED CAPACITY OF TREATMENT PLANT:

1.5 mgd.

PUMPING CAPACITY:

Raw water, 3.0 mgd; finished water, 2.6 mgd.

FINISHED-WATER STORAGE:

One clear well, 500,000 gallons; two elevated tanks, 100,000 and 200,000 gallons.

FUTURE PLANS:

None. Raw water storage reservoir under construction to be completed in late 1971.

PILOT MOUNTAIN, SURRY COUNTY

WATER-RESOURCES APPRAISAL

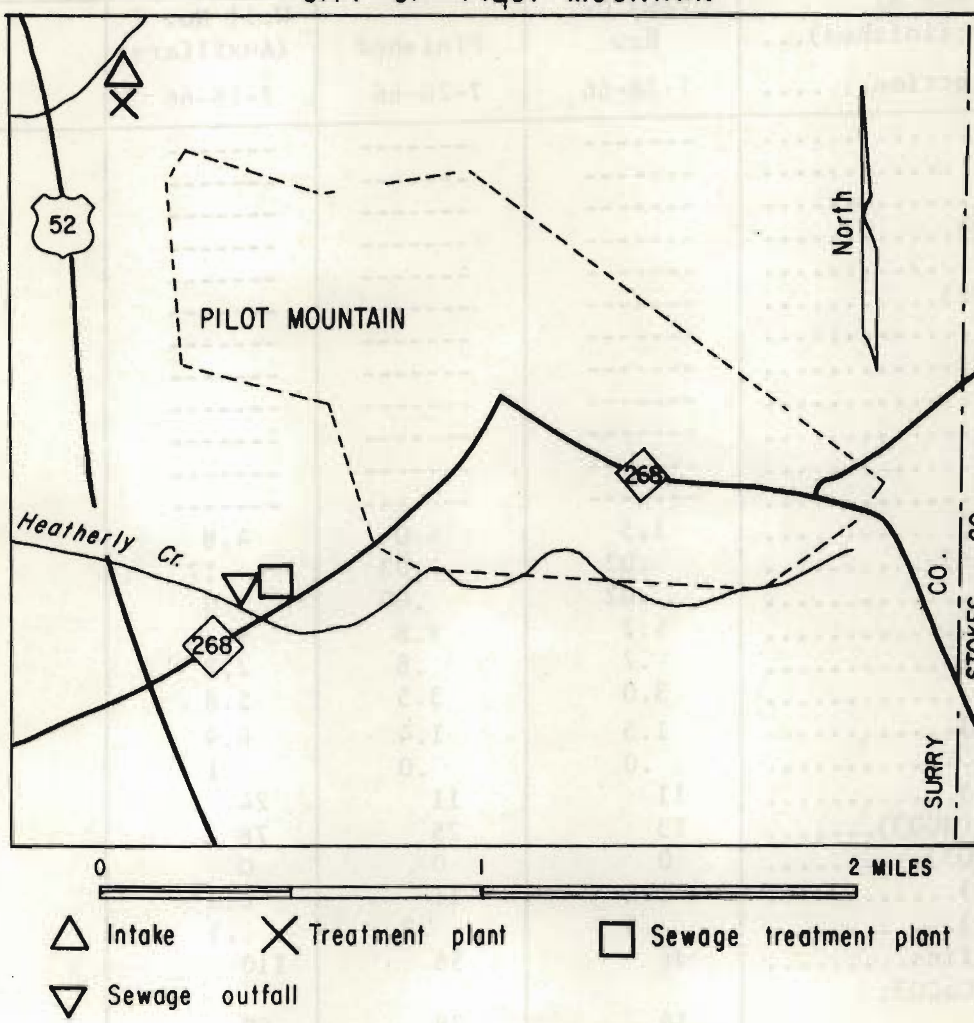
Surface water: Pilot Mountain is on the eastern border of Surry County where the terrain is moderately hilly. The area is drained by tributaries of Heatherly and Toms Creeks. The low-flow yield of streams is 0.09 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile, and the 7-day, 2-year low flow is 0.2 mgd per square mile. When the 70-million gallon raw-water storage reservoir is completed the allowable draft will increase to approximately 4.8 mgd, which should be adequate for long-term future needs. If needed in the future, the allowable draft could safely be increased to about 10 mgd by providing additional storage.

Ground water: The Town of Pilot Mountain is underlain by granite-gneiss, except in the extreme northwest corner which extends into mica-schist rocks. These rocks generally are deeply weathered, but the weathered zone varies in thickness from 30 feet to more than 100 feet. Wells in the granite-gneiss in this vicinity generally are drilled to depths of 200 to 600 feet, and are reported to yield as much as 250 gpm.

One well, 623 feet deep and cased to 150 feet, is maintained as an emergency supply well. Although ground water is not generally used for public supply, it may be considered for supplemental use, providing wells are properly spaced. Properly located and constructed wells would probably yield 0.08 mgd.

The chemical quality of ground water at Pilot Mountain generally is acceptable for most uses, but in some places the water may be moderately hard and may contain iron in excess of 0.3 milligrams per liter.

CITY OF PILOT MOUNTAIN



PILOT MOUNTAIN, SURRY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Toms Cr. Raw	Finished	Well No. 7 (Auxiliary)
Date of collection.......	7-28-66	7-28-66	7-28-66
Copper (Cu).............	-------	-------	-------
Cobalt (Co).............	-------	-------	-------
Zinc (Zn)...............	-------	-------	-------
Chromium (Cr)...........	-------	-------	-------
Boron (B)...............	-------	-------	-------
Strontium (Sr)..........	-------	-------	-------
Barium (Ba).............	-------	-------	-------
Mercury (Hq)............	-------	-------	-------
Lead (Pb)...............	-------	-------	-------
Lithium (Li)............	-------	-------	-------
Cadmium (Cd)............	-------	-------	-------
Cyanide (CN)............	-------	-------	-------
Chloride (Cl)...........	1.5	4.0	4.8
Manganese (Mn)..........	.02	.03	.17
Iron (Fe)...............	.02	.00	1.0
Calcium (Ca)............	4.2	9.8	9
Magnesium (Mg)..........	.7	.8	2.2
Sodium (Na).............	3.0	3.5	5.8
Potassium (K)...........	1.5	1.4	6.9
Fluoride (F)............	.0	.0	.1
Silica (SiO2)...........	11	11	24
Bicarbonate (HCO3)......	23	25	78
Carbonate (CO3).........	0	0	0
Sulfate (SO4)...........	1.8	11	6.8
Nitrate (NO3)...........	.3	.2	.1
Dissolved Solids........	36	56	110
Hardness as CaCO3:			
Total.................	14	28	60
Noncarbonate..........	0	8	0
Alkalinity as CaCO3.....	19	20	64
Specific conductance (micromhos at 25° C)....	45	77	159
pH......................	6.8	6.9	8.1
Temperature.............	24	23	18

Note.--Additional analyses are on next page.

PILOT MOUNTAIN, SURRY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Toms Cr. Raw	Finished	
Date of collection.......	1-20-71	1-20-71	
Copper (Cu)............	0.000	0.000	
Cobalt (Co)............	.000	.000	
Zinc (Zn)...............	.065	.160	
Chromium (Cr)...........	.000	.000	
Boron (B)...............	.029	.035	
Strontium (Sr)..........	.030	.030	
Barium (Ba).............	.000	.000	
Mercury (Hq)............	-------	-------	
Lead (Pb)...............	.000	.000	
Lithium (Li)............	.000	.000	
Cadmium (Cd)............	.000	.000	
Cyanide (CN)............	.00	.00	
Chloride (Cl)...........	3.0	4.2	
Manganese (Mn)..........	.005	.005	
Iron (Fe)...............	.242	.000	
Calcium (Ca)............	-------	-------	
Magnesium (Mg)..........	-------	-------	
Sodium (Na).............	-------	-------	
Potassium (K)...........	-------	-------	
Fluoride (F)............	-------	-------	
Silica (SiO2)...........	-------	-------	
Bicarbonate (HCO3)......	-------	-------	
Carbonate (CO3).........	-------	-------	
Sulfate (SO4)...........	-------	-------	
Nitrate (NO3)...........	-------	-------	
Dissolved Solids........	-------	-------	
Hardness as CaCO3:			
Total................	-------	-------	
Noncarbonate.........	-------	-------	
Alkalinity as CaCO3......	-------	-------	
Specific conductance (micromhos at 25° C)....	-------	-------	
pH......................	-------	-------	
Temperature.............	-------	-------	

VANCE COUNTY
WATER-RESOURCES APPRAISAL

Vance County is in the eastern part of the Piedmont Province with the North Carolina-Virginia State line as its northern boundary. The topography ranges from moderately rolling to hilly. The northern half of the county is drained by tributaries of the Roanoke River and the southern half by tributaries of the Tar River. The Tar River is the southern boundary of the county. John H. Kerr Reservoir floods Nutbush Creek from the northeast corner of the county almost to Henderson. For streams in the county, the average discharge ranges from 0.8 to 0.9 mgd per square mile. Minimum flows vary with location, averaging 0.02 mgd per square mile with a range of 0.001 to 0.05 mgd per square mile. The 7-day, 2-year low flow varies from 0.05 to 0.20 mgd per square mile, and averages 0.18 mgd per square mile. Henderson obtains its municipal supply from surface water sources. Most other domestic and industrial supplies in the county are obtained from ground-water sources. The county's population in 1970 was 32,691.

The principal rock unit underlying Vance County is mica-gneiss. It crops out as a northeast-southwest trending zone across the eastern half of the county. In a relatively small area in the southeastern part of the county, the gneiss grades into granite that is a part of a large intrusion that crops out extensively in Franklin and Wake Counties. A large belt, about five miles in width, of granodiorite extends through the western part of the county and is bordered on the east and west sides by metavolcanic rocks. Along the extreme northwest border of the county a small belt of schist is exposed.

The general ground water situation in the county is such that well yields may be expected to be in the average range for the Piedmont Province in the State. It is apparent from the available data that wells in granite have a higher average yield than wells in the other rock units. Typical reported yields and average depth of drilled wells in the various rock units are given in the following table.

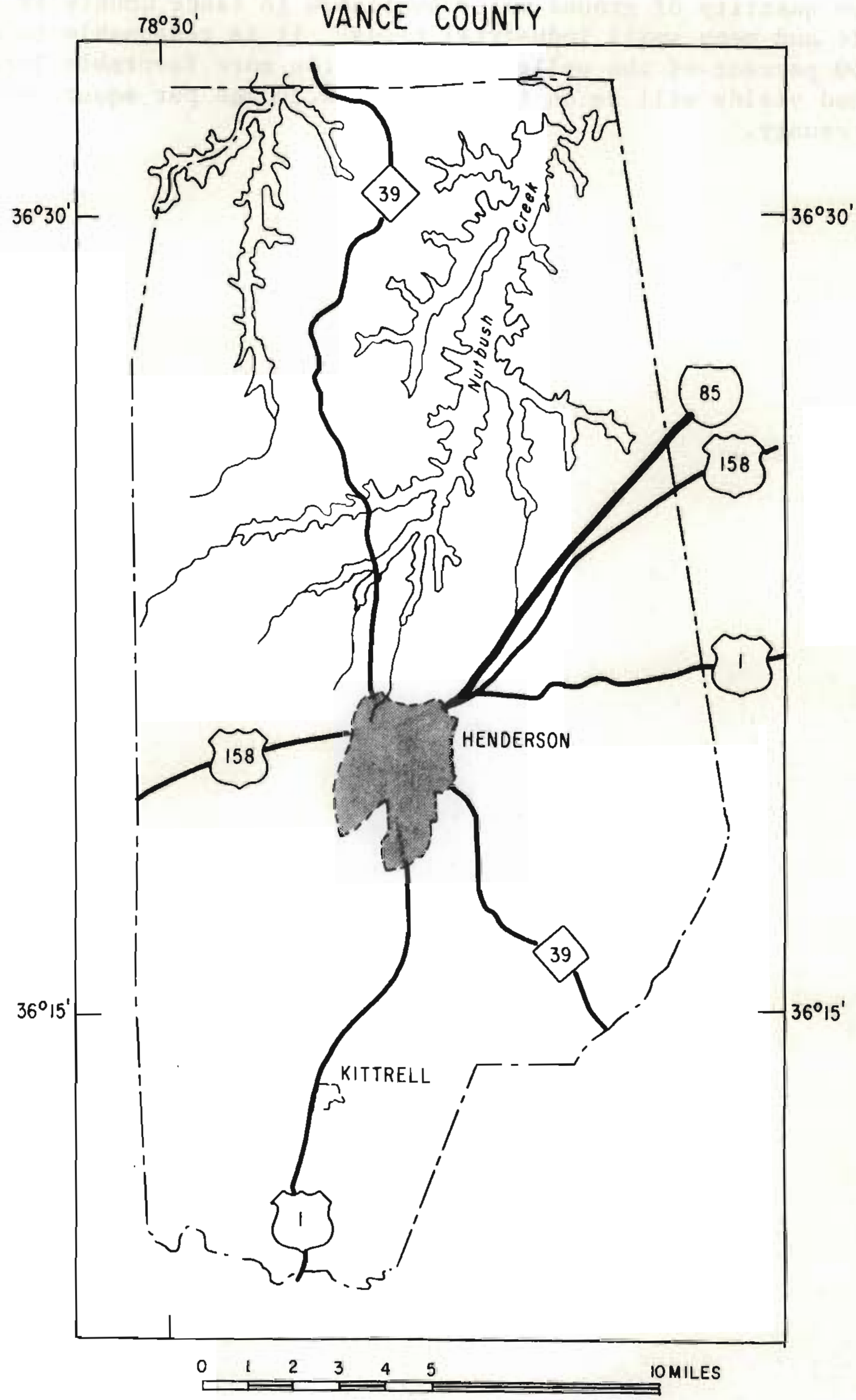
Rock unit	Yield (gpm) Maximum	Yield (gpm) Average	Average depth (feet
Mica-gneiss	40	10	167
Granite	90	23	140
Granodiorite	75	11	123
Metavolcanic rocks	36	12	105

Ground water in Vance County is principally of the calcium bicarbonate and sodium bicarbonate types and is suitable for most domestic and industrial uses with little or no treatment. Available chemical analyses indicate that water from the granite and mica-gneiss units generally is soft and has a low iron content. Water from the granodiorite generally is of good quality although in places it may be hard. Water from the metavolcanic unit generally is hard, and in some places, it is also corrosive.

VANCE COUNTY

WATER-RESOURCES APPRAISAL

The quantity of ground water available in Vance County is adequate for domestic and many small industrial needs. It is reasonable to assume that in about 50 percent of the wells drilled in the more favorable locations, the sustained yields will be on the order of 0.25 mgd per square mile in most parts of the county.



EXPLANATION

Areas served by municipal water systems in 1970

More than 500 customers

Less than 500 customers

HENDERSON, VANCE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 20,000 in 1970 (6,260 metered customers, 2,164 of which are in suburban areas).

SOURCE:

Sandy Creek and Sandy Creek tributaries impounded in Foxes Pond, Rowlands Pond, Faulkner Pond, Southerlands Pond, and Ayscue Pond. The intakes are in Foxes Pond 1/4 mile southeast of Henderson at lat 36°19'00", long 78°22'00", and in Southerlands Pond about 6 miles southeast of Henderson at lat 36°17'00", long 78°18'00".

RAW-WATER STORAGE:

Foxes Pond, 42.. million gallons; Rowlands Pond, 20.7 million gallons; Faulkner Pond, about 5 million gallons; Ayscue Pond, about 50 million gallons; Southerlands Pond, 13 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 3.6 mgd with a storage of 131.2 million gallons.

TOTAL USE:

Average (1970), 3.0 mgd, metered; maximum daily (during August 1970), 3.45 million gallons.

INDUSTRIAL USE:

1.0 mgd, estimated. Principal users include Perfect Packed Products, Nu Southern Dyeing and Finishing, Inc., and Laurens Glass, Inc.

TREATMENT:

Aeration, prechlorination, coagulation with alum, sedimentation, addition of carbon for control of taste and odor when necessary, rapid anthracite filtration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd.

PUMPING CAPACITY:

Raw water, 8.0 mgd; finished water, 5.1 mgd.

FINISHED-WATER STORAGE:

One clear well, 750,000 gallons; one elevated tank, 750,000 gallons; one stand pipe, 170,000 gallons.

FUTURE PLANS:

No definite plans at this time. Engineering consultants have recommended expansion of the treatment plant, construction of a new dam to increase the raw-water supply, and additional finished-water storage facilities.

HENDERSON, VANCE COUNTY

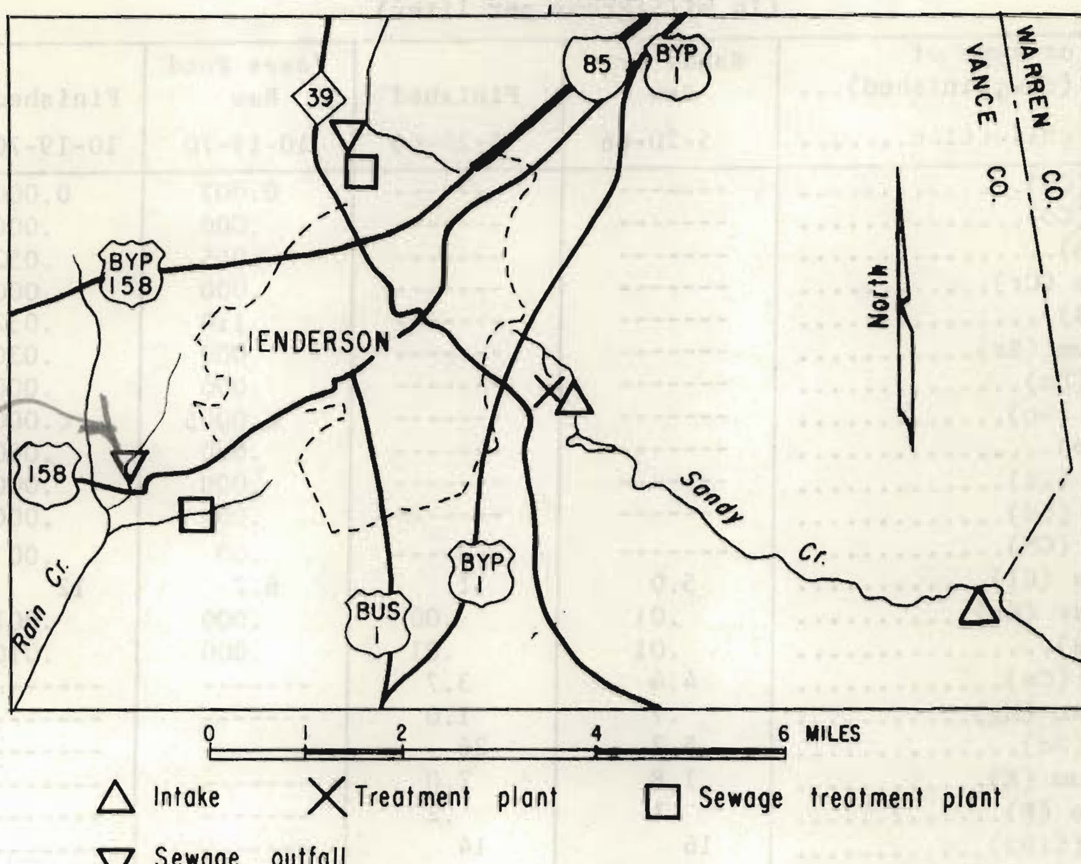
WATER-RESOURCES APPRAISAL:

Surface water: Henderson is in an upland area in central Vance County on the basin divide of the Roanoke and Tar Rivers. The area is drained by small streams radiating in different directions. The low-flow yields of streams in the immediate vicinity of Henderson are in the range of 0.005 to 0.05 mgd per square mile with the average being 0.02 mgd per square mile. The average discharge of streams is 0.6 mgd per square mile, and the 7-day, 2-year low flow is 0.13 mgd per square mile. The demand for water is approaching or at the capacity of the existing treatment and raw-water storage facilities. The John H. Kerr Reservoir could provide the most reliable source of raw water. However, with additional storage Sandy Creek can provide a dependable supply of 10 to 12 mgd in terms of allowable draft.

Ground water: Henderson is predominantly underlain by mica-gneiss. Rocks of the metavolcanic unit are exposed near the west edge of the city, and granite underlies the south part. The depth of weathered rocks differs from place to place but is known to be not deeper than about 65 feet. There is no apparent difference in weathered depth between the mica gneiss and granite, but the reported well yields are higher from wells in granite. Yields as great as 90 gpm have been reported from wells in granite and up to 40 gpm from wells in mica-gneiss. With proper location and spacing, wells should furnish adequate supplies for domestic and small industrial needs.

Water from the gneiss and granite usually is of good chemical quality, but in some localities the water is moderately hard.

CITY OF HENDERSON



HENDERSON, VANCE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Sandy Cr. Raw	Finished	Foxes Pond Raw	Finished
Date of collection.......	5-20-66	5-20-66	10-19-70	10-19-70
Copper (Cu)..............	-------	-------	0.007	0.000
Cobalt (Co)..............	-------	-------	.000	.000
Zinc (Zn)................	-------	-------	.045	.052
Chromium (Cr)............	-------	-------	.000	.000
Boron (B)................	-------	-------	.110	.052
Strontium (Sr)...........	-------	-------	.000	.030
Barium (Ba)..............	-------	-------	.000	.000
Mercury (Hq).............	-------	-------	<.0005	<.0005
Lead (Pb)................	-------	-------	.000	.000
Lithium (Li).............	-------	-------	.000	.000
Cadmium (Cd).............	-------	-------	.000	.000
Cyanide (CN).............	-------	-------	.00	.00
Chloride (Cl)............	5.0	11	6.2	12
Manganese (Mn)...........	.01	.00	.000	.007
Iron (Fe)................	.01	.01	.000	.010
Calcium (Ca).............	4.4	3.7	-------	-------
Magnesium (Mg)...........	.7	1.0	-------	-------
Sodium (Na)..............	5.2	26	-------	-------
Potassium (K)............	1.8	2.0	-------	-------
Fluoride (F).............	.1	.2	-------	-------
Silica (SiO2)............	16	14	-------	-------
Bicarbonate (HCO3).......	21	53	-------	-------
Carbonate (CO3)..........	0	0	-------	-------
Sulfate (SO4)............	5.4	13	-------	-------
Nitrate (NO3)............	.6	.6	-------	-------
Dissolved Solids.........	50	99	-------	-------
Hardness as CaCO3:				
Total..................	14	14	-------	-------
Noncarbonate...........	0	0		
Alkalinity as CaCO3......	17	43		
Specific conductance (micromhos at 25° C)....	60	155	-------	-------
pH.......................	6.5	7.2	-------	-------
Temperature..............	20	-------	15.5	17.5

15
30
15
30
90

WAKE COUNTY

WATER-RESOURCES APPRAISAL

Wake County is in the eastern part of the Piedmont Province with approximately 25 percent of the county extending southward into the Coastal Plain. The topography is characterized by rolling hills in the western part of the county, and a leveling off to moderate land slopes to the east. The Neuse River and its tributaries drain the north and central part of the county; tributaries of the Cape Fear River drain the remainder. The average discharge of streams ranges from 0.6 to 0.8 mgd per square mile. Minimum flows are variable with location: streams in the southeastern part of the county with less than 5 square miles of drainage area occasionally go dry, while others in the county range from 0.01 to 0.2 mgd per square mile and average 0.05 mgd per square mile. The 7-day, 2-year low flow ranges from 0.007 mgd per square mile in the southeastern part to 0.37 mgd per square mile in the northeastern part, and averages 0.14 mgd per square mile.

Raleigh, Apex, Wake Forest, and Zebulon obtain their municipal water supplies from surface-water sources. Cary and Garner have wells but beginning in 1967 have been obtaining an increasing part of their water needs from Raleigh which now (1971) approaches 95 percent of Cary's needs and more than 50 percent of Garner's. Wendell obtains about three-fourths of its supply from an abandoned rock quarry fed by ground water and the balance from one well. Fuquay-Varina obtains its supply from several wells. Other, smaller municipalities, rural-domestic, and most industrial water supplies are obtained from ground-water sources. Water consumed at the Raleigh-Durham Airport, in Wake County, is furnished by the City of Durham. The county's population in 1970 was 228,453.

Ground water serves as a source for small municipal, industrial, and domestic water supplies and will continue to be an important source in areas remote from municipal systems. With the exception of an area along the western border, Wake County is underlain by bedrock of Precambrian age. The Precambrian unit consists of granite, gneiss, and schist which trend north-south through the central part of the county and are the most favorable aquifers for obtaining smaller municipal and industrial supplies. A body of Triassic sandstone and shale, as much as eight miles wide, underlies the northwestern part of the county. Wells in the Triassic rocks are less productive than those in the Precambrian rocks because relatively impermeable clay is the predominant material in the Triassic.

Both the Precambrian and Triassic rocks are covered by a layer of residium (rock weathered in place) ranging in thickness from a few inches to 50 feet, and consists of particles ranging in size from clay to coarse sand to boulders. The Precambrian rocks underlying the valleys in the Fuquay-Varina area are covered by several feet of sand and other unconsolidated sediments of the Coastal Plain formations.

WAKE COUNTY

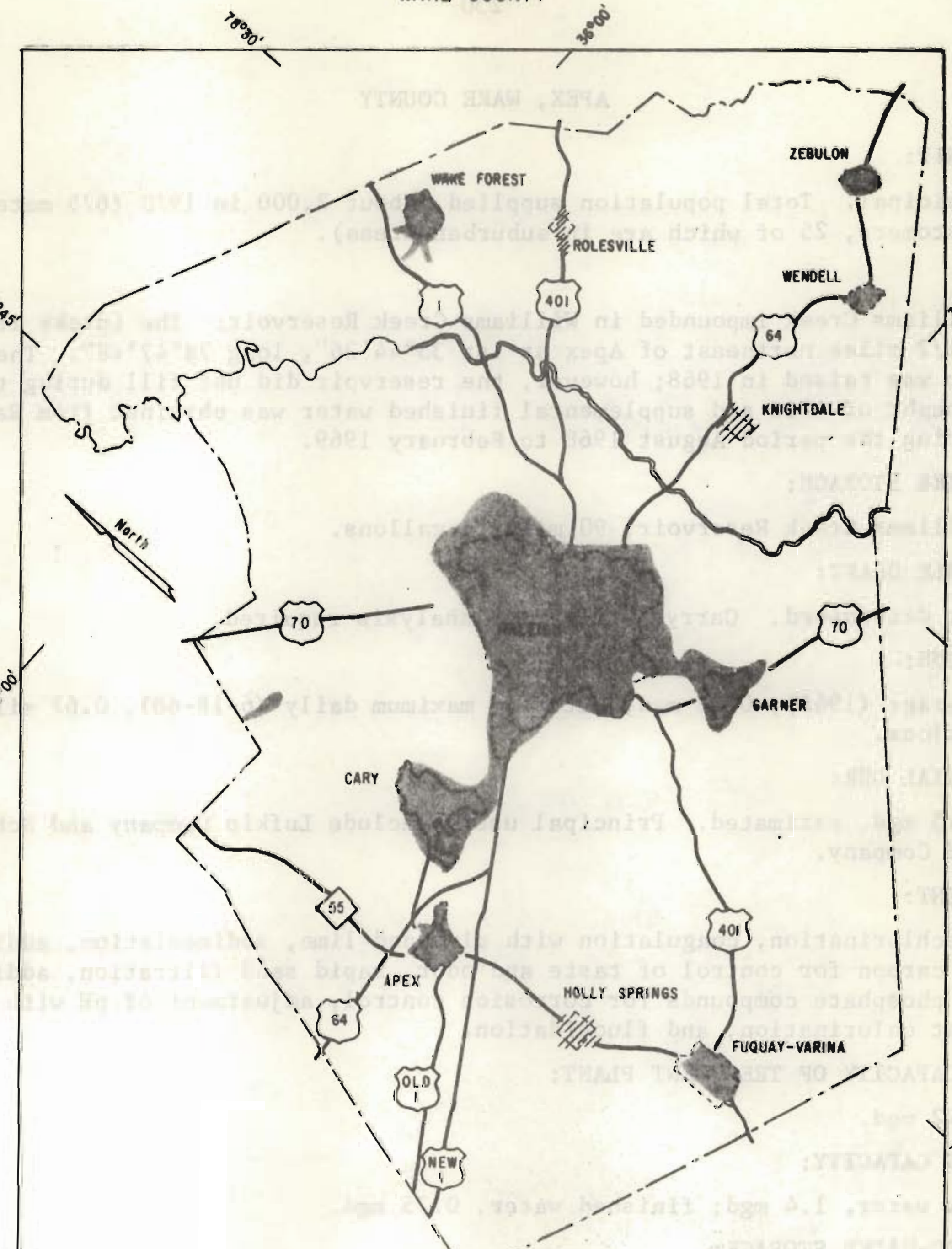
WATER-RESOURCES APPRAISAL

It is possible to develop small ground-water supplies throughout the county. Water occurs in fractures in the bedrock, fed from a "reservoir" in the residium. The best supplies are generally developed in deeper layers of residium, which occur in draws, sags, and low flat areas. The range in yields and average depths of drilled wells that have been reported are given in the following table:

Rock unit and location	Range in yield (gpm)	Average depth (feet)
Triassic		
Northwestern part of county...	0-20	160
Precambrian		
Central part of county........	0-300	175
Eastern part of county.......	0-295	140

The chemical quality of ground water in the county is acceptable for most uses. In all rock units except the Triassic, the water is soft and contains relatively low concentrations of iron and other dissolved solids. The chemical quality of water from the Triassic rocks is not uniform. In some places, water from the Triassic contains excessive chloride, dissolved solids, and hardness causing constituents.

WAKE COUNTY



78°30'
36°00'
ZEBULON
WAKE FOREST
ROLESVILLE
WENDELL
35°45'
78°45'
401
1
64
KNIGHTDALE
North
RALEIGH
70
70
78°30
36°00'
GARNER
CARY
55
401
APEX
HOLLY SPRINGS
64
FUQUAY-VARINA
OLD 1
NEW 1
78°45
35°45'
0 5 10 15 20 MILES
EXPLANATION
Areas served by municipal water systems in 1970
More than 500 customers
Less than 500 customers

APEX, WAKE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,000 in 1970 (675 metered customers, 25 of which are in suburban areas).

SOURCE:

Williams Creek impounded in Williams Creek Reservoir: The intake is 2-1/2 miles northeast of Apex at lat 35°44'36", long 78°47'48". The dam was raised in 1968; however, the reservoir did not fill during the drought of 1968 and supplemental finished water was obtained from Raleigh during the period August 1968 to February 1969.

RAW-WATER STORAGE:

Williams Creek Reservoir, 90 million gallons.

ALLOWABLE DRAFT:

Not determined. Carryover storage analysis required.

TOTAL USE:

Average (1968), 0.28 mgd, metered; maximum daily (6-18-68), 0.62 million gallons.

INDUSTRIAL USE:

0.15 mgd, estimated. Principal users include Lufkin Company and Schieffelin and Company.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

0.72 mgd.

PUMPING CAPACITY:

Raw water, 1.4 mgd; finished water, 0.75 mgd.

FINISHED-WATER STORAGE:

One clear well, 500,000 gallons; one elevated tank, 100,000 gallons.

FUTURE PLANS:

The town is presently considering obtaining additional raw water from Crabtree Creek or the proposed New Hope Reservoir, or obtaining finished water from Raleigh.

APEX, WAKE COUNTY

WATER-RESOURCES APPRAISAL:

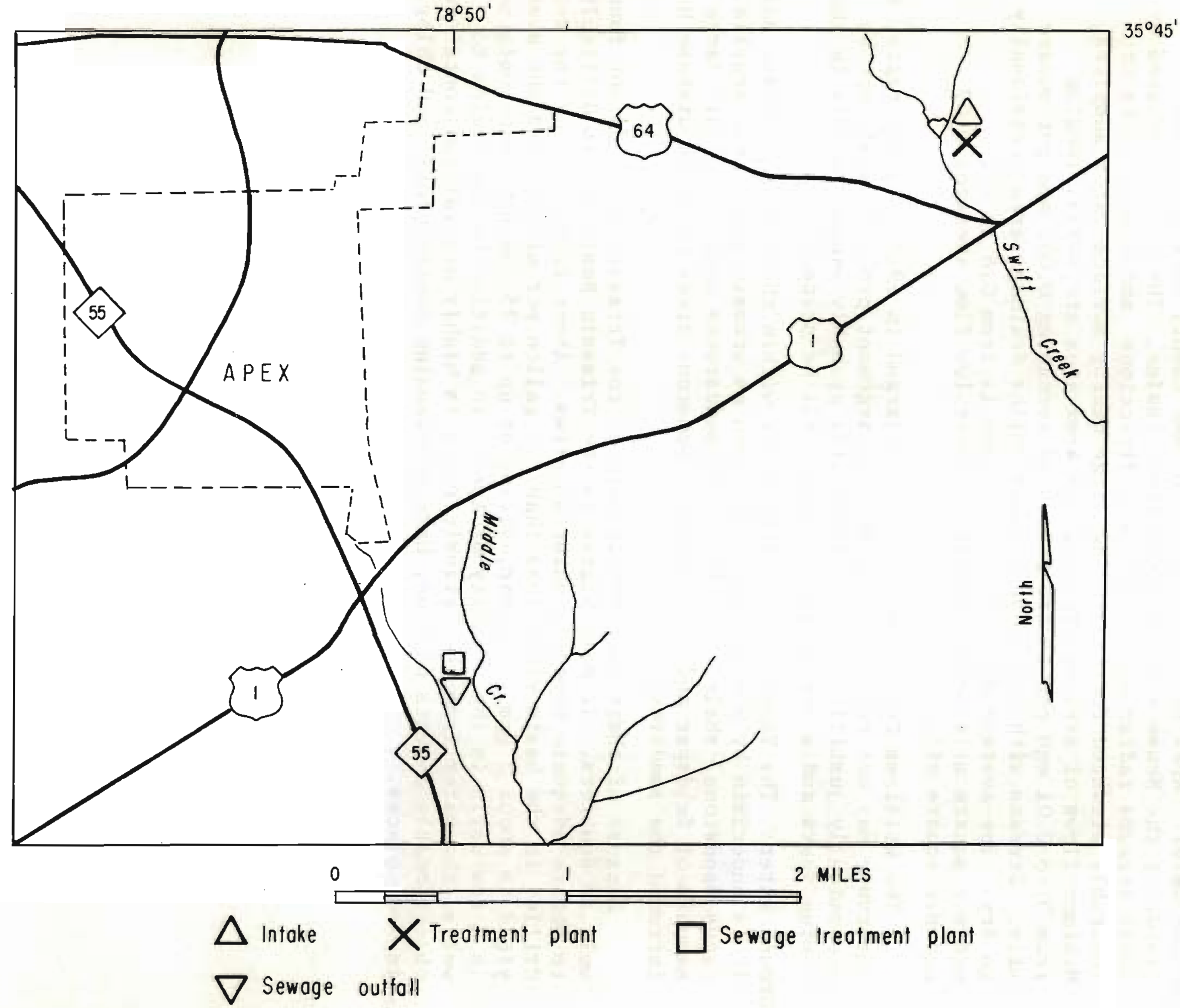
Surface water: Apex is in southwestern Wake County on the drainage divide of the Neuse and Cape Fear River basins. The area is drained by small streams radiating in different directions and therefore is not favorably situated for developing large nearby surface-water supplies. Minimum flows of streams draining the Apex area are small, ranging from 0 to 0.01 mgd per square mile, and averaging 0.002 mgd per square mile. Streams with less than 5 square miles drainage area occasionally go dry. The average discharge of streams is from 0.6 to 0.7 mgd per square mile, and the 7-day, 2-year low flow averages 0.02 mgd per square mile.

The Williams Creek reservoir was enlarged in 1968. In dry years, the reservoir may not refill and further enlargement probably would not be economically justifiable. Water use will probably expand rapidly in the coming years and a new source of water will be needed.

Ground water: The Town of Apex lies wholly within the Durham Triassic Basin. It is underlain by sedimentary rocks such as arkosic sandstone, argillaceous sandstone, shale, and clay. The sandstones usually contain large amounts of feldspar and iron oxides. Numerous dikes of black diabase have intruded the sandstones.

Because of their impermeable nature, the Triassic rocks do not function well as aquifers. In most places in the Triassic Basin, it is difficult to obtain adequate domestic water supplies. About 20 percent of the wells drilled in the basin yield less than one gallon per minute, and the average yield is about 5 gpm. However, yields of up to 25 gpm have been obtained in a few wells in the vicinity of Apex. In addition to low yields to wells, the water from the Triassic rocks is highly mineralized containing objectionable amounts of iron, hardness-causing constituents, and chloride, in some places.

CITY OF APEX


78°50'
35°45'
64
55
APEX
1
Swift Creek
Middle Cr.
North
0
1
2 MILES
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

APEX, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Williams Cr. Raw	Finished	Williams Cr. Raw	Finished
Date of collection.......	5-24-66	5-24-66	3-9-71	3-9-71
Copper (Cu)..............	-------	-------	0.000	0.000
Cobalt (Co)..............	-------	-------	.000	.000
Zinc (Zn)................	-------	-------	.015	.050
Chromium (Cr)............	-------	-------	.000	.000
Boron (B)................	-------	-------	-------	-------
Strontium (Sr)...........	-------	-------	.030	.030
Barium (Ba)..............	-------	-------	.000	.000
Mercury (Hq).............	-------	-------	<.0005	<.0005
Lead (Pb)................	-------	-------	.000	.000
Lithium (Li).............	-------	-------	.000	.000
Cadmium (Cd).............	-------	-------	.000	.000
Cyanide (CN).............	-------	-------	.00	.00
Chloride (Cl)............	7.0	13	6.0	10
Manganese (Mn)...........	.00	.01	.015	.000
Iron (Fe)................	.07	.00	.142	.000
Calcium (Ca).............	5.0	16		
Magnesium (Mg)...........	1.1	1.3	-------	-------
Sodium (Na)..............	4.5	4.6	-------	-------
Potassium (K)............	1.4	1.4	-------	-------
Fluoride (F).............	.1	.9	-------	-------
Silica (SiO2)............	3.2	3.7	-------	-------
Bicarbonate (HCO3).......	18	22	-------	-------
Carbonate (CO3)..........	0	0	-------	-------
Sulfate (SO4)............	4.2	17	-------	-------
Nitrate (NO3)............	.4	.1	-------	-------
Dissolved Solids.........	41	82	-------	-------
Hardness as CaCO3:				
Total..................	18	46	-------	-------
Noncarbonate...........	2	28	-------	-------
Alkalinity as CaCO3......	15	18	-------	-------
Specific conductance (micromhos at 25° C)....	60	123	-------	-------
pH.......................	6.3	6.9	-------	-------
Temperature..............	22		-------	-------

CARY, WAKE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 7,430 in 1970 (3,000 metered customers, about 200 of which are in suburban areas).

SOURCE:

City of Raleigh and one well.

Well No. 24 (J. L. Matthews property) Wk. 279, located at: lat 35°46'42", long 78°46'57". Driller: Heater Well Co. Date drilled: 1964. Total depth: 220 ft. Diam: 6 in. Cased to: 124 ft. Type of finish: Open hole. Topography: High flat. Aquifer: Crystalline rock (metavolcanics). Static water level: ________. Yield: 120 gpm. Pumping level: ________. Type pump: Turbine. Pump setting: ________.

TOTAL USE:

Average (1970), 0.64 mgd, metered.

INDUSTRIAL USE: 0.007 mgd. Principal users include Taylor Biscuit Co., Cary Barrel and Drum Co., and Grace Chemical Co.

TREATMENT:

None.

RATED CAPACITY OF TREATMENT PLANT:

None.

PUMPING CAPACITY:

0.17 mgd from well 24.

FINISHED-WATER STORAGE:

Three elevated tanks, 100,000, 300,000, and 500,000 gallons.

FUTURE PLANS:

Plans are being formulated for a new 1,000,000-gallon elevated tank.

WATER-RESOURCES APPRAISAL:

Surface water: Cary is in an upland area in central Wake County. The area is drained by tributaries of Walnut, Crabtree, Reedy, and Swift Creeks of the Neuse River basin. Minimum flows of streams draining the area generally exceed 0.005 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile and the 7-day, 2-year low flow is 0.04 mgd per square mile. Cary is not ideally situated for a surface-water supply since it is in the headwaters of most nearby streams. The largest nearby creek is Crabtree, about 3 miles north of the City.

Cary has grown rapidly in recent years and the ground-water system was not able to meet the increased demand. Since 1967, Cary has purchased an increasing amount of water from Raleigh and presently obtains about 95 percent of its needs in this manner. This seems to be the best source for future water supply if Raleigh is willing and able to supply the need.

CARY, WAKE COUNTY

Ground water: Cary is underlain by rocks of the metavolcanic unit which include phyllite, tuff, and schist that have been intruded by quartz dikes in many places.

The depth of weathered rock changes considerably from place to place and is known to be at least 150 feet at the Cary Junior High School. The metavolcanic rocks form the best aquifer in the county, and well yields of up to 150 gpm have been obtained in the Town of Cary. Adequate supplies for domestic and small industrial needs can be developed in all parts of town. Wells located in draws or penetrating quartz dikes should have higher yields than those on hills. In such situations most wells may be expected to have sustained yields of about 30 gallons per minute or 0.043 million gallons per day.

The chemical quality of ground water in Cary is good. In some cases the water is slightly corrosive and contains moderate amounts of dissolved iron. However, it is suitable for most uses with little or no treatment.

CARY, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	a/ Finished	Well No. 24		
Date of collection.......	6-18-65	3-9-71		
Copper (Cu)............	-------	0.000		
Cobalt (Co)............	-------	.000		
Zinc (Zn)...............	-------	.025		
Chromium (Cr)...........	-------	.000		
Boron (B)...............	-------	-------		
Strontium (Sr)..........	-------	.055		
Barium (Ba).............	-------	.000		
Mercury (Hq)............	-------	-------		
Lead (Pb)...............	-------	.000		
Lithium (Li)............	-------	.000		
Cadmium (Cd)............	-------	.000		
Cyanide (CN)............	-------	.00		
Chloride (Cl)...........	7.6	4.1		
Manganese (Mn)..........	.01	.000		
Iron (Fe)...............	.01	.000		
Calcium (Ca)............	26	-------		
Magnesium (Mg)..........	7.8	-------		
Sodium (Na).............	12	-------		
Potassium (K)...........	3.1	-------		
Fluoride (F)............	.1	-------		
Silica (SiO2)...........	36	-------		
Bicarbonate (HCO3).......	116	-------		
Carbonate (CO3)..........	0	-------		
Sulfate (SO4)...........	19	-------		
Nitrate (NO3)...........	.1	-------		
Dissolved Solids.........	175	-------		
Hardness as CaCO3:				
Total..................	96	-------		
Noncarbonate...........	0	-------		
Alkalinity as CaCO3......	95	-------		
Specific conductance (micromhos at 25°C)....	235	-------		
pH......................	6.8	-------		
Temperature.............	-------	-------		

a/ Water from 17 wells (mixed sample) in use in 1965. Water was chlorinated and treated with phosphate compounds for corrosion control in 1965.

FUQUAY-VARINA, WAKE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,500 in 1970 (1,130 metered customers, three of which are industries in suburban areas).

SOURCE:

Six wells (Nos. 2, 3, 5-8); two auxiliary wells.

Well No. 2 (Depot Street), Wk-283, located at: lat 35°34'50", long 78°48'20". Driller: Danville Drilling Co. Date drilled: 1937. Total depth: 250 ft. Diam: 10 in. Cased to: 30 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock (gneiss). Static water level: 30 ft. Yield: 90 gpm Pumping level: 55 ft. Type pump: turbine. Pump setting: 180 ft.

Well No. 3 (West Jones Street), Wk-277, located at: lat 35°35'10", long 78°48'14". Driller: C. C. Hildebrand. Date drilled: 1963. Total depth: 600 ft. Diam. 10 in. Cased to: 40 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock (gneiss). Static water level: 90 ft. Yield: 64 gpm. Pumping level: 110 ft. Type pump: turbine. Pump setting: 200 ft.

Well No. 5 (Cherry Street), Wk-267, located at: lat 35°35'27", long 78°48'22". Driller: Heater Well Co. Date drilled: 1947. Total depth: 385 ft. Diam: 10 in. Cased to: 40 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock (gneiss). Static water level: 75 ft. Yield: 34 gpm. Pumping level: 100 ft. Type pump: turbine. Pump setting: 200 ft.

Well No. 6 (Dogwood Street), Wk-282, located at: lat 35°35'44", long 78°48'23". Driller: C. C. Hildebrand. Date drilled: 1948. Total depth: 350 ft. Diam: 10 in. Cased to: 40 ft. Type of finish: open hole. Topography: hillside. Aquifer: crystalline rock (gneiss). Static water level: 90 ft. Yield: 205 gpm. Pumping level: 135 ft. Type pump: turbine. Pump setting: 200 ft.

Well No. 7 (Coefield Street), Wk-278, located at: 35°35'37", long 78°48'34". Driller: C. C. Hildebrand. Date drilled: 1965. Total depth: 400 ft. Diam: 10 in. Cased to: 40 ft. Type of finish: open hole. Topography: stream valley. Aquifer: crystalline rock (gneiss). Static water level: 70 ft. Yield: 300 gpm. Pumping level: 87 ft. Type pump: turbine. Pump setting: 200 ft.

Well No. 8 (Baughn well), Wk-279, located at: lat 35°35'33", long 78°48'46". Driller: C. C. Hildebrand. Date drilled: 1966. Total depth: 500 ft. Diam: 10 in. Cased to: 40 ft. Type of finish: open hole. Topography: stream valley. Aquifer: crystalline rock (gneiss). Static water level: 30 ft. Yield: 400 gpm. Pumping level: 45 ft. Type pump: turbine. Pump setting: 200 ft.

Well No. 9 (Averette well), Wk-280, (Auxiliary Supply), located at: 35°35'31", long 78°48'09". Driller: Sydnor Pump and Well Co. Date drilled: 1967. Total depth: 425 ft. Diam: 10 in. Cased to: 45 ft. Type of finish: open hole. Topography: flat interstream area. Aquifer: crystalline rock (gneiss). Static water level: 30 ft. Yield 225 gpm.

FUQUAY-VARINA, WAKE COUNTY

Pump: not installed.

Well No. 10 (Hobson well), Wk-281 (Auxiliary Supply), located at: lat 35°35'56", long 78°47'31". Driller: Sydnor Pump and Well Co. Date drilled: 1967. Total depth: 375 ft. Diam: 10 in. Cased to: 50 ft. Type of finish: open hole. Topography: stream valley. Aquifer: crystalline rock (gneiss). Static water level: 25 ft. Yield: 375 gpm. Pump: not installed.

TOTAL USE:

Average (1969), 0.33 mgd, metered; maximum daily (5-10-69), 0.46 mgd.

INDUSTRIAL USE:

0.03 mgd, estimated. Principal users include N. C. Textiles and Chemicals, Inc., Cornell Dubilier Co., and Kendall Co.

TREATMENT:

Aeration, rapid sand filtration, zeolite process for softening, and chlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.58 mgd.

PUMPING CAPACITY:

Raw water, 1.6 mgd; finished water, 1.0 mgd (total yield of installed wells, 2.4 mgd).

RAW-WATER STORAGE:

56,000 gallons.

FINISHED-WATER STORAGE:

Two elevated tanks, 100,000 and 200,000 gallons.

FUTURE PLANS:

Larger treatment plant presently (1969) being designed to replace existing plant.

WATER-RESOURCES APPRAISAL:

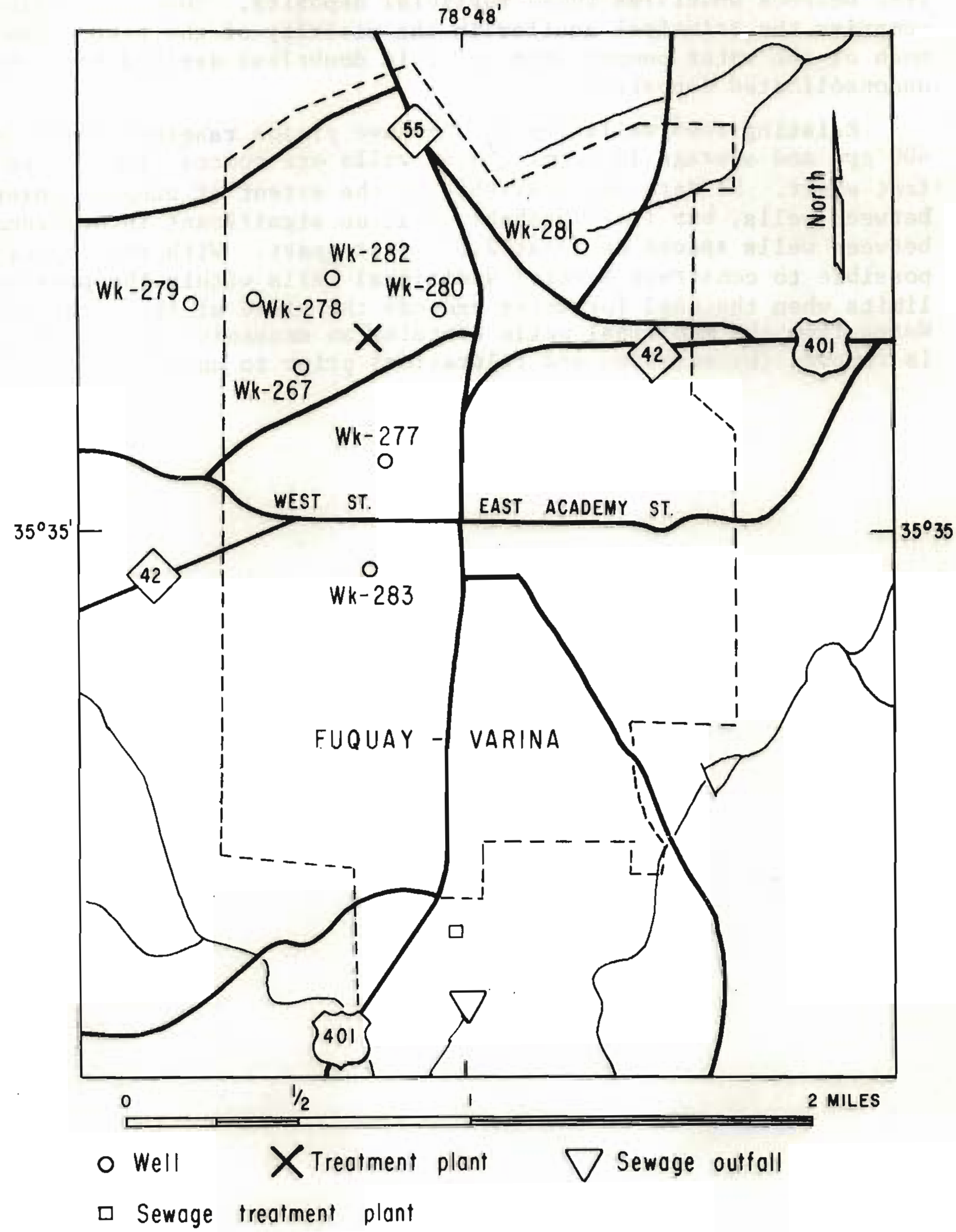
Surface water: Fuquay-Varina is in an upland area in southern Wake County. The area is drained by small streams radiating in different directions. Thus, the town is not favorably located for development of a surface-water supply. The two largest streams are Whiteoak Creek, six miles to the west and Middle Creek, six miles to the northeast. The low-flow yield of streams in the immediate vicinity of Fuquay-Varina is small, in the range of 0.002 to 0.004 mgd per square mile. However, streams smaller than about 2 square miles in drainage area go dry during most summers. The average discharge of streams is from 0.6 to 0.8 mgd per square mile and the 7-day, 2-year low flow is 0.05 mgd per square mile.

FUQUAY-VARINA, WAKE COUNTY

Ground water: The town of Fuquay-Varina is underlain by a mantle of unconsolidated sand and clay. These deposits are too thin to be important as a direct source of water for municipal and industrial supplies. Crystalline bedrock underlies these surficial deposits. The crystalline rocks comprise the principal aquifer in the vicinity of the town. However, much of the water pumped from wells is doubtless derived from the mantle of unconsolidated deposits.

Existing town wells reportedly have yields ranging from 34 gpm to 400 gpm and average 180 gpm. These wells are spaced from 700 to 2,400 feet apart. No data are available on the extent of pumping interference between wells, but it is probable that no significant interference occurs between wells spaced at least 2,000 feet apart. With this spacing it is possible to construct several additional wells within the present town limits when the need for water exceeds the yield of the existing wells. Water from the municipal wells contains an excessive amount of iron which is removed (by aeration and filtration) prior to use.

CITY OF FUQUAY-VARINA



FUQUAY-VARINA, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 4	Well No. 5	Finished	Well No. 8
Date of collection.......	5-18-62	5-18-62	5-18-62	3-9-71
Copper (Cu).............	-------	-------	-------	0.000
Cobalt (Co).............	-------	-------	-------	.010
Zinc (Zn)...............	-------	-------	-------	.100
Chromium (Cr)...........	-------	-------	-------	.000
Boron (B)...............	-------	-------	-------	-------
Strontium (Sr)..........	-------	-------	-------	.130
Barium (Ba).............	-------	-------	-------	.000
Mercury (Hq)............	-------	-------	-------	-------
Lead (Pb)...............	-------	-------	-------	.000
Lithium (Li)............	-------	-------	-------	.000
Cadmium (Cd)............	-------	-------	-------	.000
Cyanide (CN)............	-------	-------	-------	.00
Chloride (Cl)...........	3.0	2.0	3.9	3.9
Manganese (Mn)..........	.7	.8	.5	1.09
Iron (Fe)...............	2.0	2.7	1.2	.000
Calcium (Ca)............	23	22	21	-------
Magnesium (Mg)..........	2.7	2.0	2.4	-------
Sodium (Na).............	7.8	6.2	11	-------
Potassium (K)...........	2.2	2.1	2.0	-------
Fluoride (F)............	.4	.5	.4	-------
Silica (SiO2)...........	48	48	51	-------
Bicarbonate (HCO3).......	79	64	77	-------
Carbonate (CO3).........	0	0	0	-------
Sulfate (SO4)...........	17	21	17	-------
Nitrate (NO3)...........	.2	.1	.2	-------
Dissolved Solids.........	148	140	154	-------
Hardness as CaCO3:				
Total..................	72	64	66	-------
Noncarbonate...........	7	12	2	-------
Alkalinity as CaCO3.....	65	52	63	-------
Specific conductance (micromhos at 25° C)....	185	165	180	-------
pH......................	7.0	6.8	7.7	-------
Temperature.............	18	17	-------	17

GARNER, WAKE COUNTY

OWNERSHIP:

Municipal. Total population supplied about 8,000 in 1970 (2,000 metered customers, 300 of which are in suburban areas).

SOURCE:

Twelve wells: Town Hall Nos. 1 and 2; St Marys Nos. 1 and 2; and Nos. 2, 3, 5-7, 9-11. Supplemented by the City of Raleigh.

Well No. 1 (Town Hall), WK-284, located at lat 35°42'22", long 78°36'20". Driller: Poole Bros Well Drilling and Boring Co. Date drilled: ________. Total depth: ________. Diameter: 6 in. Cased to: ________. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: ________ ft. Yield: 15 gpm. Pumping level: ________. Type pump: submergible. Pump setting: ________.

Well No. 2 (Town Hall), WK-285, located at: lat 35°42'23", long 78°36'21". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: ________. Total depth: ________. Diameter: 6 in. Cased to: ________. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: ________. Yield: 25 gpm. Pumping level: ________. Type pump: submergible. Pump setting: ________.

Well No. 1 (St. Marys Street), WK-286, located at: lat 35°42'08", long 78°36'56". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: 1948. Total depth: 147 ft. Diameter: 6 in. Cased to: 90 ft. Type of finish: open hole. Topography: hilltop. Aquifer: granite. Static water level: 41 ft. Yield: 75 gpm. Pumping level: ________. Type pump: submergible. Pump setting: 125 ft.

Well No. 2 (St. Marys Street), WK-287, located at: lat 35°42'08", long 78°36'56". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: ________. Total depth: 200 ft. Diameter: 8 in. Cased to: ________. Type of finish: open hole. Topography: hilltop. Aquifer: granite. Static water level: ________. Yield: 33 gpm. Pumping level: ________. Type pump: submergible. Pump setting: 150 ft.

Well No. 2 (Sunset Street), WK-288, located at: lat 35°42'17", long 78°36'53". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: ________. Total depth: ________. Diameter: 6 inches. Cased to: 100 ft. Type of finish: open hole. Topography: hilltop. Aquifer: granite. Static water level: ________ Yield: 30 gpm. Pumping level: 61 ft. Type pump: submergible. Pump setting: 100 ft.

Well No. 3 (Dupree Street), WK-184, located at: lat 35°42'24", long 78°36'58". Driller: Heater Well Co. Date drilled: 1957. Total depth: 491 ft. Diameter: 8 in. Cased to: 166 ft. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: 26 ft. Yield: 75 gpm. Pumping level: 162 ft. Type pump: submergible. Pump setting 192 ft.

GARNER, WAKE COUNTY

Well No. 5 (Perdue Street), WK-289, located at: lat 35°42'53", long 78°37'02". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: 1956. Total depth: 135 ft. Diameter: 6 in. Cased to: 33 ft. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: 23 ft. Yield: 35 gpm. Pumping level: 130 ft. Type pump: submergible. Pump setting: ________.

Well No. 6 (School Acres), WK-183, located at lat 35°42'51", long 78°36'50". Driller: Heater Well Co. Date drilled: 1950. Total depth: 251 ft. Diameter: 6 in. Cased to: 73 ft. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: ________. Yield: 30 gpm. Pumping level: ________. Type pump: submergible. Pump setting: 125 ft.

Well No. 7 (Powell Drive), WK-182, located at lat 35°43'03", long 78°36'45". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: 1953. Total depth: 125 ft. Diameter: 6 in. Cased to: 53 ft. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: ________. Yield: 30 gpm. Pumping level: ________. Type pump: submergible. Pump setting: ________.

Well No. 9 (Fire house), WK-186, located at: lat 35°42'25", long 78°36'37". Driller: Heater Well Co. Date drilled: 1954. Total depth: 192 ft. Diameter: 8 in. Cased to: 166 ft. Type of finish: open hole. Topography: hilltop. Aquifer: granite. Static water level: ________. Yield: 90 gpm. Pumping level: ________. Type pump: submergible. Pump setting: ________.

Well No. 10 (Penny Street), WK-187, located at: lat 35°42'31", long 78"36'24". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: 1929. Total depth: 125 ft. Diameter: 6 in. Cased to: 43 ft. Type of finish: open hole. Topography: hilltop. Aquifer: granite. Static water level: 19 ft. Yield: 30 gpm. Pumping level: ________. Type pump: submergible. Pump setting: ________.

Well No. 11 (Cloverdale), WK-181, located at: lat 35°43'45", long 78°36'40". Driller: Poole Bros. Well Drilling & Boring Co. Date drilled: 1960. Total depth: 295 ft. Diameter: 8 in. Cased to: 20 ft. Type of finish: open hole. Topography: hillside. Aquifer: granite. Static water level: ________. Yield: 150 gpm. Pumping level: ________. Type pump: submergible. Pump setting: ________.

TOTAL USE:

Average 0.4 mgd, estimated; maximum daily not available.

INDUSTRIAL USE:

0.01 mgd, estimated.

TREATMENT:

None.

RATED CAPACITY OF TREATMENT PLANT:

None.

GARNER, WAKE COUNTY

PUMPING CAPACITY:

Raw water, 0.86 mgd; finished water, none.

RAW-WATER STORAGE:

Two elevated tanks: 125,000 and 500,000 gallons.

FUTURE PLANS:

Plan to acquire, through annexation, two additional wells with a reported yield of 0.13 mgd.

WATER-RESOURCES APPRAISAL:

Surface water: The south and west parts of Garner are drained by tributaries of Swift Creek and the remainder by tributaries of Walnut Creek. The average discharge of streams draining the area is 0.7 mgd per square mile. Minimum flows generally exceed 0.03 mgd per square mile and the 7-day, 2-year low flow is 0.10 mgd per square mile. The largest nearby streams are Swift Creek to the southwest and Walnut Creek to the north. Swift Creek is used for a part of Raleigh's water supply and Walnut Creek receives Raleigh's sewage effluent. Therefore, neither creek would be suitable for development of a water supply.

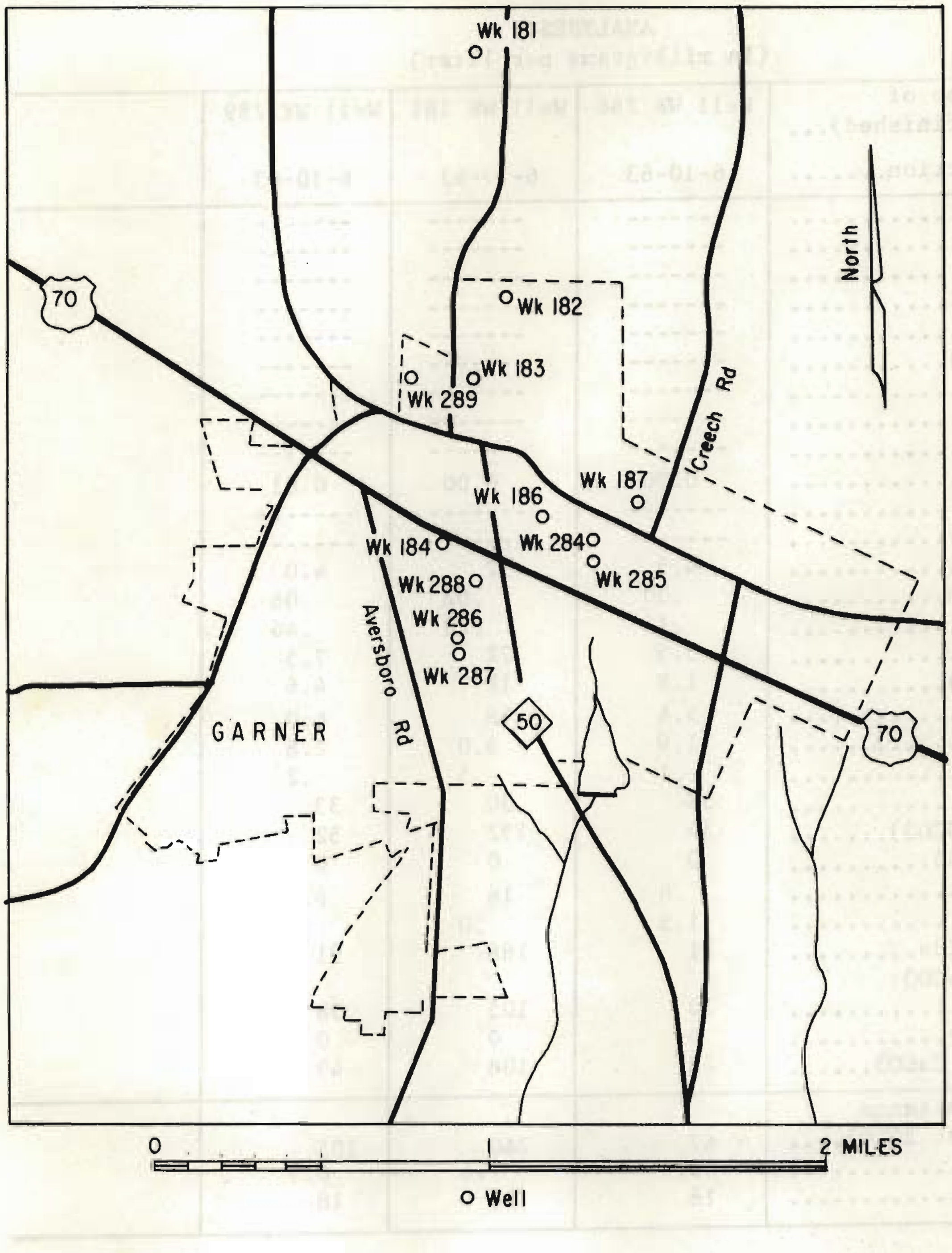
Garner began buying water from Raleigh in 1967 and at the present time obtains more than 50 percent of its water in this manner. This seems to be the best source for future water supply if Raleigh is willing and able to meet Garner's expanding needs.

Ground water: The Town of Garner overlies two principal geologic rock units: granite in the east part of town, and mica-gneiss in the west part. These rocks are weathered rather deeply in the Garner area with the thickness of the weathered material being more than 100 feet deep in places.

The municipal water system initially was supplied by one privately-owned well drilled in 1929. Currently twelve wells, including the original well, are in use. The reported yields of these wells range from 15 to 150 gpm and total 618 gpm, or 0.89 mgd. The depths of the wells range from 125 to 491 feet and the spacing ranges from 200 to more than 4,000 feet apart. It is probable that there is interference between the closely-spaced wells. To avoid interference the minimum well spacing is probably on the order of 2,500 feet for continuously pumped wells in the Garner area.

The chemical quality of ground water in the Garner area is generally excellent and usable without treatment.

CITY OF GARNER



GARNER, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well WK 286	Well WK 181	Well WK 289	
Date of collection.......	6-10-63	6-10-63	6-10-63	
Copper (Cu).............	-------	-------	-------	
Cobalt (Co).............	-------	-------	-------	
Zinc (Zn)...............	-------	-------	-------	
Chromium (Cr)...........	-------	-------	-------	
Boron (B)...............	-------	-------	-------	
Strontium (Sr)..........	-------	-------	-------	
Barium (Ba).............	-------	-------	-------	
Mercury (Hq)............	-------	-------	-------	
Lead (Pb)...............	-------	-------	-------	
Lithium (Li)............	0.00	0.00	0.01	
Cadmium (Cd)............	-------	-------	-------	
Cyanide (CN)............	-------	-------	-------	
Chloride (Cl)...........	4.5	12	4.0	
Manganese (Mn)..........	.00	.08	.08	
Iron (Fe)...............	.14	.23	.46	
Calcium (Ca)............	5.5	22	7.5	
Magnesium (Mg)..........	1.8	12	4.6	
Sodium (Na).............	5.4	18	6.0	
Potassium (K)...........	1.9	3.0	2.8	
Fluoride (F)............	.1	.5	.2	
Silica (SiO2)...........	32	30	33	
Bicarbonate (HCO3).......	34	132	52	
Carbonate (CO3)..........	0	0	0	
Sulfate (SO4)...........	.6	16	6.8	
Nitrate (NO3)...........	1.5	.0	.0	
Dissolved Solids.........	71	188	91	
Hardness as CaCO3:				
Total..................	20	105	38	
Noncarbonate...........	0	0	0	
Alkalinity as CaCO3......	28	108	43	
Specific conductance (micromhos at 25° C)....	67	260	105	
pH.......................	6.7	7.6	6.9	
Temperature..............	18	18	18	

RALEIGH, WAKE COUNTY

OWNERSHIP:

Municipal. Also supplements the water supplies of Cary and Garner. Total population supplied about 130,000 in 1970 (32,405 metered customers, about 1,000 of which are in suburban areas).

SOURCE:

Walnut Creek impounded in Lake Raleigh and Lake Johnson: The intake is in Lake Raleigh at lat 35°45'56", long 78°40'38", about 3 miles south of the Bain treatment plant. Swift Creek impounded in Lake Benson and Lake Wheeler: The intake is in Lake Benson at lat 35°39'44", long 78°36'42", about 7 miles south of the Bain treatment plant. Neuse River impounded by a low dam: The intake is at lat 35°57'01", long 78°34'56", about 3 miles north of the Johnson treatment plant.

RAW-WATER STORAGE:

Lake Raleigh, 100 million gallons; Lake Johnson, 740 million gallons; Lake Benson, 1 billion gallons; Lake Wheeler, 2 billion gallons; raw water reservoir at Johnson treatment plant, 70 million gallons.

ALLOWABLE DRAFT:

Estimated combined allowable draft of the four lakes supplying the Bain plant is 21.7 mgd with an adjusted storage of 3.7 billion gallons. Allowable draft of the Neuse River is not estimated due to the number of upstream diversions.

TOTAL USE:

Average (1970), 18.70 mgd, metered; maximum daily (9-24-70), 26.62 million gallons.

INDUSTRIAL USE:

2.0 mgd, estimated. Principal users include Watsons Seafood and Poultry Company, Inc., Cross Poultry Company, Mallinckrodt Chemical Works, Westinghouse Electric Corporation, and Corning Glass Works.

TREATMENT:

Prechlorination, coagulation with alum and lime, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, post chlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANTS:

E. B. Bain plant, 13 mgd; E. M. Johnson plant, 25 mgd.

PUMPING CAPACITY:

Raw water, 31 mgd; finished water 29 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 8,000,000 and 4,000,000 gallons; one storage reservoir, 8,000,000 gallons; four elevated tanks, 1,000,000, 1,000,000, 750,000, and 600,000 gallons.

RALEIGH, WAKE COUNTY

FUTURE PLANS:

First priority is to secure additional raw-water supply. Raleigh has been authorized to withdraw 100 million gallons a day from the proposed Falls Reservoir on the Neuse River. However, construction of the reservoir has been delayed and other interim measures are being considered.

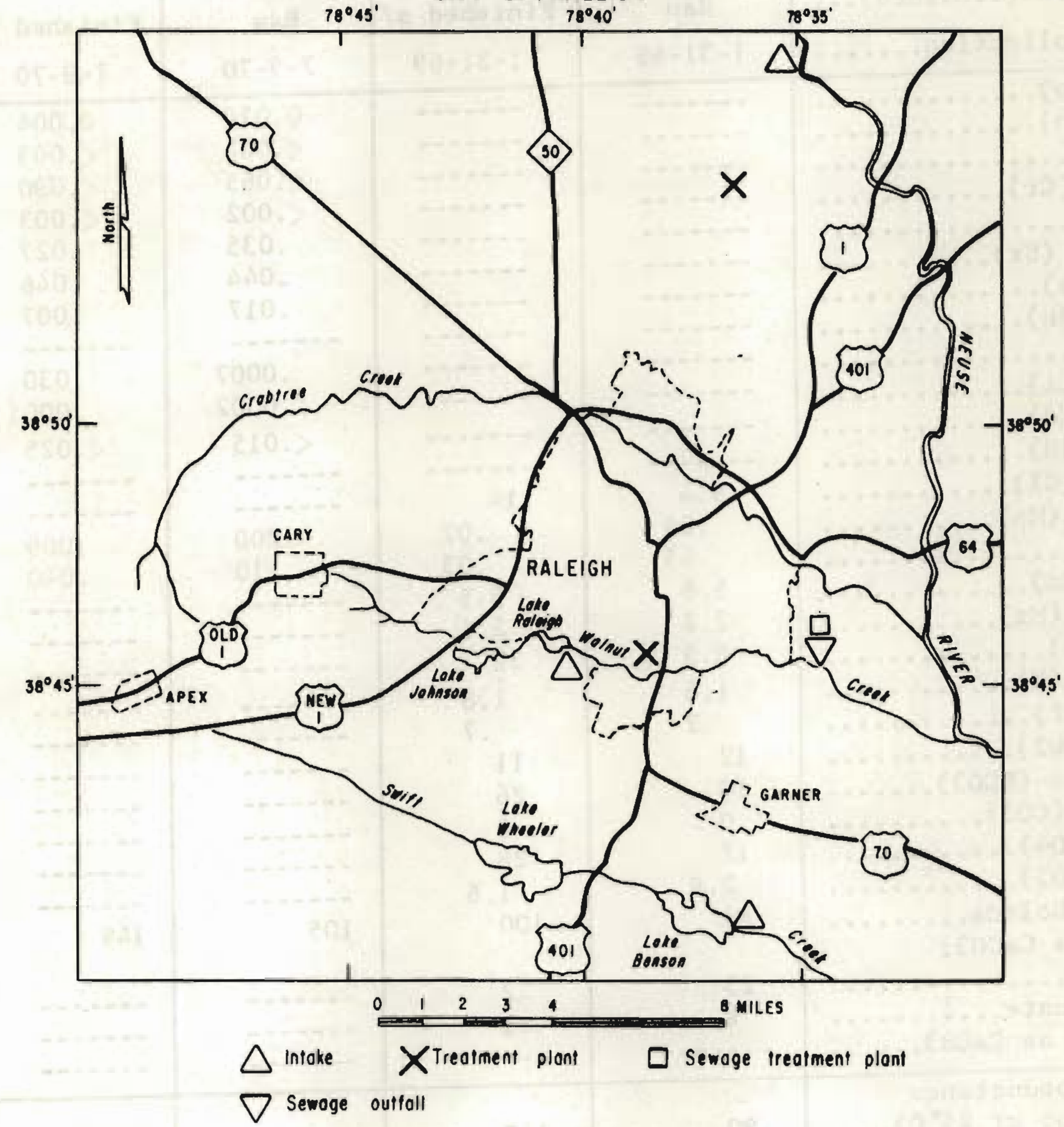
WATER-RESOURCES APPRAISAL:

Surface water: Raleigh is in central Wake County. The topography is characterized by gently rolling hills with broad, flat interstream areas. The area is drained by tributaries of Crabtree and Walnut Creeks of the Neuse River basin. Minimum flow of streams draining the immediate area is about 0.05 mgd per square mile. The average discharge of all streams is from 0.6 to 0.7 mgd per square mile, and the 7-day, 2-year low flow averages 0.15 mgd per square mile. The demand for raw water is approaching the amount available in the existing reservoir system and additional storage must be provided to meet future demands. The storage necessary to provide the authorized withdrawal of 100 mgd from the proposed Falls Reservoir, combined with the present allowable draft from the four lakes, should meet Raleigh's long-term needs.

Ground water: The City of Raleigh is predominantly underlain by biotite-feldspar gneiss. A belt of hornblende gneiss, about one mile in width, extends on a north-south axis through the central part of the city and the easternmost parts of the city are underlain by granite.

Water is stored in and moves along the joints, fractures, and foliation planes. Wells constructed at carefully selected sites should yield adequate amounts of water for domestic, small industrial, and air-conditioning supplies. Available data indicate wells in Raleigh have yields as high as 75 gpm. Casing depths range from 35 to 135 feet, and static water levels range from 10 feet to 30 feet below land surface. The chemical quality of water is generally good, but excessive amounts of iron occur locally.

CITY OF, RALEIGH



RALEIGH, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Neuse R. Raw	Finished a/	Neuse R. Raw	Finished a/
Date of collection.......	1-31-69	1-31-69	7-9-70	7-9-70
Copper (Cu).............	-------	-------	0.014	0.004
Cobalt (Co).............	-------	-------	<.002	<.003
Zinc (Zn)...............	-------	-------	<.065	<.090
Chromium (Cr)...........	-------	-------	<.002	<.003
Boron (B)...............	-------	-------	.035	.027
Strontium (Sr)..........	-------	-------	.044	.046
Barium (Ba).............	-------	-------	.017	.007
Mercury (Hq)............	-------	-------	-------	-------
Lead (Pb)...............	-------	-------	.0007	.030
Lithium (Li)............	-------	-------	.0002	.0001
Cadmium (Cd)............	-------	-------	<.015	<.025
Cyanide (CN)............	-------	-------	-------	-------
Chloride (Cl)...........	9.4	14	-------	-------
Manganese (Mn)..........	.05	.02	.200	.009
Iron (Fe)...............	.45	.03	.110	.040
Calcium (Ca)............	5.6	5.5	-------	-------
Magnesium (Mg)..........	2.2	2.1	-------	-------
Sodium (Na).............	8.9	22	-------	-------
Potassium (K)...........	1.6	1.8	-------	-------
Fluoride (F)............	.2	.7	-------	-------
Silica (SiO2)...........	12	11	-------	-------
Bicarbonate (HCO3)......	18	26	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)...........	12	28	-------	-------
Nitrate (NO3)...........	2.8	1.6	-------	-------
Dissolved Solids........	65	100	105	149
Hardness as CaCO3:				
Total..................	23	22	-------	-------
Noncarbonate...........	8	1	-------	-------
Alkalinity as CaCO3......	-------	-------	-------	-------
Specific conductance (micromhos at 25° C)....	90	147	-------	-------
pH......................	6.0	6.9		
Temperature.............	7.0	6.0	25.0	25.5

a/ E. M. Johnson plant.

WAKE FOREST, WAKE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,500 in 1970 (1,336 metered customers, 386 of which are in suburban areas).

SOURCE:

Smith Creek impounded in Wake Forest Lake. The intakes are 1-1/2 miles east of Wake Forest at lat 35°59'01", long 78°28'39". They are just upstream from the center of the dam, and water can be withdrawn at different depths.

RAW-WATER STORAGE:

Wake Forest Lake, 200 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.9 mgd with a storage of 200 million gallons.

TOTAL USE:

Average (1969), 0.38 mgd, metered; maximum daily (9-15-69), 0.75 million gallons.

INDUSTRIAL USE:

0.10 mgd, estimated. Principal users include Athey Products Company; Scovill, Schrader Division; and Neuse Plastics Company.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, adjustment of pH and removal of manganese with sodium hydroxide when necessary, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water, 3.0 mgd; finished water, 2.5 mgd.

FINISHED-WATER STORAGE:

One clear well, 250,000 gallons; three elevated tanks, 75,000, 300,000, and 300,000 gallons.

FUTURE PLANS:

None. Present system believed to be adequate for foreseeable demands.

WAKE FOREST, WAKE COUNTY

WATER-RESOURCES APPRAISAL:

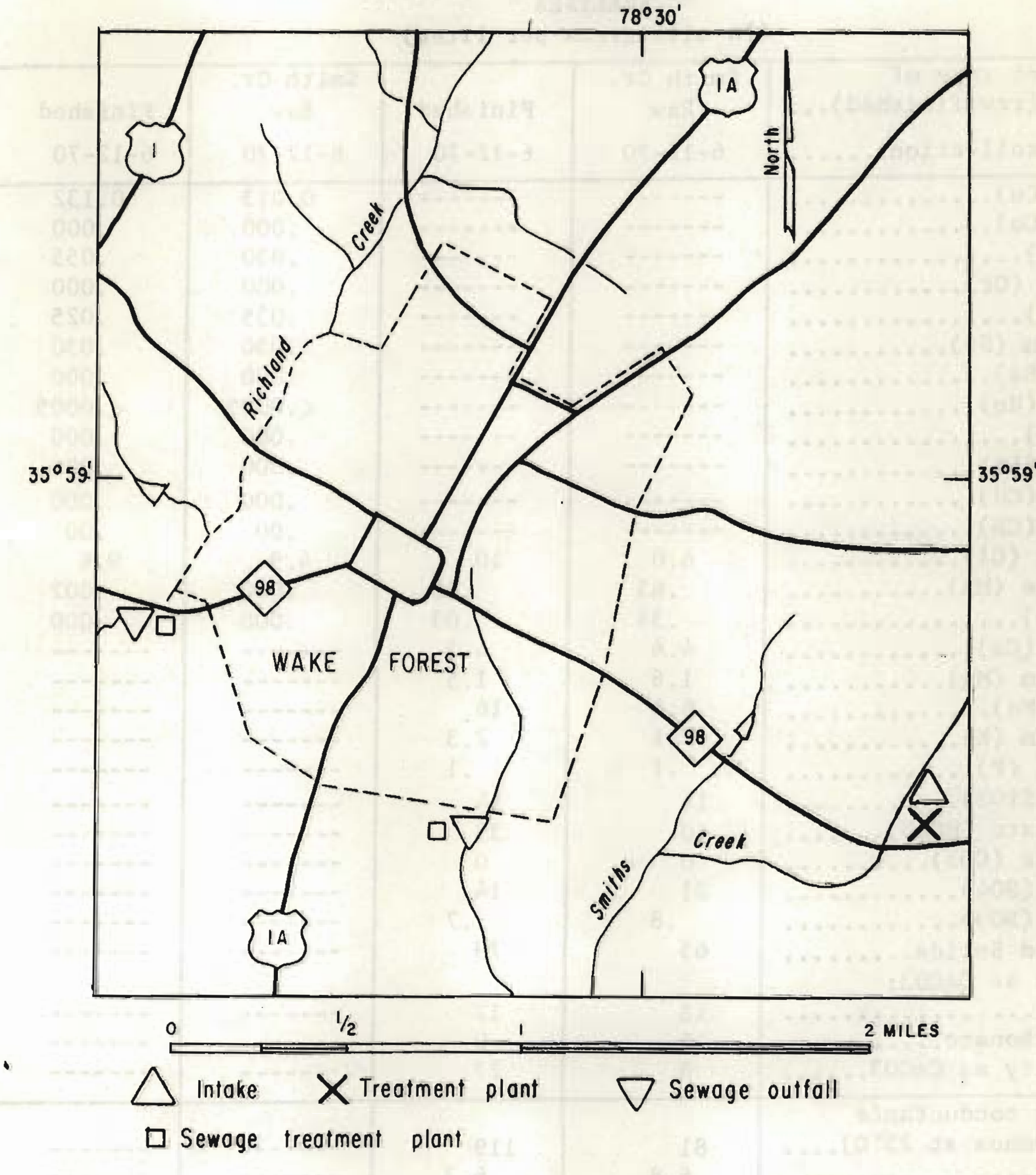
Surface water: Wake Forest is in the northern part of Wake County where the topography is characterized by rolling hills with gentle to moderately steep slopes. The area is drained by tributaries of Richland and Smiths Creeks of the Neuse River basin. Streams in the region are characterized by above-average low-flow yields. The low-flow yield generally exceeds about 0.2 mgd per square mile. The average discharge is 0.7 mgd per square mile. The 7-day, 2-year low flow is 0.3 mgd per square mile. The 200-million gallon reservoir presently in use has a capacity large enough to meet foreseeable needs. The estimated allowable draft with the present 200-million gallon reservoir is almost twice as great as the present average use, and is considered sufficient for foreseeable needs. Richland Creek or the proposed Falls Reservoir are potential sources of future water supplies.

Ground water: The Town of Wake Forest is underlain by Precambrian crystalline rocks that generally are gneissic in composition with interbedded schist. Mica, feldspar, and biotite minerals are abundant, and foliation and gneiss structures are well developed. Water occurs in the openings found along the foliation planes and other pore spaces of fractures in the rocks. Wells drilled into the rocks in the vicinity generally yield less than 25 gpm and are from 100 to 200 feet deep.

The lack of high-yielding wells in the Wake Forest vicinity indicates there is not a great potential for the development of large ground-water supplies. However, adequate supplies for domestic and small industrial needs can be developed if proper care is exercised in locating and drilling the wells.

The chemical quality of ground water from most wells in or near Wake Forest usually is good, but iron in excess of 0.3 mg/l and hardness-causing constituents in excess of 80 mg/l have been reported in water from some of the wells.

CITY OF WAKE FOREST



WAKE FOREST, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Smith Cr. Raw	Finished	Smith Cr. Raw	Finished
Date of collection.......	6-12-70	6-12-70	6-12-70	6-12-70
Copper (Cu).............	-------	-------	0.013	0.132
Cobalt (Co).............	-------	-------	.000	.000
Zinc (Zn)...............	-------	-------	.030	.055
Chromium (Cr)...........	-------	-------	.000	.000
Boron (B)...............	-------	-------	.035	.025
Strontium (Sr)..........	-------	-------	.030	.030
Barium (Ba).............	-------	-------	.000	.000
Mercury (Hq)............	-------	-------	<.0005	<.0005
Lead (Pb)...............	-------	-------	.000	.000
Lithium (Li)............	-------	-------	.000	.000
Cadmium (Cd)............	-------	-------	.000	.000
Cyanide (CN)............	-------	-------	.00	.00
Chloride (Cl)...........	6.0	10	4.9	9.6
Manganese (Mn)..........	.65	.02	.000	.002
Iron (Fe)...............	.34	.03	.000	.000
Calcium (Ca)............	4.6	4.5	-------	-------
Magnesium (Mg)..........	1.6	1.5	-------	-------
Sodium (Na).............	6.4	16	-------	-------
Potassium (K)...........	2.1	2.3	-------	-------
Fluoride (F)............	.1	.1	-------	-------
Silica (SiO2)...........	14	14	-------	-------
Bicarbonate (HCO3).......	10	33	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)...........	21	14	-------	-------
Nitrate (NO3)...........	.8	.7	-------	-------
Dissolved Solids.........	65	79	-------	-------
Hardness as CaCO3:				
Total..................	18	17	-------	-------
Noncarbonate...........	10	0	-------	-------
Alkalinity as CaCO3......	8	27	-------	-------
Specific conductance (micromhos at 25° C)....	81	119	-------	-------
pH......................	5.8	6.7	-------	-------
Temperature.............	23	24	23	24

WENDELL, WAKE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,200 in 1970 (700 metered customers, approximately 50 of which are in suburban areas).

SOURCE:

Lake Johnson, an abandoned rock quarry fed by ground water. The intake is about 1-1/2 miles northeast of Wendell at lat 35°47'06", long 78°20'41". One well (No. 8).

Well No. 8 (Zebulon Road), Wk 219, located at: lat 35°47'09", long 78°21'48". Driller: Poole Brothers Well Drilling & Boring Company. Date drilled: 1953. Total depth: 300 feet. Diameter: 8 inch. Cased to: 94 feet. Type of finish: Open hole. Topography: Hillside. Aquifer: Granite. Static water level: 30 feet. Yield: 30 gpm.

RAW-WATER STORAGE:

Lake Johnson, 200 million gallons.

ALLOWABLE DRAFT:

Pumpages from Lake Johnson in the past indicate that the allowable draft (or yield) from that source is in excess of 0.15 mgd.

TOTAL USE:

Average (1969), 0.19 mgd, metered; maximum daily (2-13-69), 0.30 mgd.

INDUSTRIAL USE:

0.02 mgd, estimated. Principal users include Wenco Furniture, Inc., Piedmont Assembly Products, Inc., and Monk-Henderson Tobacco Company.

TREATMENT:

Prechlorination, addition of calgon for iron treatment, and micro-strainer filtration. Water from well No. 8 is not treated.

RATED CAPACITY OF TREATMENT PLANT:

0.30 mgd.

PUMPING CAPACITY:

Raw water, 1.0 mgd; finished water, 1.0 mgd.

FINISHED WATER STORAGE:

Two clear wells, 5,000 and 500,000 gallons; one elevated tank, 100,000 gallons.

FUTURE PLANS:

Engineering study presently underway to determine the feasibility of using surface water as the principal source of raw water.

WENDELL, WAKE COUNTY

WATER-RESOURCES APPRAISAL:

Surface water: Wendell is in eastern Wake County where the topography is relatively flat or gently sloping. Buffalo Creek tributaries drain the western part of the town and Little River tributaries drain the eastern part. Streams in the immediate area have rather small low-flow yields, generally exceeding only 0.02 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile, and the 7-day, 2-year low flow is 0.12 mgd per square mile. The most dependable surface water source for future development probably is Little River. With adequate storage, Little River would supply sufficient water for foreseeable needs.

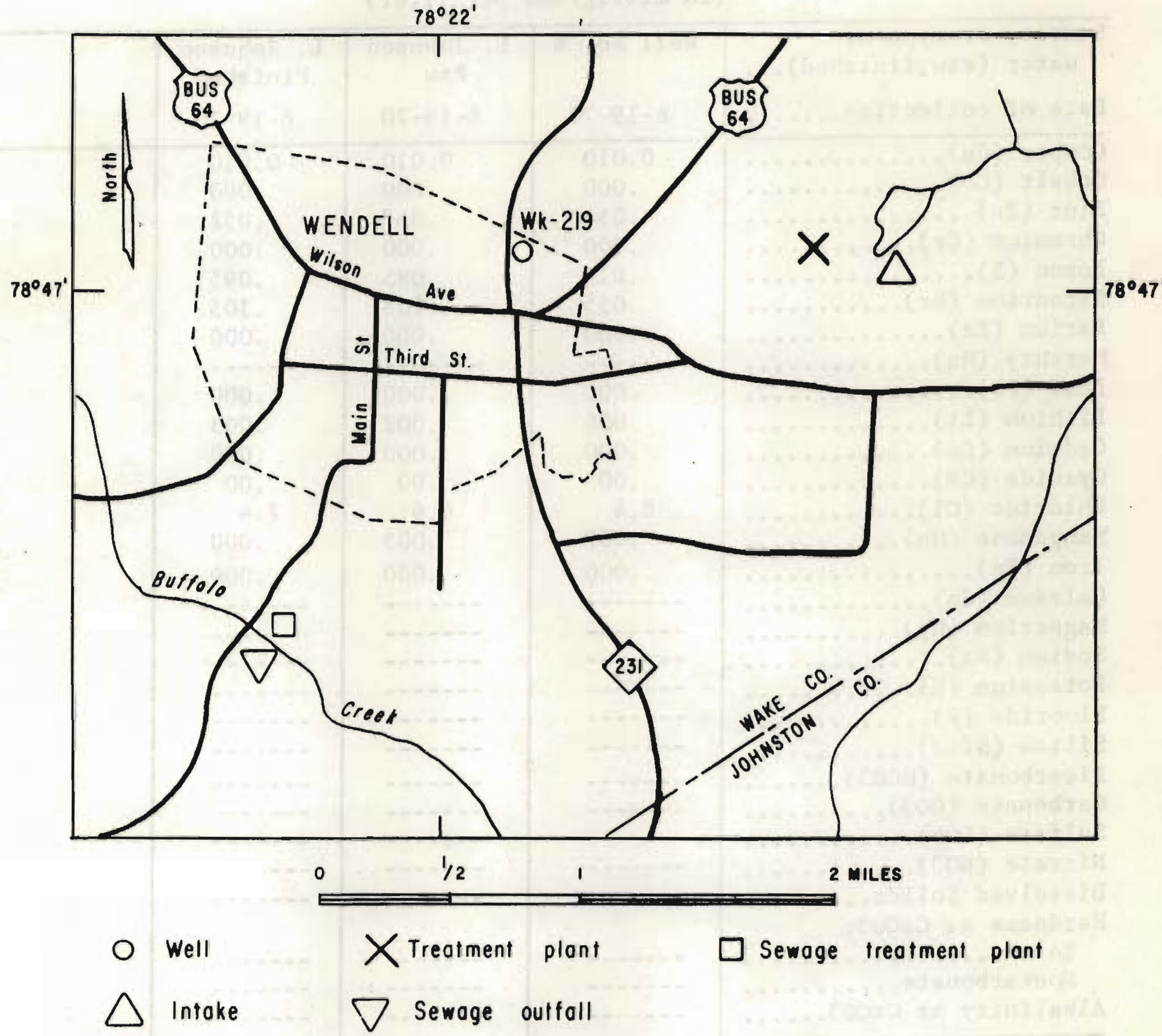
Ground water: The Town of Wendell is underlain entirely by light gray, coarse to medium-grained biotite granite.

Because of the jointing and sheeting patterns, granite rocks are among the better aquifers in the county. In the vicinity of Wendell, wells in granite yield as much as 80 gpm. Static water levels are usually less than 30 feet below ground surface, and specific capacities usually are about 1 gallon per foot of drawdown. The chemical quality of the water from granite generally is acceptable for municipal use with little or no treatment.

Prior to about 1963, the Town of Wendell obtained its water supply from seven wells which supplied an average daily demand of 0.1 mgd. At present, the town uses one of these wells as a supplement to its existing supply.

Wells drilled to depths of 100 to 200 feet in carefully selected sites spaced at least 1,000 to 1,500 feet apart should each yield about 0.04 mgd.

CITY OF WENDELL



WENDELL, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 8	L. Johnson Raw	L. Johnson Finished	
Date of collection.......	6-19-70	6-19-70	6-19-70	
Copper (Cu)..............	0.010	0.010	0.010	
Cobalt (Co)..............	.000	.000	.000	
Zinc (Zn)................	.054	.057	.052	
Chromium (Cr)............	.000	.000	.000	
Boron (B)................	.015	.085	.095	
Strontium (Sr)...........	.055	.105	.105	
Barium (Ba)..............	.000	.000	.000	
Mercury (Hq).............	-------	-------	-------	
Lead (Pb)................	.000	.000	.000	
Lithium (Li).............	.006	.002	.003	
Cadmium (Cd).............	.000	.000	.000	
Cyanide (CN).............	.00	.00	.00	
Chloride (Cl)............	8.4	6.6	7.4	
Manganese (Mn)...........	.002	.005	.000	
Iron (Fe)................	.000	.000	.000	
Calcium (Ca).............	-------	-------	-------	
Magnesium (Mg)...........	-------	-------	-------	
Sodium (Na)..............	-------	-------	-------	
Potassium (K)............	-------	-------	-------	
Fluoride (F).............	-------	-------	-------	
Silica (SiO2)............	-------	-------	-------	
Bicarbonate (HCO3).......	-------	-------	-------	
Carbonate (CO3)..........	-------	-------	-------	
Sulfate (SO4)............	-------	-------	-------	
Nitrate (NO3)............	-------	-------	-------	
Dissolved Solids.........	-------	-------	-------	
Hardness as CaCO3:				
Total..................	-------	-------	-------	
Noncarbonate...........	-------	-------	-------	
Alkalinity as CaCO3......	-------	-------	-------	
Specific conductance (micromhos at 25° C)....	-------	-------	-------	
pH.......................	-------	-------	-------	
Temperature..............	22	27	27	

Note.--See additional analyses on next page.

WENDELL, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	L. Johnson Raw	L. Johnson Finished		
Date of collection.......	1-31-72	1-31-72		
Copper (Cu).............	-------	-------		
Cobalt (Co).............	-------	-------		
Zinc (Zn)...............	-------	-------		
Chromium (Cr)...........	-------	-------		
Boron (B)...............	-------	-------		
Strontium (Sr)..........	-------	-------		
Barium (Ba).............	-------	-------		
Mercury (Hq)............	-------	-------		
Lead (Pb)...............	-------	-------		
Lithium (Li)............	-------	-------		
Cadmium (Cd)............	-------	-------		
Cyanide (CN)............	-------	-------		
Chloride (Cl)...........	7.0	6.9		
Manganese (Mn)..........	.008	.005		
Iron (Fe)...............	.000	.000		
Calcium (Ca)............	16	16		
Magnesium (Mg)..........	2.9	2.9		
Sodium (Na).............	10	10		
Potassium (K)...........	2.6	2.6		
Fluoride (F)............	0.4	0.5		
Silica (SiO2)...........	13	13		
Bicarbonate (HCO3)......	74	74		
Carbonate (CO3).........	0	0		
Sulfate (SO4)...........	4.4	4.4		
Nitrate (NO3)...........	0.3	0.6		
Dissolved Solids........	100	101		
Hardness as CaCO3:				
Total..................	51	51		
Noncarbonate...........	0	0		
Alkalinity as CaCO3......	61	61		
Specific conductance (micromhos at 25°C)...	150	150		
pH......................	6.9	7.2		
Temperature.............	8.5	9.5		

ZEBULON, WAKE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,300 in 1970 (829 metered customers, approximately 100 of which are in suburban areas).

SOURCE:

Little River. The intake is at lat 35°49'42", long 78°21'09", near the east bank in open channel, 300 feet above a low level dam at U. S. Highway 64 bypass 2 miles west of Zebulon.

RAW-WATER STORAGE:

Negligible.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.6 mgd without storage.

TOTAL USE:

Average (1969), 0.30 mgd, estimated.

INDUSTRIAL USE:

0.02 mgd, estimated. Principal users include: Omark Industries, Hydraulic Materials Handling Division; Devil Dog Manufacturing Company, Inc.; and Illinois Tool Works.

TREATMENT:

Prechlorination, coagulation with alum, addition of carbon for control of taste and odor, anthracite filtration, adjustment of pH with lime, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

1.5 mgd.

PUMPING CAPACITY:

Raw water, 1.4 mgd; finished water, 3.7 mgd.

FINISHED-WATER STORAGE:

One clear well, 500,000 gallons; one elevated tank, 75,000 gallons.

FUTURE PLANS:

Treatment plant was designed and constructed so that with the addition of two settling basins and two filters capacity can be increased to 3 mgd. Addition of fluoride is planned in the near future.

ZEBULON, WAKE COUNTY

WATER-RESOURCES APPRAISAL:

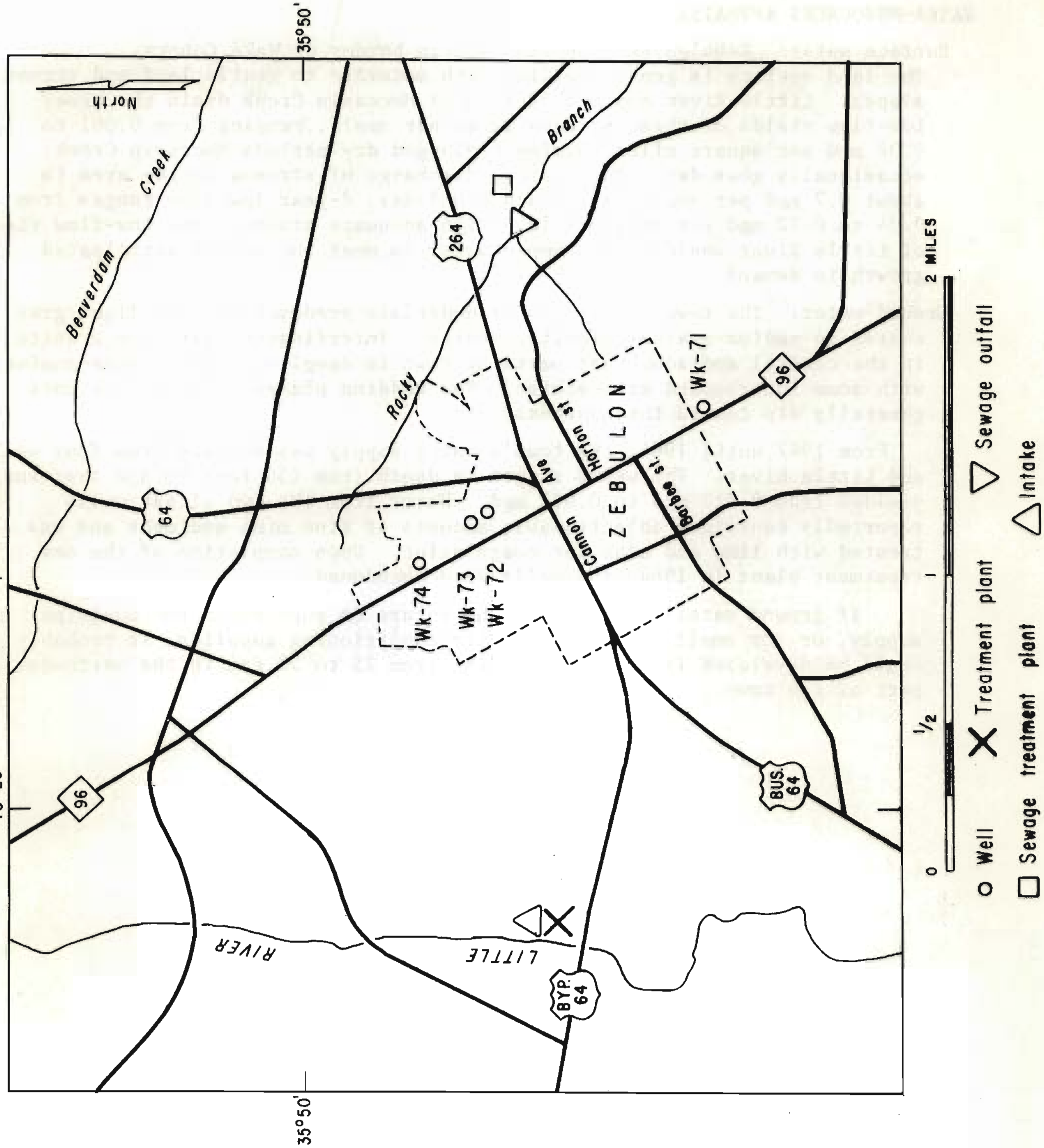
Surface water: Zebulon is near the eastern border of Wake County. The land surface is gently rolling with moderate to gentle land and stream slopes. Little River and tributaries of Moccasin Creek drain the area. Low-flow yields of these streams is rather small, ranging from 0.001 to 0.02 mgd per square mile. During prolonged dry periods Moccasin Creek occasionally goes dry. The average discharge of streams in the area is about 0.7 mgd per square mile, and the 7-day, 2-year low flow ranges from 0.04 to 0.10 mgd per square mile. With adequate storage, the low-flow yield of Little River would supply ample water to meet the normal anticipated growth in demand.

Ground water: The town of Zebulon is underlain predominantly by light gray coarse to medium-grained biotite granite. Interfingered with the granite in the central and southeast parts of town is deeply-weathered mica-gneiss with some interbedded mica-schist. The bedding planes of this rock unit generally dip toward the southeast.

From 1947 until 1964, the town's water supply was derived from four wells and Little River. The wells ranged in depth from 150 feet to 312 feet and yielded from 0.017 mgd to 0.072 mgd. Water from the two oldest wells reportedly contained objectionable amounts of fine mica sediment and was treated with lime and alum for coagulation. Upon completion of the new treatment plant in 1964, the wells were abandoned.

If ground water is needed in the future to supplement the municipal supply, or for small industrial or air-conditioning supplies, it probably could be developed from wells yielding from 25 to 50 gpm in the northwest part of the town.

CITY OF ZEBULON



ZEBULON, WAKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Little R. Raw	Finished	Little R. Raw	Finished
Date of collection.......	5-23-66	5-23-66	6-12-70	6-12-70
Copper (Cu).............	-------	-------	0.024	0.012
Cobalt (Co).............	-------	-------	.000	.000
Zinc (Zn)...............	-------	-------	.090	.050
Chromium (Cr)...........	-------	-------	.000	.000
Boron (B)...............	-------	-------	.030	.025
Strontium (Sr)..........	-------	-------	.030	.055
Barium (Ba).............	-------	-------	.000	.000
Mercury (Hq)............	-------	-------	<.0005	<.0005
Lead (Pb)...............	-------	-------	.000	.000
Lithium (Li)............	-------	-------	.000	.000
Cadmium (Cd)............	-------	-------	.000	.000
Cyanide (CN)............	-------	-------	.00	.00
Chloride (Cl)...........	2.0	6.5	4.7	6.7
Manganese (Mn)..........	.02	.01	.000	.001
Iron (Fe)...............	.02	.03	.000	.000
Calcium (Ca)............	2.5	18	-------	-------
Magnesium (Mg)..........	.2	.7	-------	-------
Sodium (Na).............	3.3	4.9	-------	-------
Potassium (K)...........	1.7	1.8	-------	-------
Fluoride (F)............	.0	.0	-------	-------
Silica (SiO2)...........	8.6	11	-------	-------
Bicarbonate (HCO3)......	11	41	-------	-------
Carbonate (CO3).........	0	0	-------	-------
Sulfate (SO4)...........	3.8	20	-------	-------
Nitrate (NO3)...........	.5	.3	-------	-------
Dissolved Solids........	40	89	-------	-------
Hardness as CaCO3:				
Total...................	7	49		-------
Noncarbonate............	0	16		-------
Alkalinity as CaCO3.....	9	34	-------	-------
Specific conductance (micromhos at 25° C)....	39	133	-------	
pH......................	6.1	7.4		
Temperature.............	22	-------	21	23

YADKIN COUNTY
WATER-RESOURCES APPRAISAL

Yadkin County is in the northwest part of the Piedmont Province. There is a short chain of low mountains and a few isolated knobs in the northwest corner of the county. The topography in the remainder of the county is characterized by rolling hills with moderate to steep land slopes. The Yadkin River forms the north and east boundaries of the county and receives the drainage of the entire county. The average discharge of the Yadkin River tributaries draining the county is 0.8 mgd per square mile. Minimum flows of the tributaries average 0.06 mgd per square mile, and their 7-day, 2-year low flow is 0.2 mgd per square mile. The average discharge of the Yadkin River in Yadkin County is about 1.1 mgd per square mile. Minimum natural flows of the river are augmented by release of water from W. Kerr Scott Reservoir in Wilkes County. Jonesville obtains its municipal supply from surface sources. Other municipal and most domestic and industrial supplies are obtained from ground-water sources.

Many varieties of rock crop out in Yadkin County, but they may be grouped into four northeast-southwest trending units as granite-gneiss, quartzite-schist, Triassic sediments, and diorite-gabbro. The granite-gneiss unit occupies the entire western half of the county and two smaller belts on the eastern side of the county. Quartzite-schist underlies a large area in the east-central part and diorite-gabbro underlies most of the eastern edge of the county. Bedded Triassic sediments occupy a relatively small area in the south-central part of the county. The mantle of weathered rock overlying all rock units ranges in depth from a few inches to more than 100 feet, extending to somewhat greater depth in the granite-gneiss unit. The following table shows typical reported ranges in yields and depths of drilled wells in the various rocks in the county:

Rock unit	Range in yield (gpm)	Range in depth (feet)
Granite-gneiss	0-250	17-638
Quartzite-schist	2-300	20-500
Triassic	7-40	95-170
Diorite-gabbro	1-45	103-405

Three towns, Yadkinville, East Bend, and Boonville, use ground water for public supplies. Most rural domestic and some small industrial users are supplied by wells or springs.

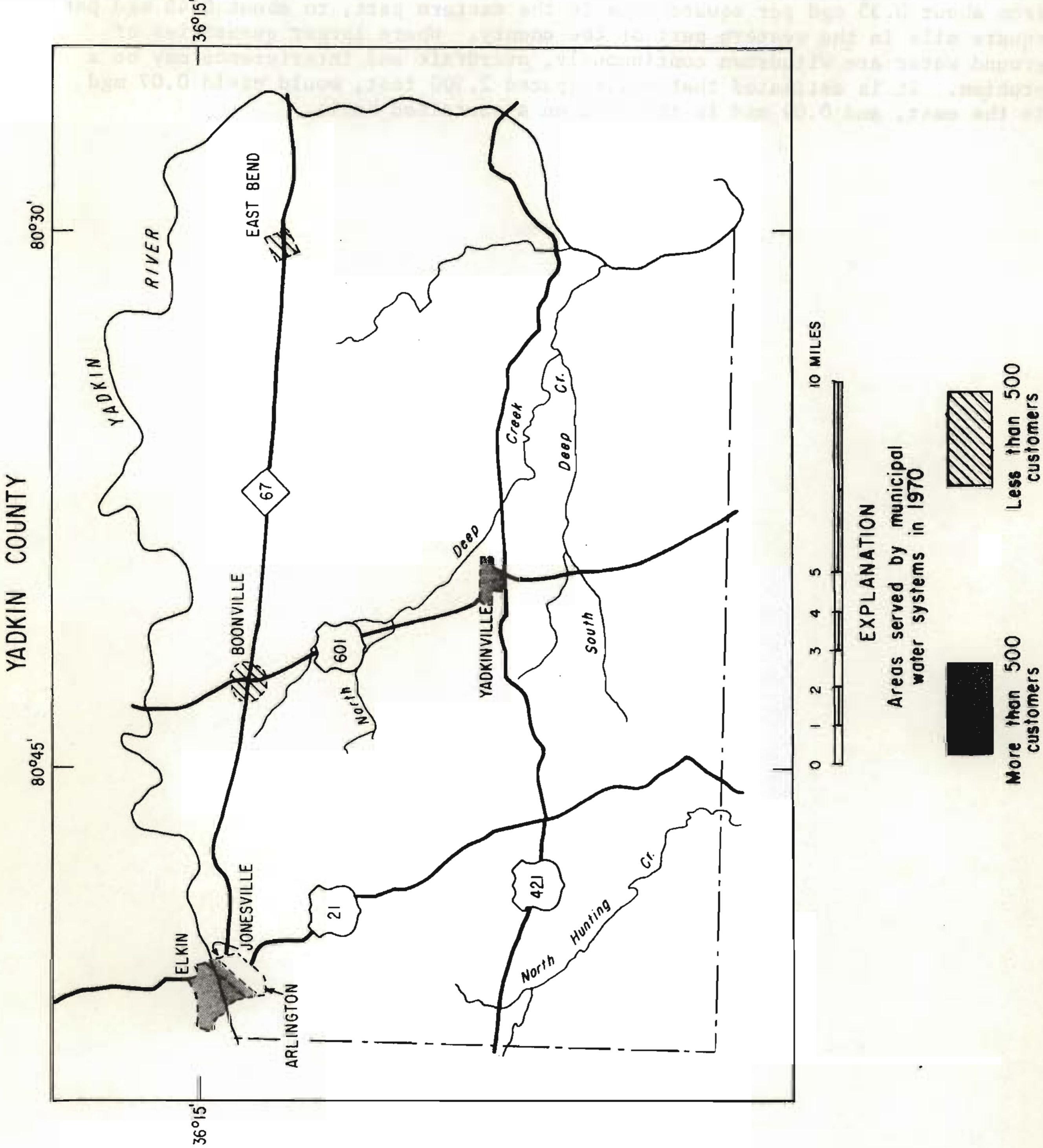
The chemical quality of the ground water is acceptable for most uses. In some parts of each rock unit however, concentrations of iron, fluoride, manganese, and hardness-causing constituents are higher than desirable.

Potential supplies of ground water are adequate, with proper planning and management, for small industrial and small municipal needs. Adequate supplies for these purposes are available if the well-sites are selected where the weathered rock is thickest, as indicated by low or flat topography. In these favorable areas it is estimated that the quantity of water available ranges

YADKIN COUNTY

WATER-RESOURCES APPRAISAL

from about 0.35 mgd per square mile in the eastern part, to about 0.45 mgd per square mile in the western part of the county. Where larger quantities of ground water are withdrawn continuously, overdraft and interference may be a problem. It is estimated that wells spaced 2,500 feet, would yield 0.07 mgd in the east, and 0.09 mgd in the west on a sustained basis.


YADKIN COUNTY
36°15'
80°30'
80°45'
36°15'
YADKIN
RIVER
EAST BEND
BOONVILLE
67
601
21
421
ELKIN
JONESVILLE
ARLINGTON
YADKINVILLE
North
Deep
Creek
Deep
Cr.
South
North
Hunting
Cr.
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1970
More than 500 customers
Less than 500 customers

JONESVILLE, YADKIN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,200 in 1970 (625 metered customers, 15 of which are in suburban areas).

SOURCE:

Yadkin River. The intakes are on the south bank of the river in Jonesville at lat 36°14'27", long 80°51'10".

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft is 175 mgd without storage.

TOTAL USE:

Average 1970, 0.22 mgd, metered; maximum daily (12-9-70), 0.49 million gallons.

INDUSTRIAL USE:

0.04 mgd, estimated.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor when necessary, rapid sand filtration, adjustment of pH with lime, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.5 mgd.

PUMPING CAPACITY:

Raw water, 1.0 mgd; finished water, 1.7 mgd.

FINISHED-WATER STORAGE:

One clear well, 200,000 gallons; one stand pipe, 640,000 gallons.

FUTURE PLANS:

Plan construction of a 20-million gallon raw-water settling reservoir, possibly in 1971.

JONESVILLE, YADKIN COUNTY

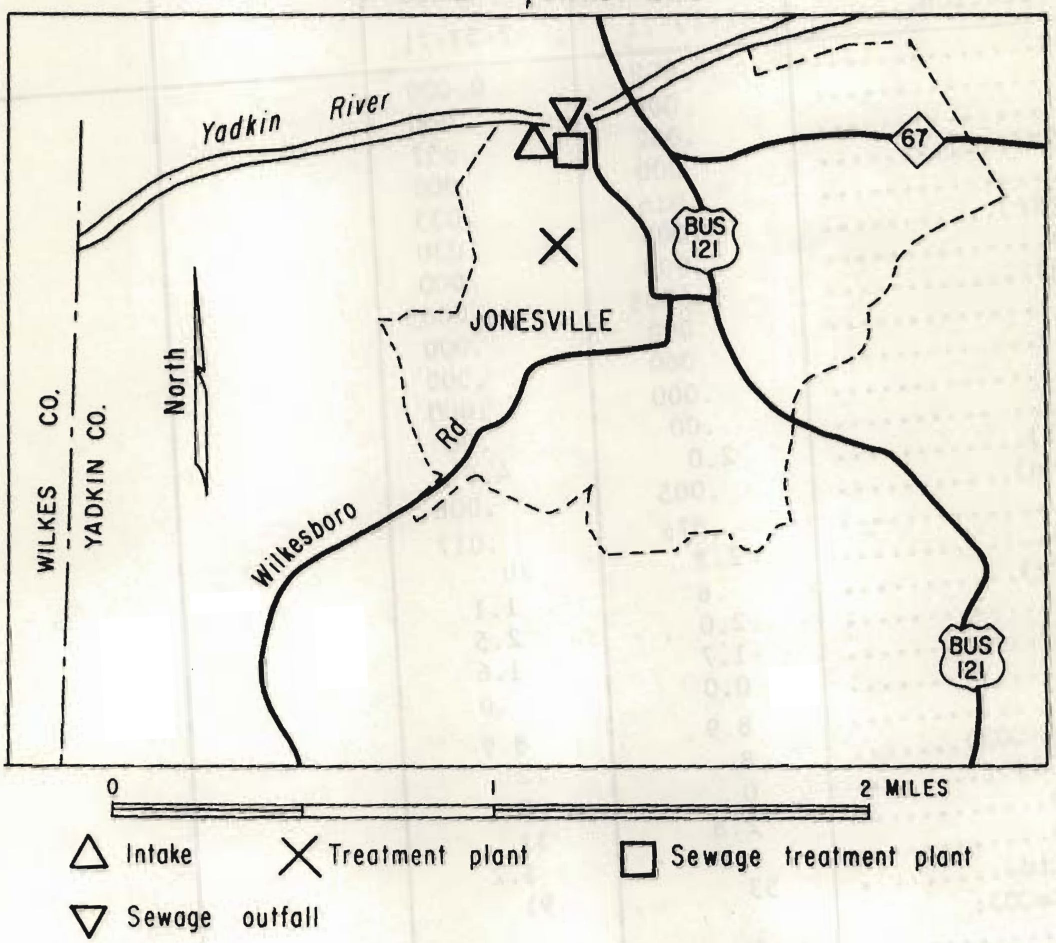
WATER-RESOURCES APPRAISAL:

Surface water: Jonesville is located on the south bank of the Yadkin River in the northwest corner of Yadkin County. The minimum flow of the Yadkin River is hundreds of times greater than that needed to supply the needs of Jonesville.

Ground water: The rocks underlying the Town of Jonesville are principally granite and granite-gneiss. These rocks are weathered to an average depth of about 100 feet. Wells in the gneiss in the vicinity of Jonesville are drilled to depths ranging from 200 to nearly 500 feet, and are reported to yield 20-30 gpm.

The chemical quality of ground water in the granite-gneiss at Jonesville is generally acceptable for use, without treatment, but may contain dissolved iron slightly in excess of 0.3 milligrams per liter.

CITY OF JONESVILLE



JONESVILLE, YADKIN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Yadkin R. Raw	Finished		
Date of collection.......	2-23-71	2-23-71		
Copper (Cu).............	0.000	0.000		
Cobalt (Co).............	.000	.000		
Zinc (Zn)...............	.032	.052		
Chromium (Cr)...........	.000	.000		
Boron (B)...............	.016	.033		
Strontium (Sr)..........	.000	.030		
Barium (Ba).............	.000	.000		
Mercury (Hq)............	<.0005	<.0005		
Lead (Pb)...............	.000	.000		
Lithium (Li)............	.000	.000		
Cadmium (Cd)............	.000	.000		
Cyanide (CN)............	.00	.00		
Chloride (Cl)...........	2.0	4.6		
Manganese (Mn)..........	.005	.008		
Iron (Fe)...............	.076	.017		
Calcium (Ca)............	2.2	20		
Magnesium (Mg)..........	.6	1.1		
Sodium (Na).............	2.0	2.5		
Potassium (K)...........	1.7	1.6		
Fluoride (F)............	0.0	.0		
Silica (SiO2)...........	8.9	8.9		
Bicarbonate (HCO3).......	8	22		
Carbonate (CO3).........	0	0		
Sulfate (SO4)...........	2.8	33		
Nitrate (NO3)...........	1.9	1.2		
Dissolved Solids.........	53	91		
Hardness as CaCO3:				
Total.................	8	55		
Noncarbonate...........	0	36		
Alkalinity as CaCO3......	8	18		
Specific conductance (micromhos at 25°C)....	35	130		
pH......................	6.0	8.5		
Temperature..............	-------	-------		

YADKINVILLE, YADKIN COUNTY

OWNERSHIP:

Municipal. Total population supplied, 3,000 (950 metered customers, about 120 of which are in suburban areas).

SOURCE:

Seven wells: Nos. 1, 2, 3, 4, 5, 6, 8. One auxiliary well No. 7.

Well No. 1, Yd-1, located at: lat 36°07'49", long 80°39'48". Driller: R. E. Faw. Date drilled: 1941. Total depth: 267 ft. Diam: 8 in. Cased to: 56 ft. Type of finish: open hole. Topography: Slope. Aquifer: crystalline rock (granite-gneiss). Static water level: ________. Yield: 23 gpm. Pumping level: ________. Type pump: submersible. Pump setting: ________.

Well No. 2, Yd-2, located at: lat 36°07'30", long 80°40'12". Driller: ________. Date drilled: 1958. Total depth: 175 ft. Diam: 6 in. Cased to: ________. Type of finish: open hole. Topography: large draw. Aquifer: crystalline rock (granite-gneiss). Static water level: ________. Yield: 30 gpm. Pumping level: ________. Type pump: submersible. Pump setting: ________.

Well No. 3, Yd-3, located at: lat 36°07'58", long 80°40'06". Driller: Newman Bros. Date Drilled: 1957. Total depth: 275 ft. Diam: 6 in. Cased to: ________. Type of finish: open hole. Topography: Slope of draw. Aquifer: crystalline rock (granite-gneiss). Static water level: ________. Yield: 35 gpm. Pumping level: ________. Type pump: turbine. Pump setting: ________.

Well No. 4, Yd-4, located at: lat 36°08'13", long 85°39'48". Driller: Heater Well Co. Date drilled: 1935. Total depth: 286 ft. Diam: 6 in. Cased to: 60 ft. Type of finish: open hole. Topography: Slope. Aquifer: Crystalline rock (granite-gneiss). Static water level: -50 ft. (1951). Yield: 30 gpm. Pumping level: ________. Type pump: turbine. Pump setting: ________.

Well No. 5, Yd-5, located at: lat 36°08'30", long 80°39'39". Driller: W. S. Steelman. Date drilled: 1956. Total depth: 187 ft. Diam: 6 in. Cased to: 80 ft. Type of finish: open hole. Topography: slope. Aquifer: crystalline rock (granite-gneiss). Static water level: 40 ft. Yield: 30 gpm. Pumping level: 162 ft. Type pump: submersible. Pump setting: ________.

Well No. 6, Yd-6, located at: lat 36°08'29", long 80°40'24". Driller: ________. Date drilled: 1957. Total depth: 150 ft. Diam: 6 in. Cased to: 45 ft. Type of finish: open hole. Topography: hill. Aquifer: crystalline rock (granite-gneiss). Static water level: ________. Yield: 35 gpm. Pumping level: ________. Type pump: turbine. Pump setting: ________.

YADKINVILLE, YADKIN COUNTY

Well No. 7, Yd-7, located at: lat 36°07'59", long 80°40'59". Driller: Newman Bros. Date drilled: 1959. Total depth: 272 ft. Diam: 6 in. Cased to: ________. Type of finish: open hole. Topography: draw. Aquifer: crystalline rock (granite-gneiss). Static water level: ________. Yield: 60 gpm. Pumping level: ________. Type pump: Submersible. Pump setting: ________.

Well No. 8, Yd-8, located at: lat 36°07'45", long 80°39'00". Driller: Newman Bros. Date drilled: 1964. Total depth: 290 ft. Diam: 6 in. Cased to: 30 ft. Type of finish: open hole. Topography: small stream valley. Aquifer: crystalline rock (granite-gneiss). Static water level: 28 ft. Yield: 275 gpm. Pumping level: 252 ft. Type pump: Turbine (50 hp). Pump setting: 289½ ft.

TOTAL USE:

Average (1970), 0.125 mgd, metered; maximum daily 0.140 mgd.

INDUSTRIAL USE:

0.003 mgd.

TREATMENT:

None.

PUMPING CAPACITY:

0.72 mgd.

RAW-WATER STORAGE:

One elevated tank, 100,000 gallons.

FUTURE PLANS:

An additional well will be drilled, probably in 1971.

WATER-RESOURCES APPRAISAL:

Surface water: Yadkinville is in the center of Yadkin County. The area is drained by tributaries of North Deep Creek and South Deep Creek of the Yadkin River basin. The low-flow yield of streams draining the area generally exceeds 0.06 mgd per square mile. The average discharge of streams in the immediate vicinity of Yadkinville is 0.8 mgd per square mile, and the 7-day, 2-year low flow averages 0.2 mgd per square mile. If surface water is used as a source for municipal supply, South Deep Creek about one mile south of town would probably be the best source.

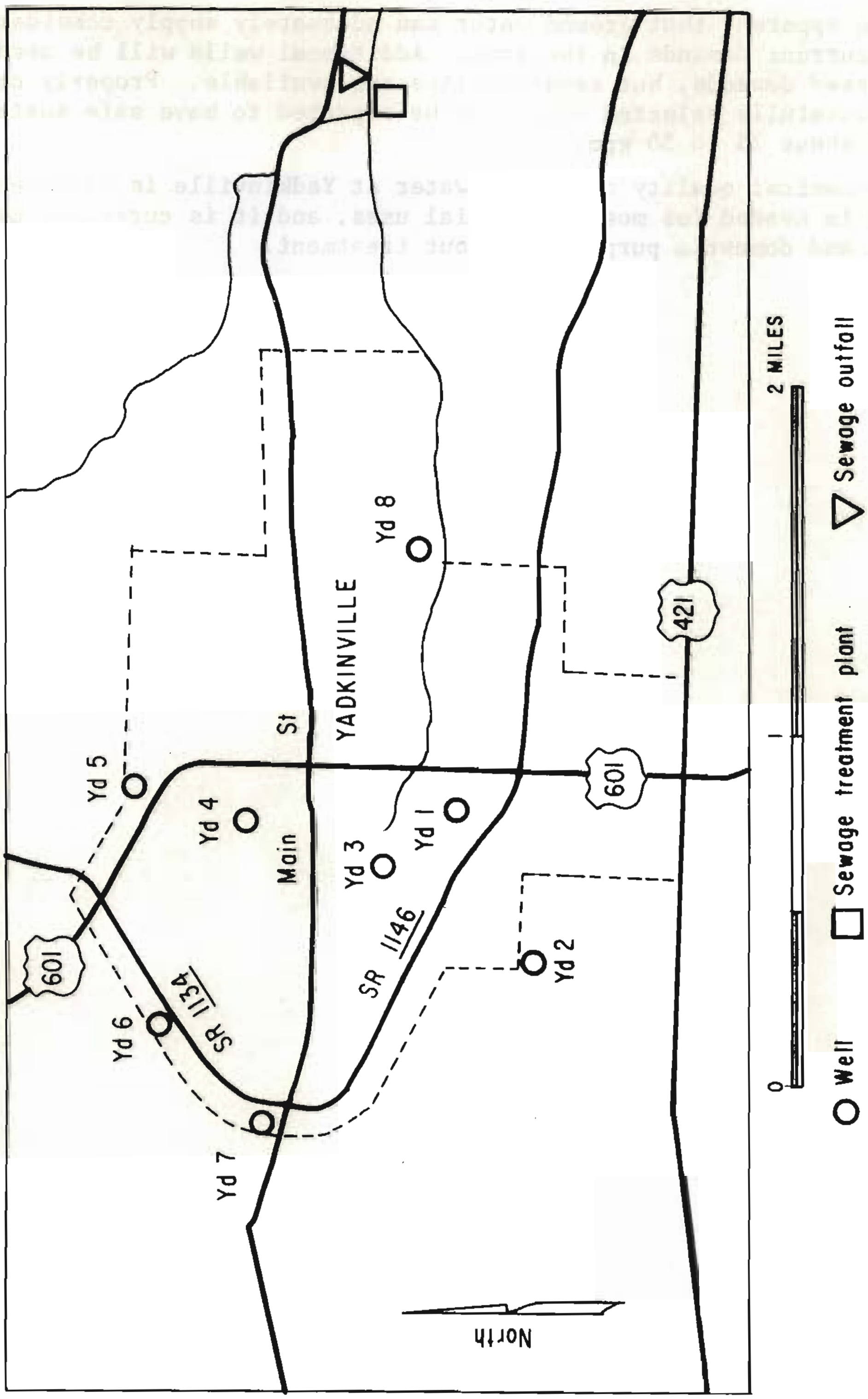
Ground water: Yadkinville is underlain by granite and gneiss. The rocks are weathered to depths of 30 to 70 feet in the area. Ample depths of weathered material and the fractured and jointing character of the rocks tend to form a better-than-average ground-water system in the vicinity of the town. Several wells in the area yield more than 100 gpm and one of the town's wells reportedly yields 275 gpm. The rolling topography of the area provides many good well sites. The better sites are probably southeast of the town along Haw Branch upstream from the sewage outfall or northeast of the town along Deep Creek.

YADKINVILLE, YADKIN COUNTY

It is apparent that ground water can adequately supply considerably more than the current demands in the town. Additional wells will be needed to meet the increased demands, but several sites are available. Properly constructed wells in carefully selected sites may be expected to have safe sustained yields of about 35 to 50 gpm.

The chemical quality of ground water at Yadkinville is excellent. No treatment is needed for most industrial uses, and it is currently used for municipal and domestic purposes without treatment.

CITY OF YADKINVILLE



YADKINVILLE, YADKIN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 1	Well No. 2	Well No. 3	Well No. 4
Date of collection......	7-23-66	7-28-66	7-28-66	7-28-66
Copper (Cu).............	-------	-------	-------	-------
Cobalt (Co).............	-------	-------	-------	-------
Zinc (Zn)...............	-------	-------	-------	-------
Chromium (Cr)...........	-------	-------	-------	-------
Boron (B)...............	-------	-------	-------	-------
Strontium (Sr)..........	-------	-------	-------	-------
Barium (Ba).............	-------	-------	-------	-------
Mercury (Hq)............	-------	-------	-------	-------
Lead (Pb)...............	-------	-------	-------	-------
Lithium (Li)............	-------	-------	-------	-------
Cadmium (Cd)............	-------	-------	-------	-------
Cyanide (CN)............	-------	-------	-------	-------
Chloride (Cl)...........	2.5	2.2	1.6	8.4
Manganese (Mn)..........	.04	.06	.04	.10
Iron (Fe)...............	.44	1.1	.51	1.5
Calcium (Ca)............	15	14	13	23
Magnesium (Mg)..........	2.5	2.2	1.9	3.6
Sodium (Na).............	11	4.8	3.9	6.1
Potassium (K)...........	2.6	2.4	2.0	4.8
Fluoride (F)............	.2	.1	.1	.1
Silica (SiO2)...........	26	26	27	24
Bicarbonate (HCO3)......	81	53	51	72
Carbonate (CO3).........	0	0	0	0
Sulfate (SO4)...........	7.4	11.0	6.4	19
Nitrate (NO3)...........	.2	.1	.7	.6
Dissolved Solids........	108	90	82	126
Hardness as CaCO3:				
Total.................	48	40	40	72
Noncarbonate..........	0	0	0	0
Alkalinity as CaCO3.....	66	43	42	59
Specific conductance (micromhos at 25° C)....	141	112	99	183
pH......................	7.2	7.1	6.8	7.2
Temperature.............	18	-------	18	17

Note.--See additional analyses on the next two pages.

YADKINVILLE, YADKIN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 5	Well No. 6	Well No. 7
Date of collection.......	7-28-66	7-28-66	7-28-66
Copper (Cu)...............	-------	-------	-------
Cobalt (Co)...............	-------	-------	-------
Zinc (Zn).................	-------	-------	-------
Chromium (Cr).............	-------	-------	-------
Boron (B).................	-------	-------	-------
Strontium (Sr)............	-------	-------	-------
Barium (Ba)...............	-------	-------	-------
Mercury (Hq)..............	-------	-------	-------
Lead (Pb).................	-------	-------	-------
Lithium (Li)..............	-------	-------	-------
Cadmium (Cd)..............	-------	-------	-------
Cyanide (CN)..............	-------	-------	-------
Chloride (Cl).............	1.9	2.4	5.2
Manganese (Mn)............	.01	.00	.04
Iron (Fe).................	.02	.01	.19
Calcium (Ca)..............	11	3.7	10
Magnesium (Mg)............	3.0	1.1	2.6
Sodium (Na)...............	4.6	2.8	4.8
Potassium (K).............	2.1	1.3	2.0
Fluoride (F)..............	.1	.1	.3
Silica (SiO2).............	28	17	21
Bicarbonate (HCO3)........	58	21	42
Carbonate (CO3)...........	0	0	0
Sulfate (SO4).............	3.4	1.0	3.0
Nitrate (NO3).............	.1	1.8	6.9
Dissolved Solids..........	83	41	77
Hardness as CaCO3:			
Total..................	40	14	36
Noncarbonate...........	0	0	2
Alkalinity as CaCO3......	48	17	34
Specific conductance (micromhos at 25°C)....	99	44	99
pH........................	6.8	6.3	6.7
Temperature...............	17	17	16

YADKINVILLE, YADKIN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 8	Well No. 8		
Date of collection.......	7-28-66	1-21-71		
Copper (Cu)..............	-------	0.000		
Cobalt (Co)..............	-------	.000		
Zinc (Zn)................	-------	.063		
Chromium (Cr)............	-------	.000		
Boron (B)................	-------	.175		
Strontium (Sr)...........	-------	.000		
Barium (Ba)..............	-------	.000		
Mercury (Hq).............	-------	-------		
Lead (Pb)................	-------	.000		
Lithium (Li).............	-------	.000		
Cadmium (Cd).............	-------	.000		
Cyanide (CN).............	-------	.00		
Chloride (Cl)............	1.5	2.4		
Manganese (Mn)...........	.06	.008		
Iron (Fe)................	.15	.166		
Calcium (Ca).............	15	-------		
Magnesium (Mg)...........	2.8	-------		
Sodium (Na)..............	6.3	-------		
Potassium (K)............	2.7	-------		
Fluoride (F).............	.1	-------		
Silica (SiO2)............	30	-------		
Bicarbonate (HCO3).......	76	-------		
Carbonate (CO3)..........	0	-------		
Sulfate (SO4)............	3.6	-------		
Nitrate (NO3)............	.3	-------		
Dissolved Solids.........	100	-------		
Hardness as CaCO3:				
Total..................	50	-------		
Noncarbonate...........	0	-------		
Alkalinity as CaCO3......	62	-------		
Specific conductance (micromhos at 25°C)....	126	-------		
pH.......................	7.1	-------		
Temperature..............	17	-------		

INITIAL DISTRIBUTION LIST

1. Water and Air Resources Board and Staff

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Dept. of Public Health
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Department of Agriculture
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Dept. of Archives and History
Department of Justice
Box 629
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Utilities Eng. Dept.
Utilities Commission
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Raleigh, North Carolina 27602

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Dept. of Natural & Economic Res.
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Mr. L. B. McGee
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3. N. C. Educational Institutions and Libraries

Duke University Library
Duke University
Durham,
North Carolina 27706

Prof. Milton S. Heath, Jr.
Associate Professor
Institute of Government
University of North Carolina
Chapel Hill, North Carolina 27514

D. H. Hill Library
Box 5007
North Carolina State University
Raleigh, North Carolina 27602

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Water Resources Research Institute
124 Riddick Building
North Carolina State University
Raleigh,
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Dr. Maynard M. Hufschmidt
Prof. of City & Regional Planning
University of North Carolina
Chapel Hill,
North Carolina 27514

Planning Library
Dept. Of City & Regional Planning
University of North Carolina
Chapel Hill, North Carolina 27514

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Dr. Daniel A. Okun
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Olivia Raney Library
104 Fayetteville Street
Raleigh,
North Carolina
27601

School of Public Health
Reading Room
Annex No. 4
Chapel Hill, North Carolina 27514

Professor Charles Smallwood, Jr.
Civil Engineer
416 Mann
North Carolina State University
Raleigh, North Carolina 27607

State Library
Archives and Library Building
109 E. Jones Street
Raleigh, North Carolina 27602 (5)

Technical Library
Research Triangle Institute
Box 12194
Research Triangle Park,
North Carolina
27709

Library, Institute of Government
University of North Carolina
Chapel Hill,
North Carolina
27514

4. Intra-State Regional and Local Agencies

Region G - Piedmont Triad Council of Governments
Lindsay W. Cox, Executive Director
Box 6004
Greensboro, North Carolina 27405

Region J - Research Triangle Regional Planning Commission
Pearson Stewart, Executive Director
P. O. Box 12255
Research Triangle Park,
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Region K - Region K Council of Governments
William J. Benton, Exec. Dir.
P. O. Box 1013
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311 North Second Avenue
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City Manager
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City Manager
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Drawer W-2
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U. S. Department of Health,
Education, & Welfare, PHC.
SSB, NE Technical Services Unit
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E.P.A. Office of Water Programs
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4676 Columbia Parkway
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U. S. Department of Interior
Fish and Wildlife Service
Bureau of Sport Fisheries & Wildlife
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Department of the Interior
Division of River Basin Studies
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Division of Water Control Planning
408 Evans Building
Tennessee Valley Authority
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Agricultural Research Service
Water Quality Management Laboratory
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Mr. Lee Tebo
Pollution Surveillance Branch
Environmental Protection Agency
Southeast Water Laboratory
Athens, Georgia 30601

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U. S. Dept. of Agriculture
Soil Conservation Service
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Southeast Water Laboratory
Environmental Protection Agency
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Athens,
Georgia 30601

U. S. Geological Survey Library
Building 25
Denver Federal Center
Denver,
Colorado 80225

Library
Environmental Control Administration
Cincinnati Laboratories
5555 Ridge Avenue
Cincinnati, Ohio 45213

Meteorologist-in-Charge
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National Weather Service, NOAA
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6. Other States - State Agencies

Director, Bureau of Water Resources
State Water Control Board
Second Floor, Davenport Building
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Richmond, Virginia 23219

Director
Office of Urban and Federal Affairs
State of Tennessee
321 - 7th Avenue, North
Nashville, Tennessee 37210

The Documents Department
Clemson University Library
Clemson, South Carolina 29631

Walter Library
University Libraries
Minneapolis, Minn. 55455

Executive Director
S. C. Water Resources Commission
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Columbia,
South Carolina 29201

State Planning Officer
State of Georgia
State Planning & Programming Bur.
116 Mitchell Street, S. W.
Atlanta, Georgia 30303

University of Delaware
The University Library
Newark, Delaward 19711

Mr. Mark P. Worsham
Alabama Development Office
Planning Reference Section
State Office Building
Montgomery, Alabama 36104

Mr. Julian M. Alexander
Commissioner
Division of Water Resources
Seventh Floor, 911 E. Broad Street
Richmond, Virginia 23219

Documents Division
University of Illinois Library
Urbana, Illinois 61801

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Business and Industry

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North Carolina Citizens Association, Inc.
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Stone and Webster Engineering Contractors
Technical Library
225 Franklin Street
Boston, Mass. 02107

Virginia Electric & Power Company
Ninth and Franklin Streets
Richmond, Virginia 23219
Attn: Mr. C. M. Stallings and Librarian

Wiley and Wilson
Consulting Engineers
2310 Langhorn Avenue
Lynchburg, Virginia 24501

Public Service Research
7050 S.W. 86th Avenue
Miami, Florida 33143
Attn: Mr. Guston Gegguff

Charles T. Main, Inc.
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