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,

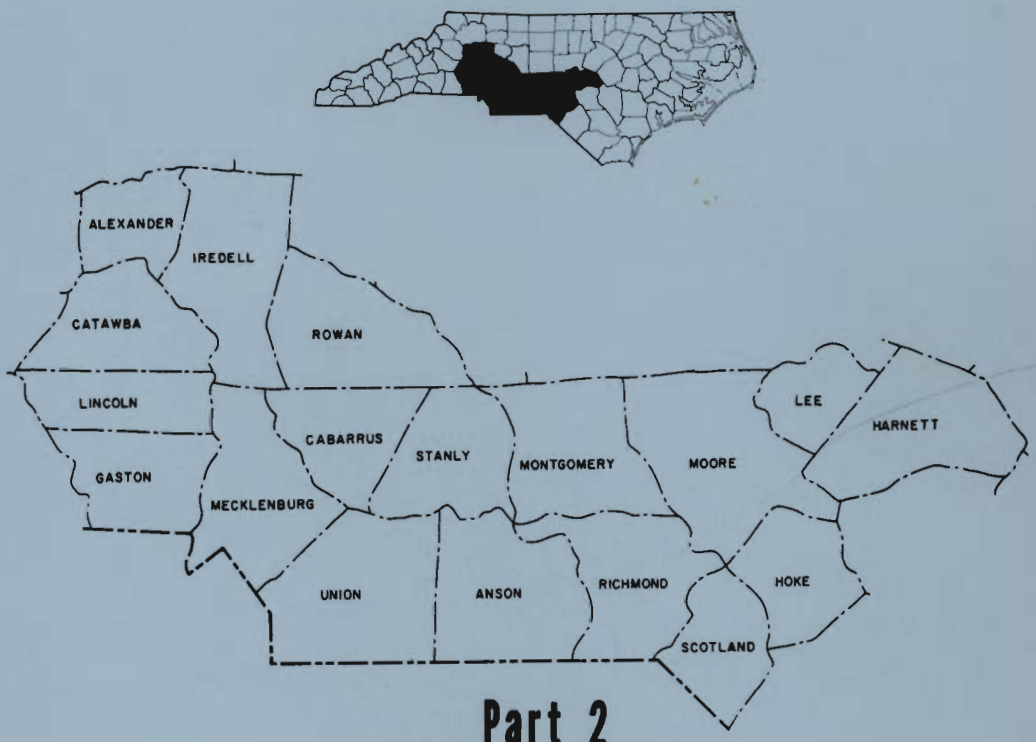
N. M. Jackson, Jr.

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 2
SOUTHERN 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 1973

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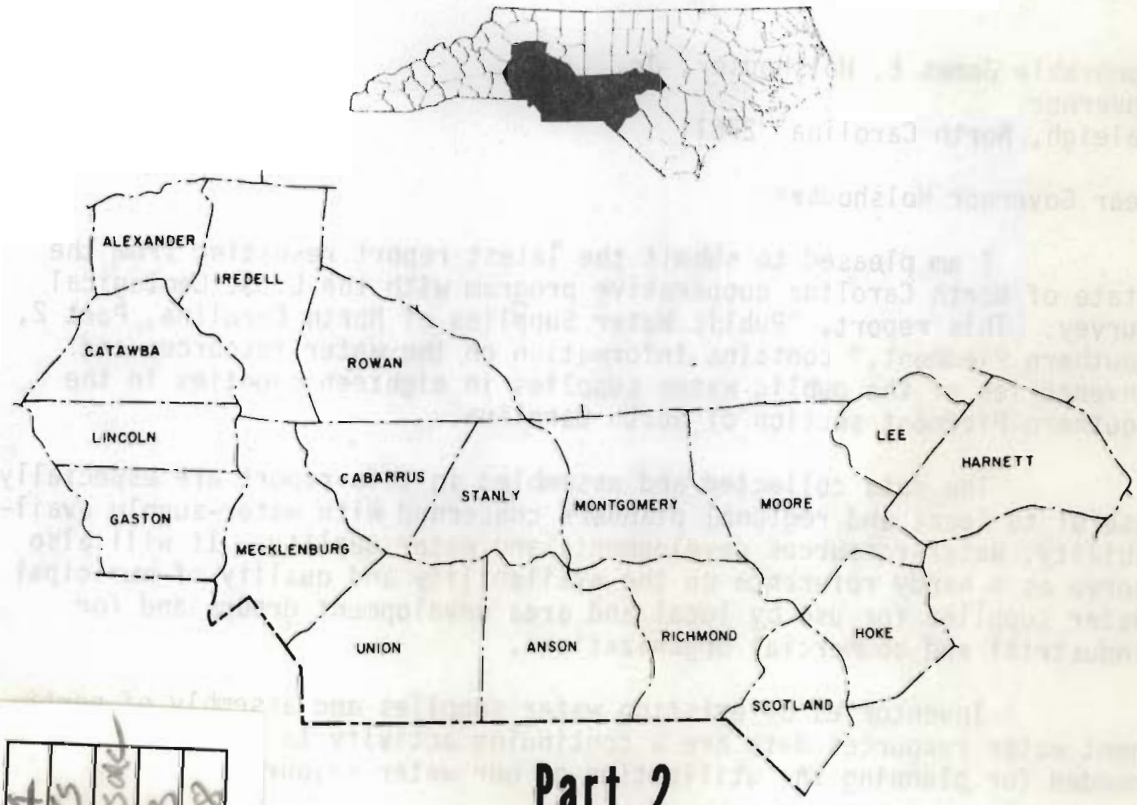

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STATE OF NORTH CAROLINA
DEPARTMENT OF NATURAL AND ECONOMIC RESOURCES
Box 27687 Raleigh 27611

JAMES L. HARRINGTON
SECRETARY
TELEPHONE
AREA CODE 919 829-4984

JAMES E. HOLSHOUSER, JR.
GOVERNOR

November 16, 1973

Honorable James E. Holshouser, Jr.
Governor
Raleigh, North Carolina 27611

Dear Governor Holshouser:

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 2, Southern Piedmont," contains information on the water resources and inventories of the public water supplies in eighteen counties in the Southern 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,

E. C. Hubbard, Director
Office of Water & Air Resources

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 gound-water sources; both reports resulted from cooperative studies with the North Carolina 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 60 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.

The first volume, "Public Water Supplies of North Carolina, Part 1, Northern Piedmont, was published in 1972. This volume contains data on the Southern Piedmont, the second area to be studied.

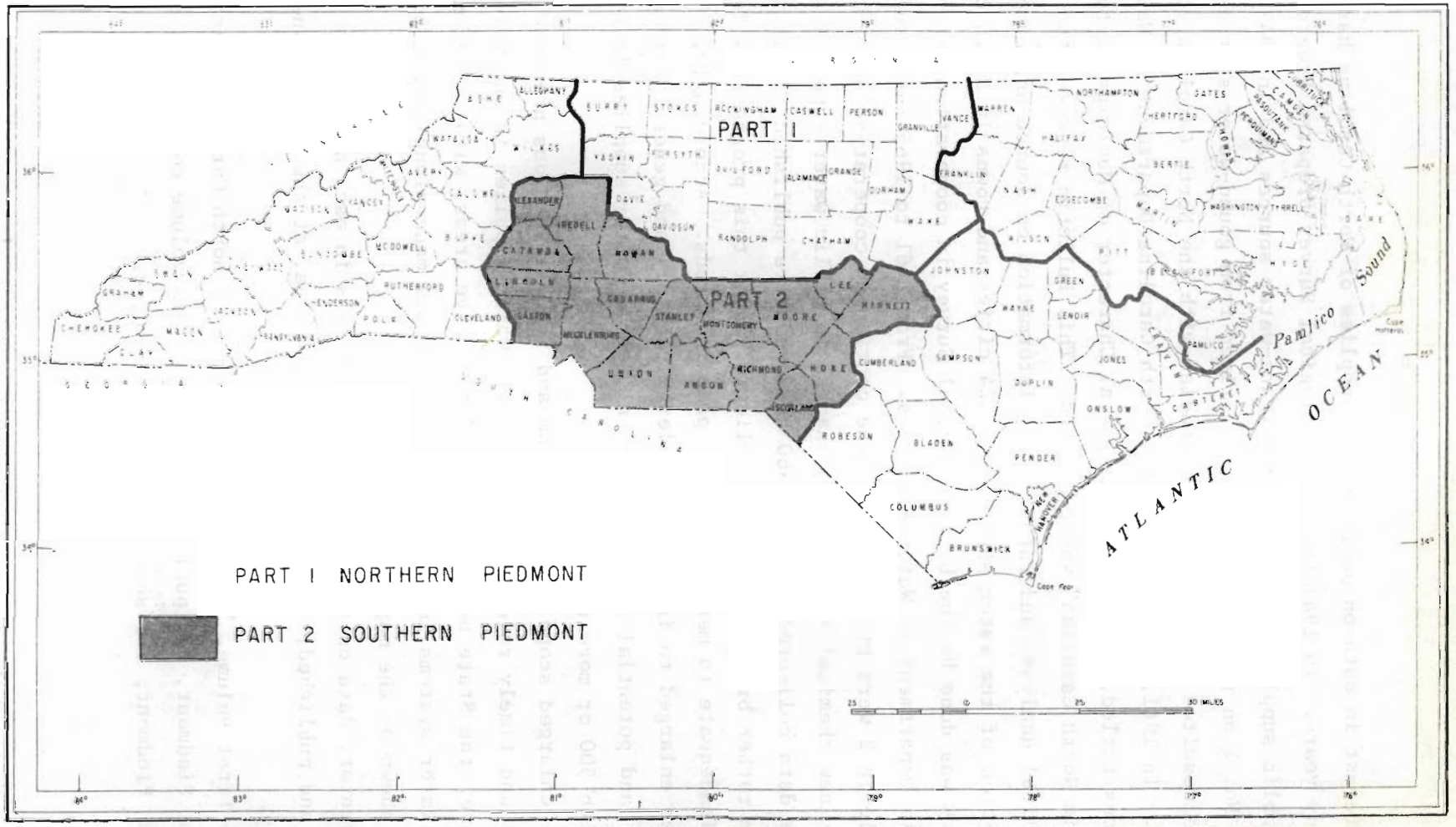

Figure 1.--Map of North Carolina showing subdivision of the State for purpose of the public water-supply inventory.

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PUBLIC WATER SUPPLIES OF NORTH CAROLINA

PART 2

SOUTHERN 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 southern 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 municipal systems in Part 2 were inventoried March to November 1972.

The results of chemical analyses include the results of 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 is being 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 the southern Piedmont subdivision of 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, 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 conditions used as a basis for their differentation are:

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

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

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

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

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

The location of these hydrologic areas is shown in figure 2 with the counties covered by this volume shaded. The counties covered by this volume lie in three of the hydrologic areas. Ground water occurrence in these three areas varies considerably.

In the Piedmont section, ground water is stored between the individual grains in the soil and weathered rock and in the fractures of the underlying bedrock. Simply speaking, the saturated spaces in the soil form a reservoir of stored water and the bedrock fractures serve as pipe lines tapping the reservoir. It follows then, that normally the best wells are those drilled where the thickness of overlying soil is greatest, and where the bedrock contains numerous fractures. Of course it's impossible to predetermine, without drilling a test hole, the locations of fractures or the exact thickness of the soil cover. However, an examination of the surface features and a

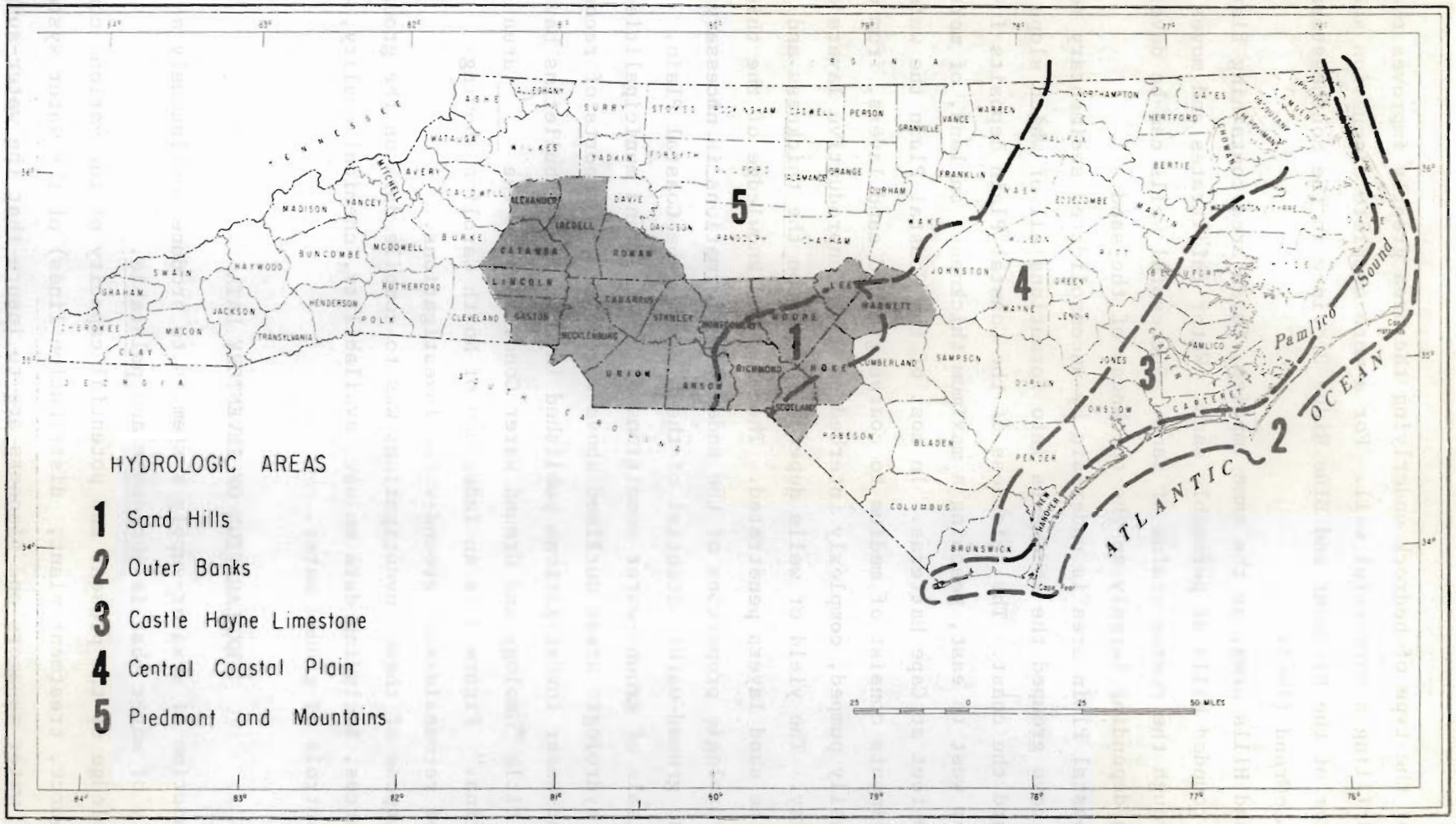

Figure 2.--Map of North Carolina showing the approximate boundaries of the hydrologic areas pertinent to the description of ground-water conditions. Shaded area is part 2.

knowledge of the type of bedrock underlying the area greatly improves the chance of drilling a successful well. For a more complete discussion see "Ground Water of the Piedmont and Blue Ridge Province in the Southeastern States" by LeGrand (1967).

The Sand Hills area, as the name implies, is an area containing flat-topped and rounded hills of permeable sand. Water infiltrates and moves readily through the coarse grains of sand. Successful wells can be developed in the area depending largely on the thickness of the sand.

The Coastal Plain area is underlain by unconsolidated sedimentary rocks. Geologists have grouped the sediments into formations all of which slope gently toward the coast. The thickness of the Coastal Plain deposits increases from west to east, reaching a maximum thickness, on land, of more than 10,000 feet at Cape Hatteras. In most of the Coastal Plain the water-bearing sediments consist of medium to coarse grained sand layers, from which water is easily pumped, complexly interbedded with nonproductive layers of silt and clay. The yield of wells depends largely on the thickness and extent of the sand layers penetrated. Therefore, a knowledge of the thickness and hydrologic properties of the underlying formations is necessary to appraise the ground-water potential of the sites in the Coastal Plain.

Appraisals of ground-water conditions of counties and municipalities within the hydrologic areas outlined above were based on reports of reconnaissance ground-water investigations published in a series of bulletins having the genral title "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.

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

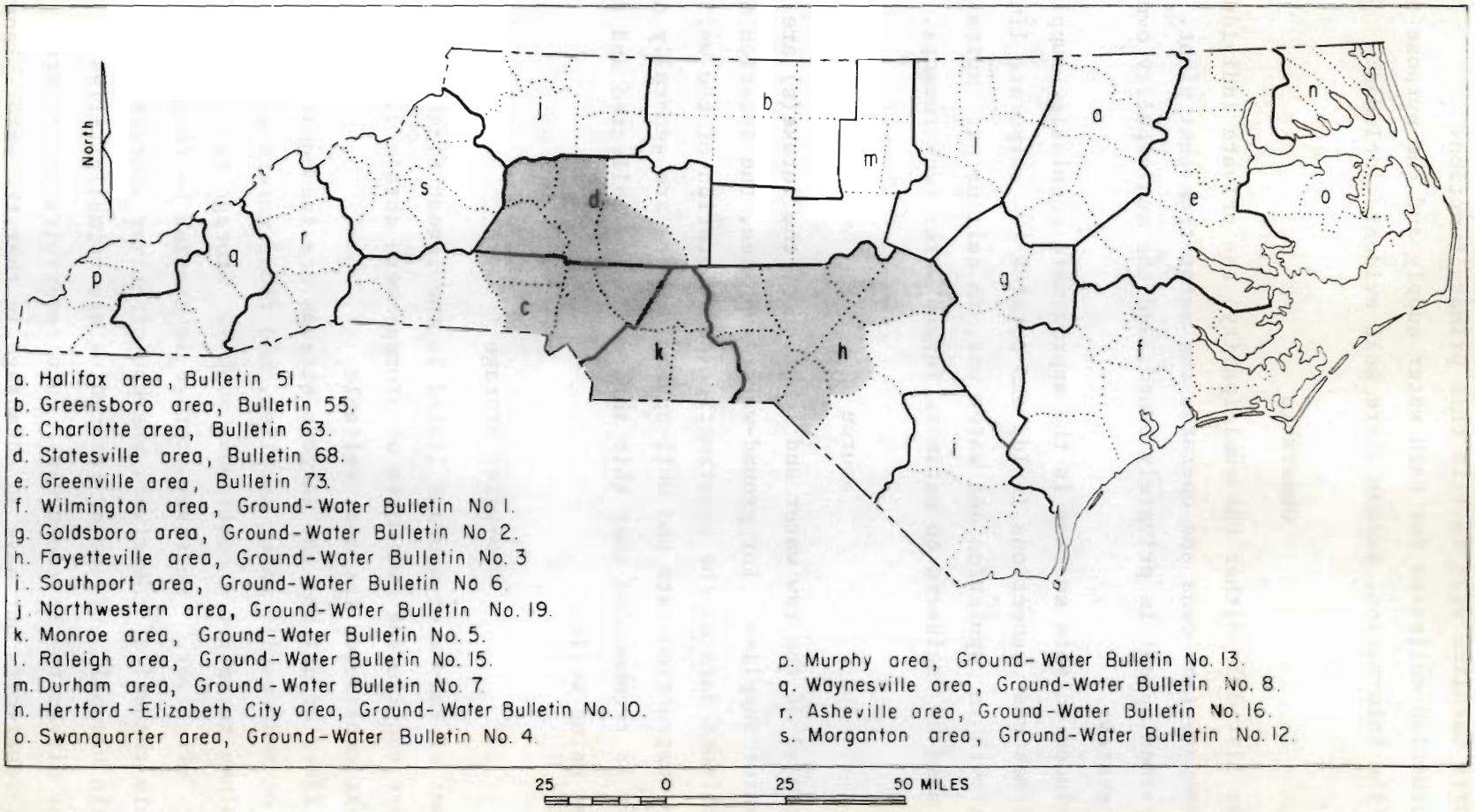

Figure 3.--Index map of North Carolina showing areas covered by reconnaissance ground-water investigations. Shaded area is part 2.

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 are based on minimum flows that can be expected to occur once in 20 years on the average. Thus, the flow of the stream or the flow 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 developed by McMaster and Hubbard (1970, sheet 1) and reproduced 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 by 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:

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

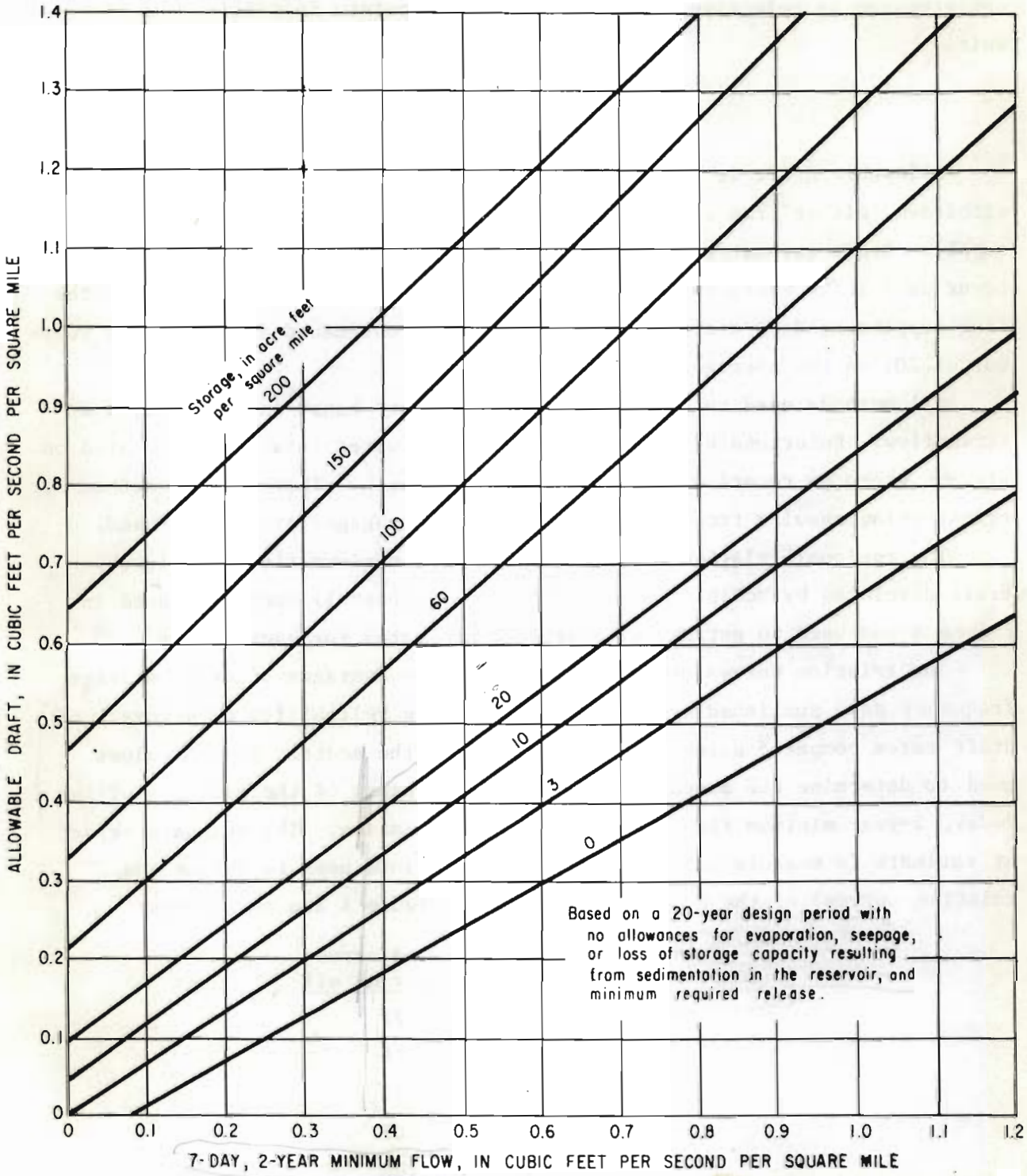

Figure 4.--Relation for estimating the allowable draft of a stream-reservoir using the 7-day, 2-year minimum flow of the stream as an index for entering the graph.

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, is estimated. These estimates are based on actual metering of the larger users (those that use as much as 2 percent of the total daily use) 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 iron and manganese removal and 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 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.--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 sodium hexametaphosphate in the treatment process. It is not entirely clear how polyphosphate 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. Polyphosphates 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.

Postchlorination.--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 each treatment plant, expressed in million gallons per day, is given in this report. 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 component of 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 mentions 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 $CaCO_3$:
Aluminum (Al)	Carbonate (CO_3)	Total
Iron (Fe)	Sulfate (SO_4)	Noncarbonate
Manganese (Mn)	Chloride (Cl)	Alkalinity as $CaCO_3$
Calcium (Ca)	Fluoride (F)	Specific conductance
Magnesium (Mg)	Nitrate (NO_3)	pH
Sodium (Na)	Dissolved solids	Color
Potassium (K)		Temperature

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 the Geological Survey 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 varies 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 well 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 an adequate supply of 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 a shortage.

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 essential for maintaining an adequate supply. Only with this information, can a reliable estimate of the yield of the source be made.

Few towns have the experienced persons with diversified knowledge of wells and ground-water conditions to provide management comparable in quality to that available to most municipalities with surface-water systems (LeGrand, 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 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 may indicate the need for additional wells.

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ALEXANDER COUNTY

WATER-RESOURCES APPRAISAL

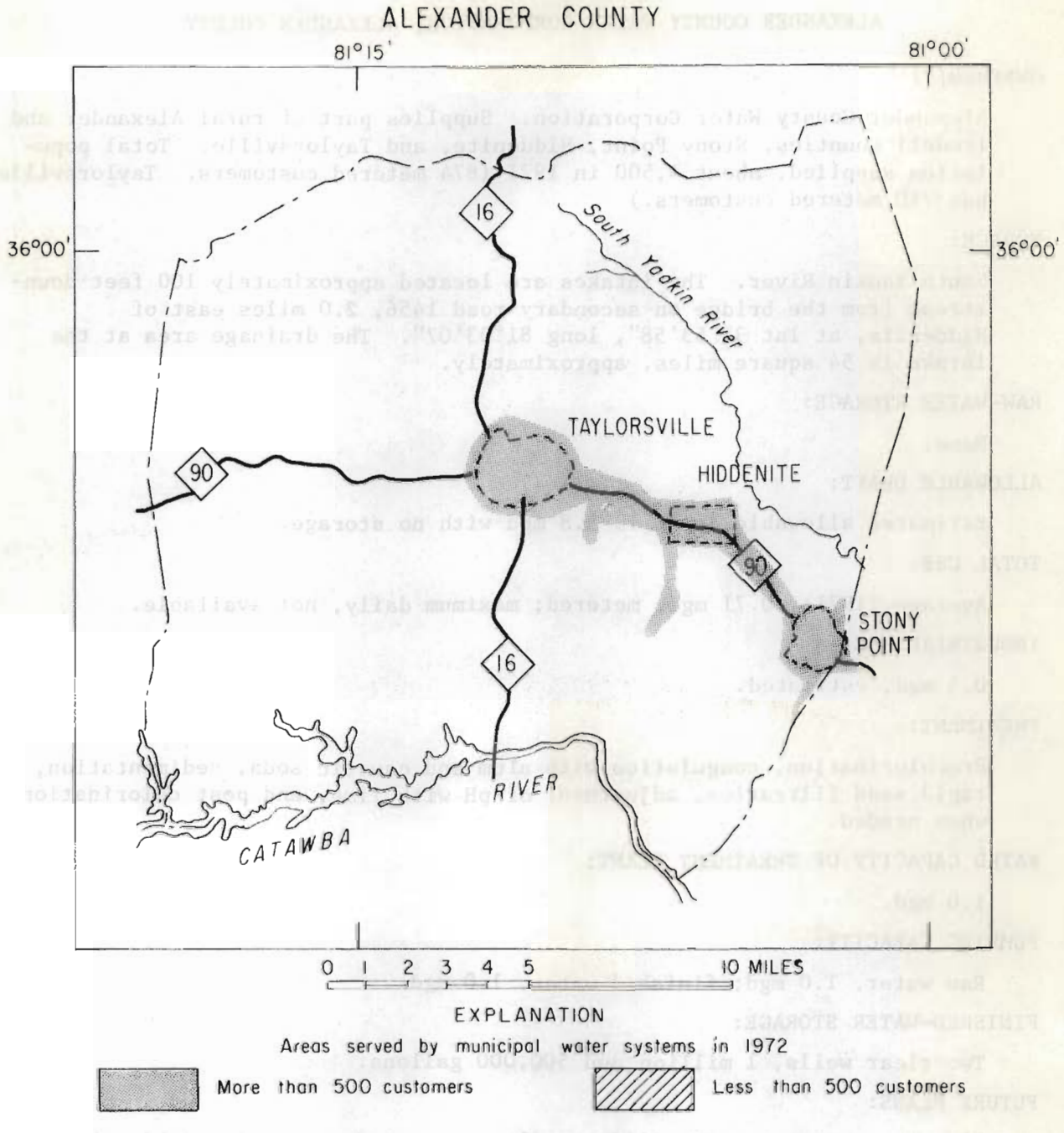
Alexander County is in the western part of the Piedmont Province. The topography is hilly, especially in the area north and west of Taylorsville where mountain peaks and ridges are common. Stream slopes are relatively steep and drainage is good. The South Yadkin River and its tributaries drain the northeast quarter of the county; the remainder is drained by tributaries of the Catawba River which forms the county's southern boundary. The average discharge of streams ranges from 0.6 to 0.8 mgd per square mile. The low-flow yield of streams generally exceeds 0.1 mgd per square mile, and the 7-day, 2-year low-flow averages 0.3 mgd per square mile.

The Alexander County Water System obtains its raw water from surface sources. Taylorsville previously used ground water, but presently obtains its water from the Alexander County Water System. The Taylorsville wells are now on standby. The county's total population in 1970 was 19,466.

An immense thickness of schists underlie the county. In a broad sense, it represents a host rock into which granite and other basic rocks have been intruded. The geology is complex and there are not enough records of drilled wells to appraise the water-bearing potential of the various rock units. However, the ground-water potential is probably slightly less than average for the Piedmont province. Well yields probably vary considerably with respect to location, the higher yielding wells being located where the thickness of saturated weathered rock is greatest, such as topographically low or flat areas. Records of forty drilled wells are available, and the average depth of these wells is 245 feet, with a range of 53 to 710 feet, and the average yield is 26 gpm, with a range of 0 to 300 gpm.

The chemical quality of ground water is generally excellent and is acceptable for most uses without treatment.

Ground water will continue to be an important source of supply in areas remote from the distribution lines of the Alexander County Water System. It is estimated that there is approximately 0.40 mgd per square mile of ground water available in the county.


ALEXANDER COUNTY
81°15'
81°00'
36°00'
36°00'
16
South Yadkin River
TAYLORSVILLE
HIDDENITE
90
90
STONY POINT
16
CATAWBA
RIVER
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

ALEXANDER COUNTY WATER CORPORATION, ALEXANDER COUNTY

OWNERSHIP:

Alexander County Water Corporation. Supplies part of rural Alexander and Iredell Counties, Stony Point, Hiddenite, and Taylorsville. Total population supplied, about 4,500 in 1971 (874 metered customers. Taylorsville has 710 metered customers.)

SOURCE:

South Yadkin River. The intakes are located approximately 100 feet downstream from the bridge on secondary road 1456, 2.0 miles east of Hiddenite, at lat 35°53'58", long 81°03'07". The drainage area at the intake is 54 square miles, approximately.

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft is 3.8 mgd with no storage.

TOTAL USE:

Average (1971), 0.71 mgd, metered; maximum daily, not available.

INDUSTRIAL USE:

0.5 mgd, estimated.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd.

PUMPING CAPACITY:

Raw water, 1.0 mgd; finished water, 1.0 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 1 million and 500,000 gallons.

FUTURE PLANS:

Plan to construct a 30 million gallon raw-water reserovir within the next 5 years and an additional 1.0 mgd filter. Fluoridation will be added to the treatment process, probably in 1972.

WATER-RESOURCES APPRAISAL:

Surface water: The Alexander County Water Corporation serves an area generally paralleling North Carolina Highway 90 in southeastern Alexander County and northwestern Iredell County. The area is drained by tributaries of the Catawba and South Yadkin Rivers. The average discharge of streams in the area is 0.7 mgd per square mile. The low flow yield of streams generally exceeds 0.1 mgd per square mile and the 7-day, 2-year

ALEXANDER COUNTY WATER CORPORATION: ALEXANDER COUNTY

low-flow averages 0.3 mgd per square mile. The flow of the South Yadkin River should be adequate to supply the system for several years. The allowable draft could be increased significantly by providing storage.

The predominate rocks in the area are mica schist and granite. The thickness of the weathered rock ranges from zero to as much as 100 feet. Reported well yields are as high as 300 gpm and average about 25 gpm.

The chemical quality of ground water in the area is generally excellent and can be used for most purposes with little or no treatment.

ALEXANDER COUNTY WATER CORPORATION

ALEXANDER COUNTY WATER CORPORATION, ALEXANDER COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	S.Yadkin R. Raw	Finished		
Date of collection.....	3-22-72	3-22-72		
Copper (Cu).....	0.014	0.010		
Cobalt (Co).....	.000	.000		
Zinc (Zn).....	.000	.040		
Chromium (Cr).....	.00	.00		
Boron (B).....	.000	.005		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.004	.004		
Cadmium (Cd).....	<.001	<.001		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	2.2	3.0		
Manganese (Mn).....	.160	.008		
Iron (Fe).....	1.549	.118		
Calcium (Ca).....	2.5	2.0		
Magnesium (Mg).....	1.2	.8		
Sodium (Na).....	2.8	2.1		
Potassium (K).....	1.2	1.8		
Fluoride (F).....	.1	.1		
Silica (SiO2).....	9.6	7.1		
Bicarbonate (HCO3).....	10	8		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	6.0	4.8		
Nitrate (NO3).....	1.2	2.2		
Dissolved Solids.....	35	37		
Hardness as CaCO3:				
Total.....	11	9		
Noncarbonate.....	3	3		
Alkalinity as CaCO3.....	8	7		
Specific conductance (micromhos at 25° C)....	41	33		
pH.....	6.5	6.4		
Temperature (°C).....	13	14		

ANSON COUNTY

WATER-RESOURCES APPRAISAL

Anson County is in the southern part of the Piedmont province. The southern boundary is the North Carolina-South Carolina state line. The topography is characterized by rolling hills with moderate land and stream slopes. The county is thoroughly dissected by streams and is generally well drained. The Rocky and Pee Dee Rivers are the north and east boundaries and tributaries of these rivers drain the county. The average discharge of the tributaries ranges from 0.5 mgd per square mile in the southwest part to 0.7 mgd per square mile in the northeast part and averages 0.6 mgd per square mile for the county as a whole. Minimum flows are small, ranging from 0 to 0.002 mgd per square mile. Streams with as much as 100 square miles drainage area occasionally go dry. The 7-day, 2-year low flow ranges from 0.001 mgd per square mile to 0.08 mgd per square mile and averages 0.03 mgd per square mile. The Pee Dee River is highly regulated by several large hydroelectric power developments. The average discharge of the Pee Dee River at the U. S. Highway 74 bridge is 4.98 billion gallons per day and the minimum flow as required by the Federal Power Commission is 97 million gallons per day.

The Anson County water system and Wadesboro obtain their municipal water supplies from surface sources. Lilesville, Morven, Polkton, and Ansonville obtain their municipal supplies from ground-water sources. However, these ground-water supplies are connected to the Anson County system. The Anson County system plans to serve the entire county. The county's population in 1970 was 23,488.

A wide variety of rocks underlie the county. The northwestern third is underlain by bedded argillites (volcanic slate). A belt of Triassic-age sediments (bedded sandstone, shale, clay and cemented gravel) 6 to 10 miles wide extends in a northeast-southwest direction across the central part. Deposits of sand, clay, and gravel as much as 50 feet thick cover a considerable part of the southeastern half. Granite, gneiss and schist crop out in the southeastern half of the county. The majority of wells are drilled wells ranging in diameter from 2 to 8 inches. Some dug or bored wells obtain their water from the weathered zone above hard rock or from the sand and gravel deposits. Most of the bored wells are in the sand and gravel deposits and are generally satisfactory for domestic purposes.

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

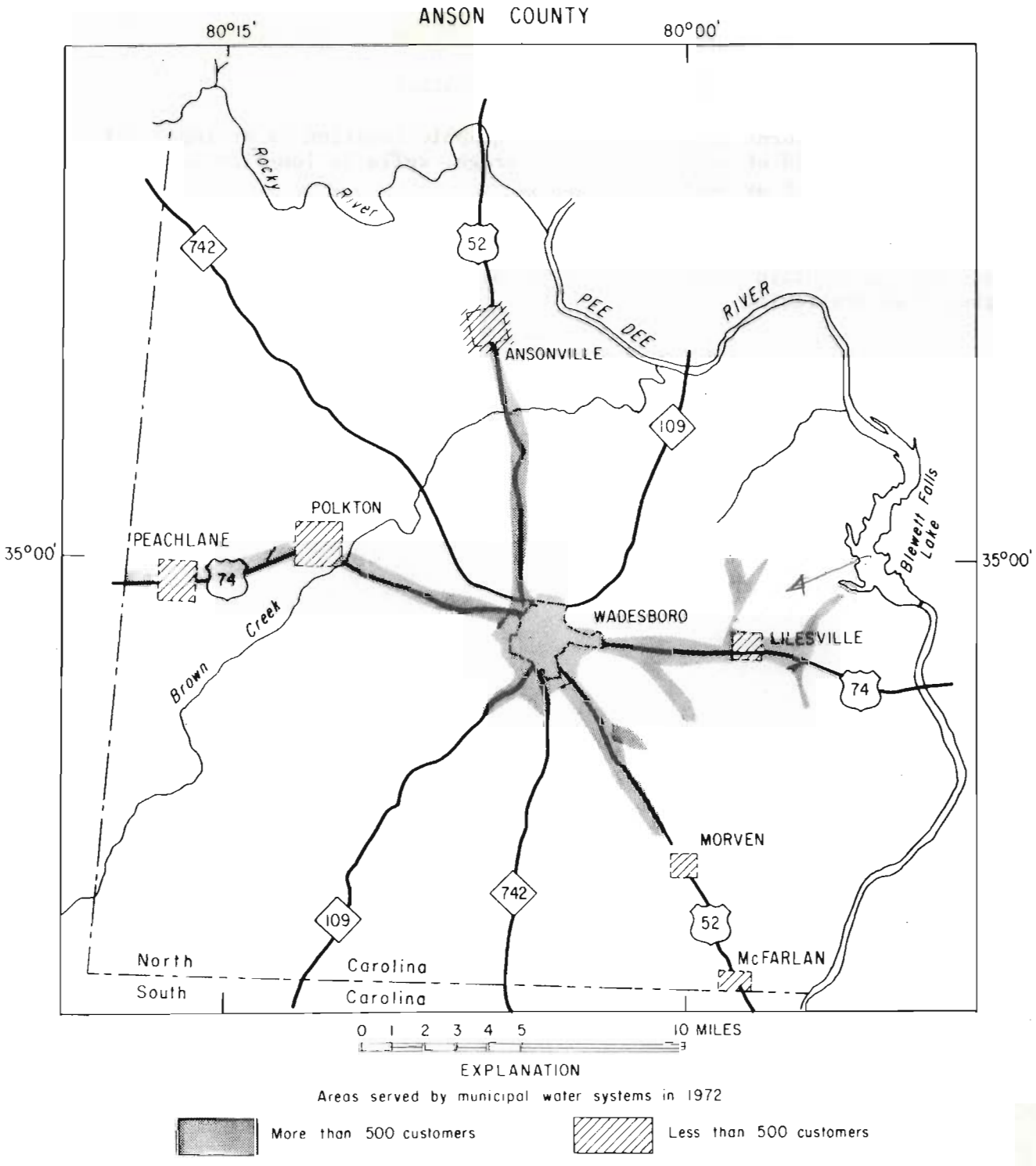
Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Granite	45	13	92
Sand and Gravel	5	5	27
Triassic	65	16	156
Argillite	60	10	110

ANSON COUNTY

WATER-RESOURCES APPRAISAL

Available records indicate that topographic location is an important factor in the yield of wells. On the average, wells in low-flat areas yield twice as much water as wells on hills.

The chemical quality of ground water is generally good. The quality of water from wells in the Triassic rocks varies considerably from place to place and may contain concentrations of chloride, nitrate, and iron that are higher than desirable.


ANSON COUNTY
80°15'
80°00'
35°00'
35°00'
Rocky River
742
52
PEE DEE RIVER
ANSONVILLE
109
POLKTON
PEACHLANE
74
Brown Creek
WADESBORO
LILESVILLE
Blewett Falls Lake
74
MORVEN
742
109
52
McFARLAN
North Carolina
South Carolina
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

ANSON COUNTY WATER SYSTEM, ANSON COUNTY

OWNERSHIP:

Anson County. Serves a part of rural Anson County; the municipalities of Morven, Peachland, and McFarlan; supplements the supplies of Marshville, Wadesboro, Ansonville, and Polkton, and is connected to the system of Lilesville. Water is sold to the municipalities and to about 225 rural customers.

SOURCE:

Pee Dee River impounded in Blewett Falls Lake. Blewett Falls Lake is used for hydroelectric power development by Carolina Power & Light Company. The intakes are about 2 miles northwest of the powerhouse at lat 34°59'27", long 79°54'37". The drainage area at the dam is approximately 6,830 square miles.

RAW-WATER STORAGE:

Blewett Falls Lake, 31.6 billion gallons.

ALLOWABLE DRAFT:

The contract between Anson County and Carolina Power & Light Company specifies the maximum withdrawal of water from Blewett Falls Lake is limited to 12 mgd.

TOTAL USE:

Average (1972) 1.34 mgd, metered; maximum daily (5-24-72) 2.38 million gallons.

INDUSTRIAL USE:

1.0 mgd, estimated.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

4.0 mgd.

PUMPING CAPACITY:

Raw water, 3.7 mgd; finished water, 6.3 mgd.

FINISHED-WATER STORAGE:

One clear well, 500,000 gallons; one elevated tank, 1,000,000 gallons.

FUTURE PLANS:

An additional 2,800 gpm raw water pump was being installed in November 1972 and a 1400 gpm finished water pump is scheduled for installation in 1973. The plant was designed and constructed for expansion to 12.0 mgd capacity as required. The distribution system will be extended to serve

ANSON COUNTY WATER SYSTEM, ANSON COUNTY

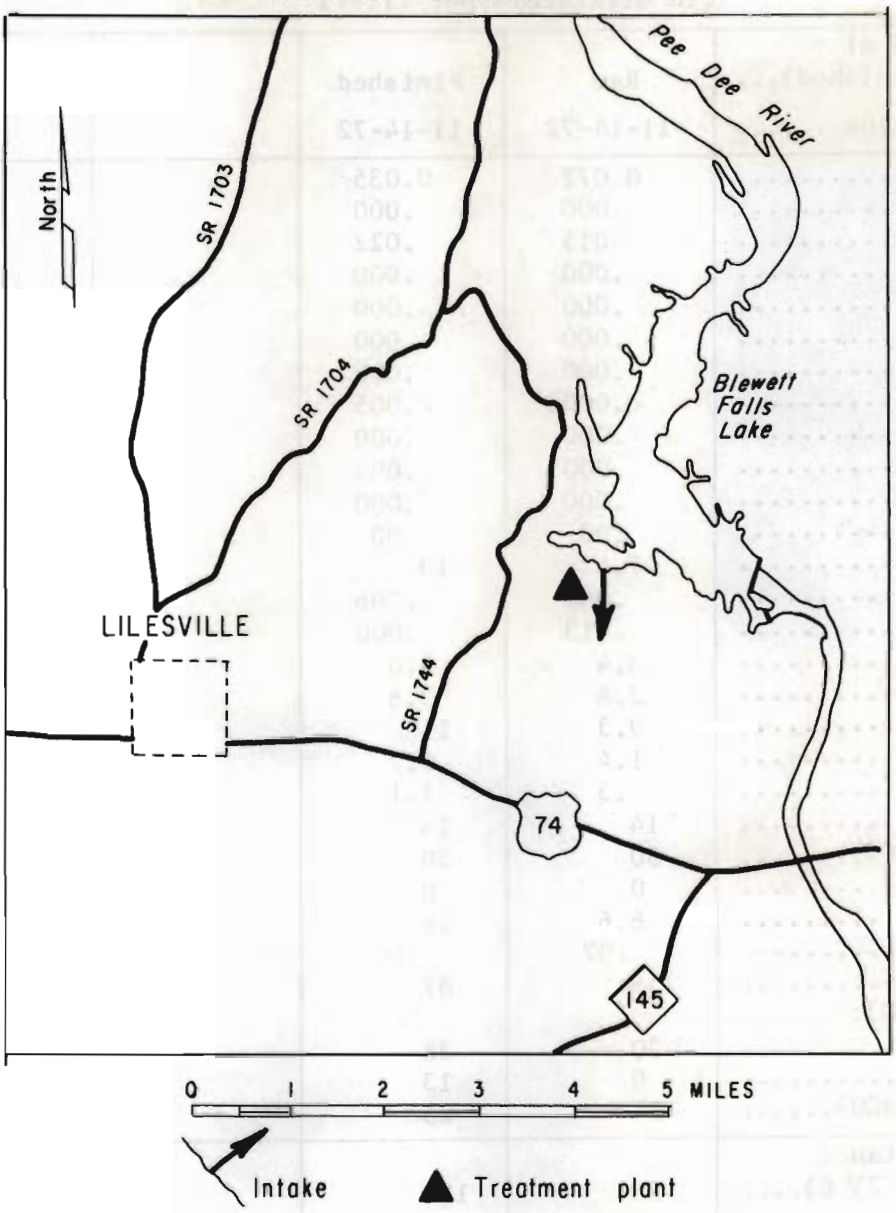
the entire county.

WATER-RESOURCES APPRAISAL:

Surface water: There is ample water to meet the needs of the system for the foreseeable future. The allowable withdrawal from Blewett Falls Lake is more than eight times greater than current use.

Ground water: For a discussion of the ground water resources of the county see pages 28 and 29.

ANSON COUNTY WATER SYSTEM



ANSON COUNTY WATER SYSTEM

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished		
Date of collection.....	11-14-72	11-14-72		
Copper (Cu).....	0.072	0.035		
Cobalt (Co).....	.000	.000		
Zinc (Zn).....	.015	.022		
Chromium (Cr).....	.000	.000		
Boron (B).....	.000	.000		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.000	.000		
Cadmium (Cd).....	.000	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	7.4	13		
Manganese (Mn).....	.080	.006		
Iron (Fe).....	.413	.000		
Calcium (Ca).....	3.4	9.0		
Magnesium (Mg).....	2.8	3.6		
Sodium (Na).....	9.3	11		
Potassium (K).....	1.4	2.7		
Fluoride (F).....	.3	1.1		
Silica (SiO2).....	14	14		
Bicarbonate (HCO3).....	30	30		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	6.6	16		
Nitrate (NO3).....	.07	.00		
Dissolved Solids.....	59	87		
Hardness as CaCO3:				
Total.....	20	38		
Noncarbonate.....	0	13		
Alkalinity as CaCO3.....	25	25		
Specific conductance (micromhos at 25° C)....	86	130		
pH.....	6.7	7.0		
Temperature (°C).....	17	17		

WADESBORO, ANSON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 5,000 in 1972 (2,410 metered customers, 600 of which are in suburban areas).

SOURCE:

North Fork Jones Creek impounded in City Pond: The intakes are at the dam about 3.1 miles south of Wadesboro at lat 34°55'25", long 80°04'50". The drainage area of North Fork Jones Creek at the intake is 9.0 square miles, approximately. Also purchase finished water from Anson County.

RAW-WATER STORAGE:

City Pond, 120 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.5 mgd with a storage of 120 million gallons.

TOTAL USE:

Average (1971) 1.35 mgd, metered; maximum daily not determined. The treatment plant operates at capacity 6 days a week. Additional water needed is obtained from the Anson County System.

INDUSTRIAL USE:

0.9 mgd, estimated. Principal users include Wansona Manufacturing Company, West Knitting Corporation, and Hornwood, Inc.

TREATMENT:

Prechlorination, coagulation with alum and lime, 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 fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

1.25 mgd.

PUMPING CAPACITY:

Raw water, 1.25 mgd; finished water, 1.7 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 420,000 and 450,000 gallons; two elevated tanks, 75,000 and 300,000 gallons.

FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

Surface water: Wadesboro is in an upland area in central Anson County. The area is drained by many small tributaries of the Pee Dee River. The low-flow yield of streams is very low, with most streams occasionally

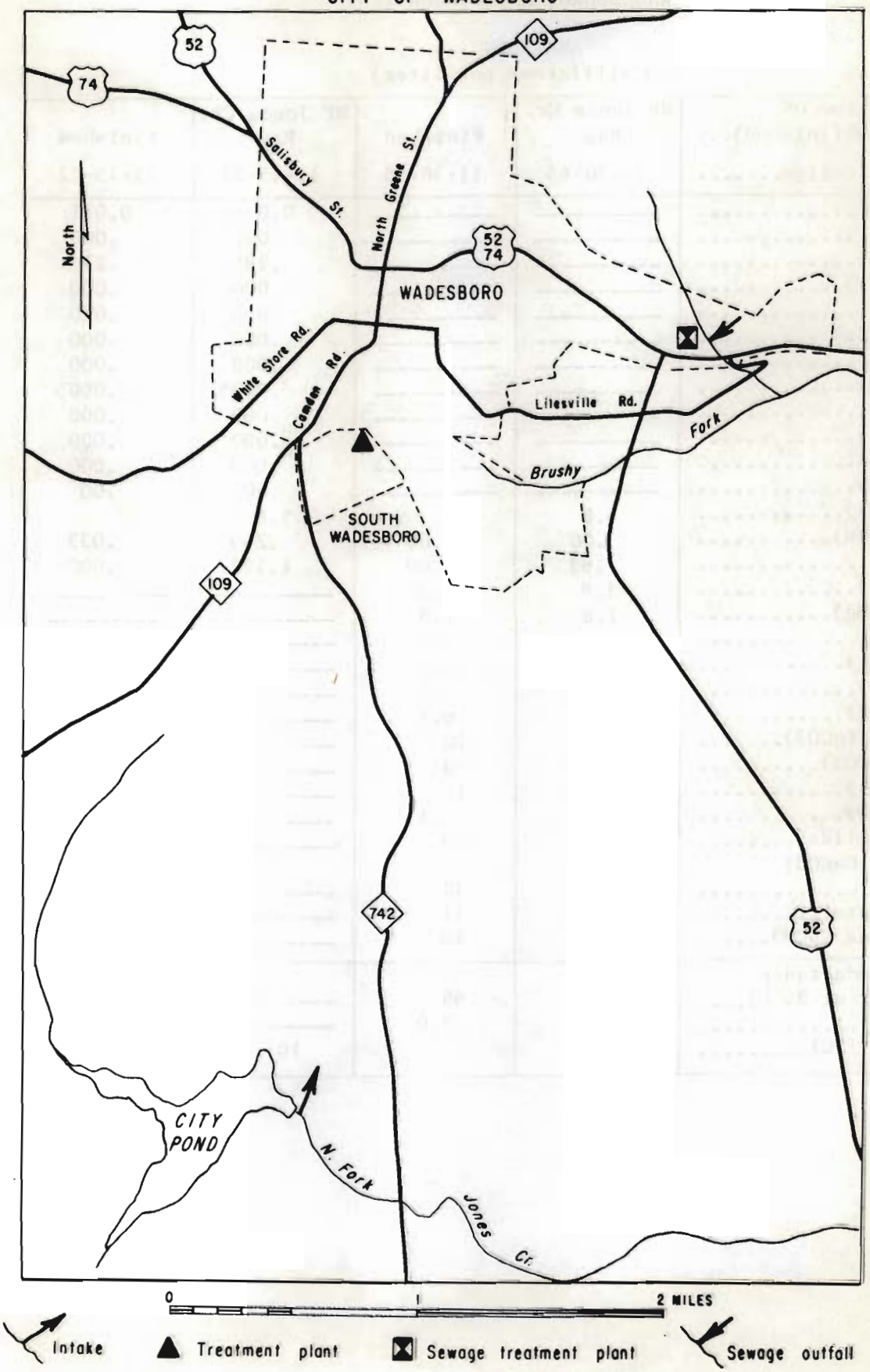
going dry. For all streams, the average discharge is 0.6 to 0.7 mgd per square mile, and the 7-day, 2-year low flow averages 0.04 mgd per square mile. There are no large streams with a dependable low-flow yield for water-supply in the immediate vicinity of Wadesboro. However, the Pee Dee River with an average discharge of 4.98 billion gallons per day, is within approximately 8 miles of the city. This is the most dependable source of water, whether obtained directly or through the Anson County System.

Ground water: Wadesboro is underlain by sedimentary rocks of Triassic age, consisting of claystone, siltstone, sandstone, and conglomerate. Drilled wells in this rock unit generally are 100-200 feet deep and average 150 feet. Well yields vary from 1/2 to 65 gpm with the higher yielding wells being drilled alongside intrusive diabase dikes.

The chemical quality of ground water is generally good though moderately hard. Locally, iron, nitrate, and chloride concentrations may be higher than desirable.

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

CITY OF WADESBORO



WADESBORO, ANSON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)...	NF Jones Cr. Raw	Finished	NF Jones Cr. Raw	Finished
Date of collection.....	11-30-65	11-30-65	11-15-72	11-15-72
Copper (Cu).....	----------	----------	0.035	0.011
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.285	.245
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.050	.020
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).....	5.8	11	5.8	12
Manganese (Mn).....	.00	.00	.269	.033
Iron (Fe).....	.63	.00	1.142	.000
Calcium (Ca).....	3.8	9.3	----------	----------
Magnesium (Mg).....	1.6	1.8	----------	----------
Sodium (Na).....	4.4	5.2	----------	----------
Potassium (K).....	1.5	1.7	----------	----------
Fluoride (F).....	.1	.2	----------	----------
Silica (SiO_2).....	6.3	6.1	----------	----------
Bicarbonate (HCO_3).....	23	20	----------	----------
Carbonate (CO_3).....	0	0	----------	----------
Sulfate (SO_4).....	2.4	12	----------	----------
Nitrate (NO_3).....	.4	.1	----------	----------
Dissolved Solids.....	39	59	----------	----------
Hardness as $CaCO_3$:				
Total.....	16	32	----------	----------
Noncarbonate.....	0	15	----------	----------
Alkalinity as $CaCO_3$.....	19	16	----------	----------
Specific conductance (micromhos at 25° C)....	55	94	----------	----------
pH.....	6.6	7.0	----------	----------
Temperature (°C).....	12		16	16.5

CABARRUS COUNTY

WATER-RESOURCES APPRAISAL

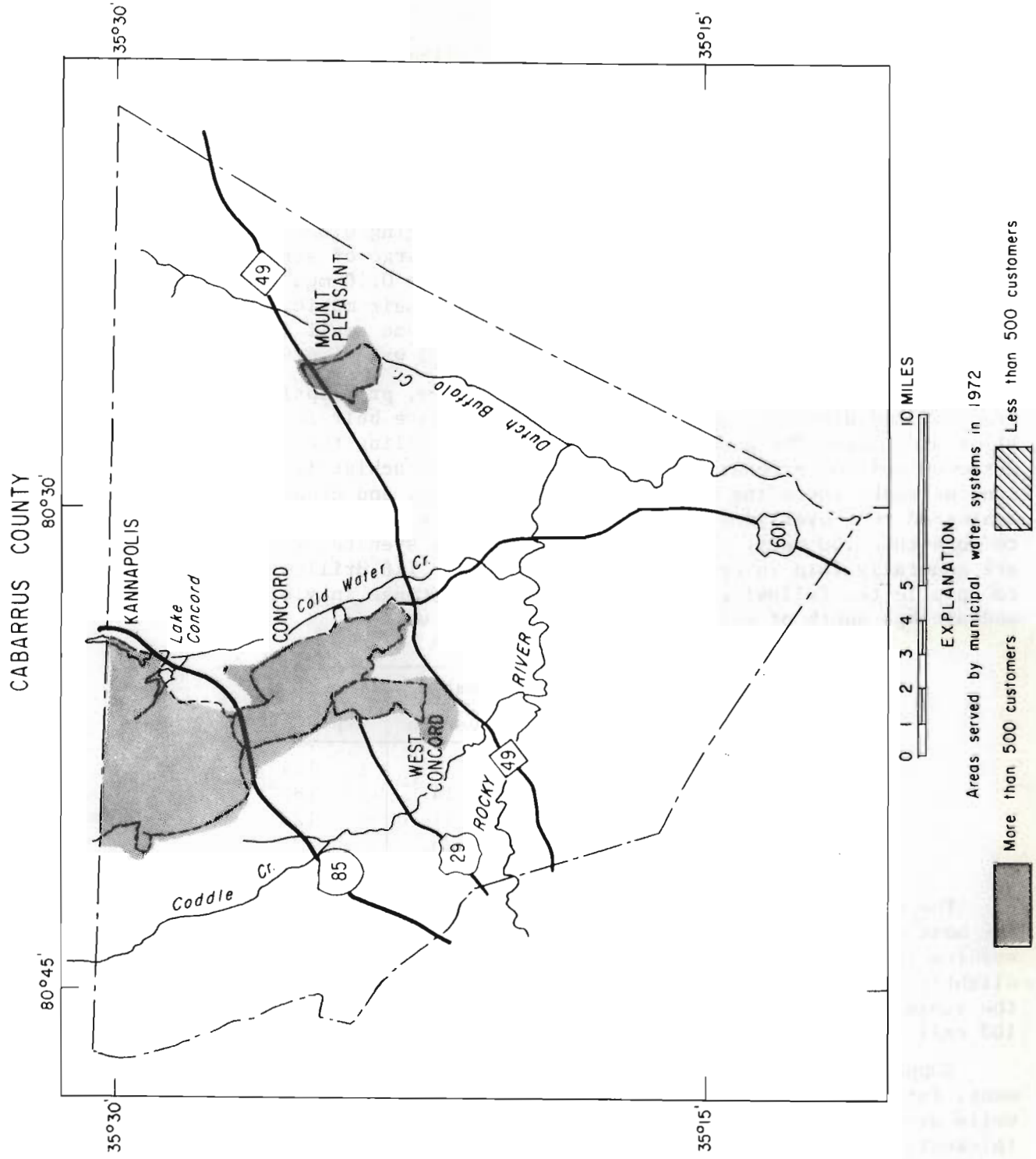
Cabarrus County is in the south-central part of the Piedmont Province. The topography is characterized by rolling hills with moderate land and stream slopes. Most streams have relatively wide flood plains and drainage is generally good. The county is drained by Rocky River, of the Pee Dee River system, and its tributaries. Minimum flows are quite variable, ranging from 0.009 to 0.04 mgd per square mile and averaging 0.027 mgd per square mile. Streams rarely go dry. The average discharge of streams is 0.7 mgd per square mile and the 7-day, 2-year low flow is 0.10 mgd per square mile. Concord, Kannapolis, and Mount Pleasant obtain their municipal water supply from surface sources. Most rural domestic and some small industrial supplies use ground water. The county population in 1970 was 74,629.

A wide variety of rocks underlie the county, principally slate, schist, granite, and diorite. Rocks of the Carolina slate belt form a belt about 4 miles wide along the southeast boundary. Paralleling the slate, is a narrower belt of greenstone schist. West of the schist is a complex group of igneous rocks including diorite, syenite, gabbro, and granite. The mantle of weathered rock overlying all rock units range in thickness from a few inches to more than 100 feet. The soils overlying the syenite, gabbro, and diorite are generally thin in upland areas. Records of 116 drilled wells were used to compile the following table which shows the range in yield, average yield, and average depth of wells in the various rock units.

Rock unit	Yield (gpm)		Average depth (feet)
	Range	Average	
Diorite	0-20	7	124
Granite	1-150	14	186
Slate	0-70	11	123
Schist	9-50	26	207

The chemical quality of ground-water is generally good and acceptable for most uses with little or no treatment. Water from the granite and syenite is low in dissolved mineral matter. Water from the diorite is slightly more mineralized than that from granite. As a rule, the water from the schist and slate is hard, and water from the slate may contain as much as 100 mg/l chloride.

Supplies of ground-water are adequate, with proper planning and management, 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 the quantity of ground-water available for development ranges from 0.35 mgd per square mile in the western half of the county to 0.25 mgd per square mile in the eastern half.


CABARRUS COUNTY
80°45'
80°30'
35°30'
35°15'
KANNAPOLIS
Lake Concord
CONCORD
Cold Water Cr.
MOUNT PLEASANT
Dutch Buffalo Cr.
WEST CONCORD
ROCKY RIVER
Coddle Cr.
49
85
29
601
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

CONCORD, CABARRUS COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 26,000 in 1972 (8,040 metered customers, 1,090 of which are in suburban areas. Also supplies Parkwood Sanitary District, Parkland Sanitary District, South Concord Sanitary District, and Jackson Park Sanitary District.

SOURCES:

Cold Water Creek impounded in Lake Fisher: the intake is located at the dam about 3.7 miles north of the treatment plant at lat 35°25'10", long 80°34'44". The drainage area at the dam is 18 square miles, approximately.

Chambers Branch impounded in Lake Concord: the intake is located at the dam about 3.5 miles north of the treatment plant at lat 35°28'41", long 80°35'07". The drainage area at the dam is 3.7 square miles.

Coddle Creek: the intake is located 200 feet upstream from N. C. Highway 73, 6 miles west of the treatment plant at lat 35°26'15", long 80°41'56". The drainage area at the intake is 46.5 square miles.

RAW-WATER STORAGE:

Lake Fisher, 1,100 million gallons; Lake Concord, 350 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft of Lake Fisher and Lake Concord were not determined because carryover storage analysis is required. Estimated allowable draft of Coddle Creek is 2.2 mgd with no storage.

TOTAL USE:

Average (1971) 6.2 mgd, metered; maximum daily (9-2-71), 8.45 million gallons.

INDUSTRIAL USE:

3.6 mgd, estimated. Principal users include Kerr Bleaching and Finishing Works, Cannon Mills Company, Randolph Mills, Inc., Specialty Dyers, Inc., and Collins and Aikman.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, rapid-sand filtration, addition of phosphate compounds for corrosion control, ammoniation, adjustment of pH with caustic soda, and fluoridation. In addition, equipment and supplies for postchlorination and addition of carbon for control of taste and odor is available and used if necessary.

RATED-CAPACITY OF TREATMENT PLANT:

12.0 mgd.

PUMPING CAPACITY:

Raw water 16.0 mgd; finished water, 16.0 mgd.

CONCORD, CABARRUS COUNTY

FINISHED WATER STORAGE:

Two clear wells, 2 million gallons each; three elevated tanks, 1 million, 500,000, and 100,000 gallons; one standpipe, 2 million gallons.

FUTURE PLANS:

The city plans to construct a new reservoir and treatment plant on Coddle Creek in next 5-8 years with an expected yield of 16-18 mgd.

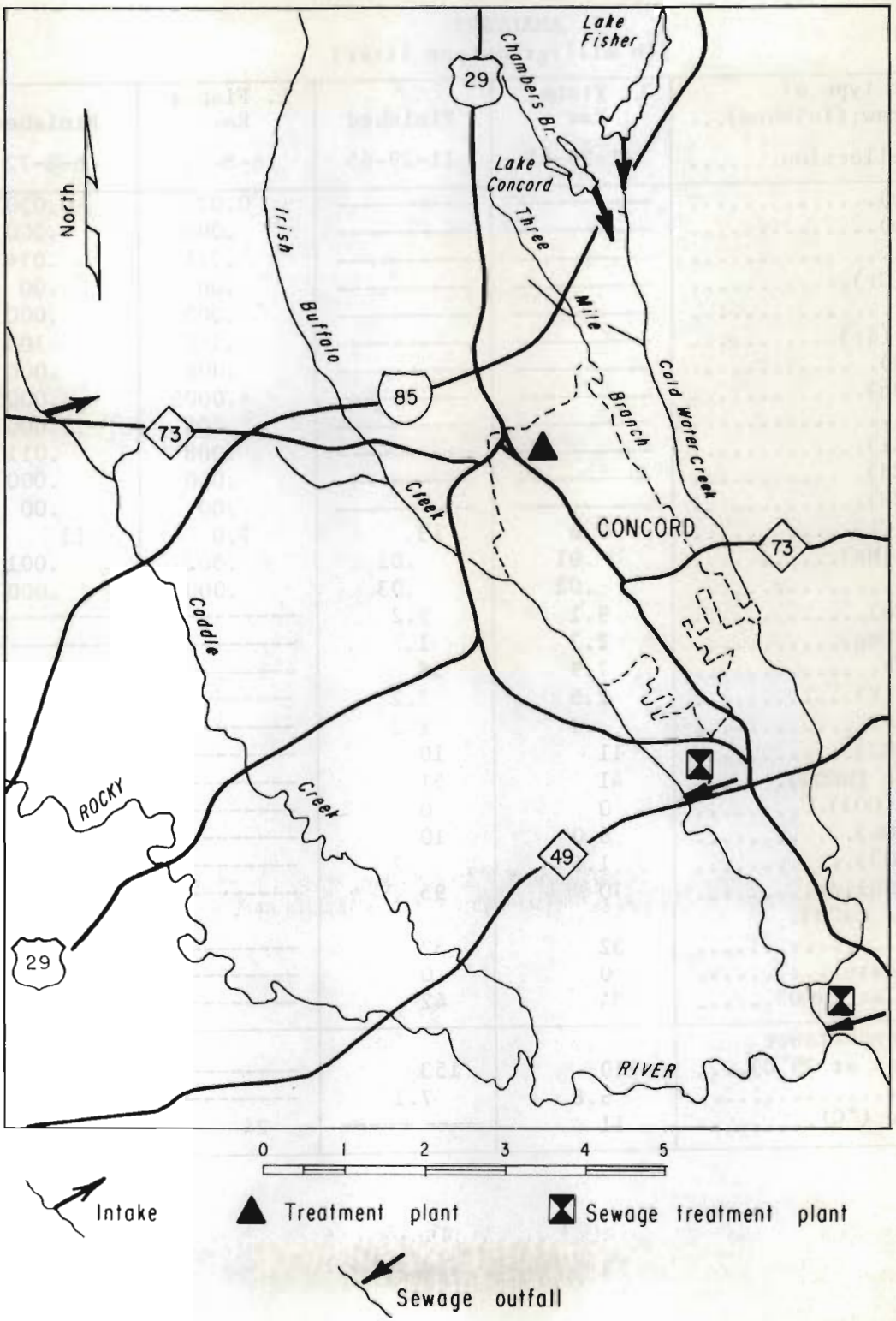
WATER-RESOURCES APPRAISAL:

Surface water: Concord is in central Cabarrus County in the upland area between Irish Buffalo Creek and Cold Water Creek. The city is drained by Threemile Branch and other small tributaries of these creeks. Minimum flows of streams draining the area generally exceed 0.02 mgd per square mile. Their average discharge is 0.65 mgd per square mile and their 7-day, 2-year low-flow averages 0.10 mgd per square mile. The proposed schedule for securing additional water supply and a new water treatment plant will insure an adequate supply for the foreseeable future.

Ground water: Concord is underlain by granite and diorite, with diorite predominant. The depth of overlying weathered material is as great as 100 feet in places. Reported well yields are as high as 37 gpm. Wells drilled in favorable areas, such as topographically low flat areas, draws or sags, can reasonably be expected to yield as much as 0.05 mgd.

The chemical quality of ground water is generally good and suitable for most uses with little or no treatment. Locally hardness-causing constituents may be higher than desirable.

CITY OF CONCORD



CONCORD, CABARRUS COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	L. Fisher Raw	Finished	L. Fisher Raw	Finished
Date of collection.....	11-29-65	11-29-65	6-8-72	6-8-72
Copper (Cu).....	----------	----------	0.026	0.030
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.015	.014
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.000	.000
Strontium (Sr).....	----------	----------	.150	.100
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hg).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.005	.000
Lithium (Li).....	----------	----------	.008	.011
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	9.6	13	7.0	13
Manganese (Mn).....	.01	.01	.002	.001
Iron (Fe).....	.02	.03	.000	.000
Calcium (Ca).....	9.1	9.2	----------	----------
Magnesium (Mg).....	2.3	1.7	----------	----------
Sodium (Na).....	7.9	18	----------	----------
Potassium (K).....	2.5	3.2	----------	----------
Fluoride (F).....	.1	1.2	----------	----------
Silica (SiO2).....	11	10	----------	----------
Bicarbonate (HCO3).....	41	51	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	6.0	10	----------	----------
Nitrate (NO3).....	1.6	.7	----------	----------
Dissolved Solids.....	70	95	----------	----------
Hardness as CaCO3:				
Total.....	32	32	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	34	42	----------	----------
Specific conductance (micromhos at 25° C)....	110	153	----------	----------
pH.....	6.8	7.1	----------	----------
Temperature (°C).....	11	----------	24	24.5

MOUNT PLEASANT, CABARRUS COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,600 in 1972 (710 metered customers, 52 of which are in suburban areas).

SOURCE:

Dutch Buffalo Creek impounded by a low dam: the intake is 1-3/4 miles northeast of Mount Pleasant at lat 35°25'58", long 80°25'08". The drainage area at the intake is 43 square miles, approximately.

RAW-WATER STORAGE:

Negligible. Low dam basically creates a pumping pool.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.4 mgd with no storage.

TOTAL USE:

Average (1972) 0.3 mgd, estimated. The amount of water treated at the plant is not metered.

INDUSTRIAL USE:

0.25 mgd, estimated.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT;

0.345 mgd.

PUMPING CAPACITY:

Raw water, 0.7 mgd; finished water, 1.1 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 200,000 and 15,000 gallons; one elevated tank, 100,000 gallons; one standpipe 100,000 gallons. Water stored in an additional 28,000 gallon standpipe is used to backwash the filters.

FUTURE PLANS:

No definite plans in November 1972. Preliminary consideration has been given to upgrading the filter plant and doubling the treatment capacity.

WATER-RESOURCES APPRAISAL:

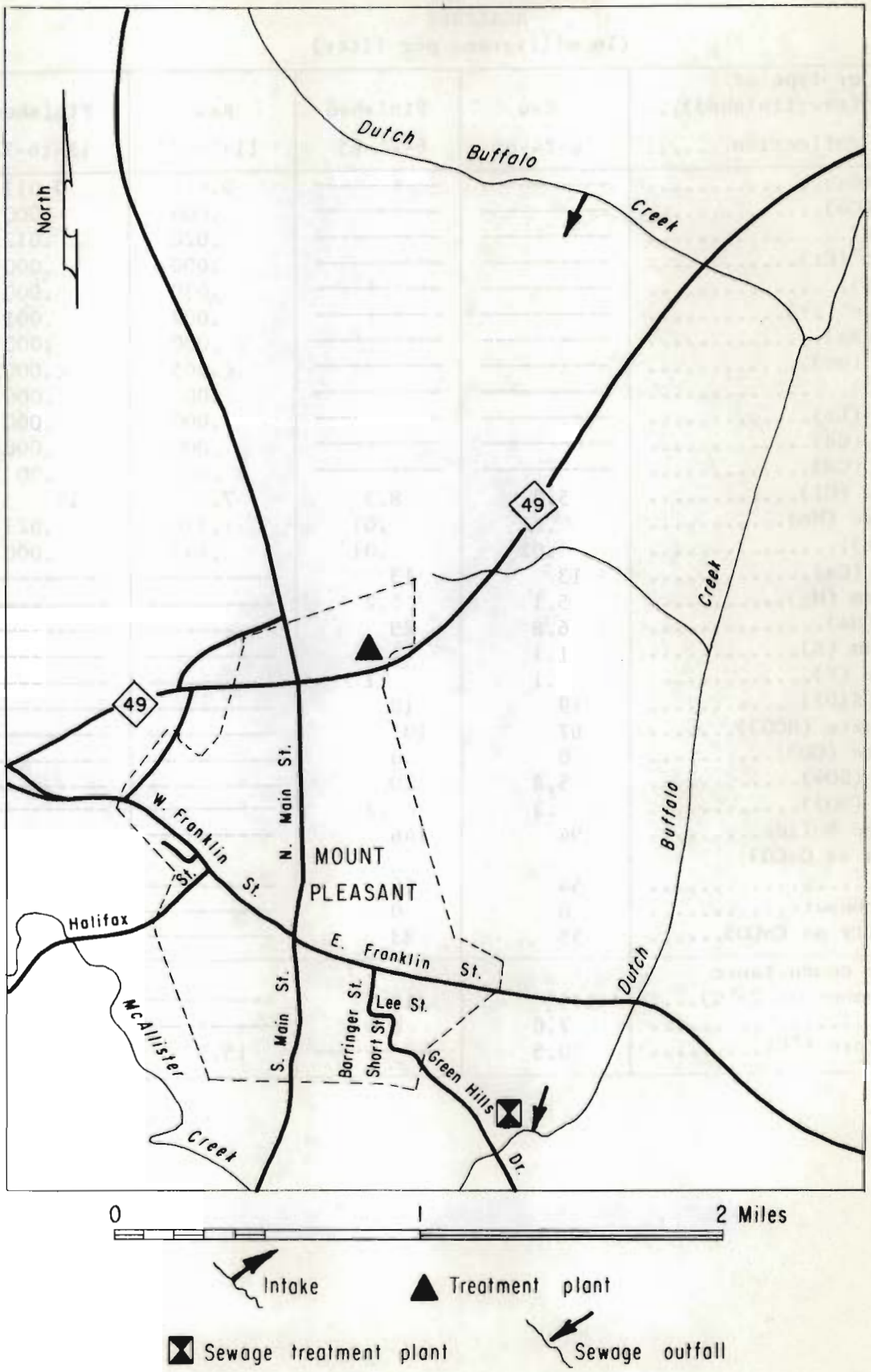
Surface water: Mount Pleasant is in an upland area in eastern Cabarrus County. The town is drained by tributaries of Dutch Buffalo Creek, a tributary of the Pee Dee River. Minimum flows of streams draining the immediate vicinity of Mount Pleasant generally exceed 0.015 mgd per square mile. The average discharge of streams is 0.7 mgd per square mile, and the 7-day, 2-year low flow is 0.06 mgd per square mile. The amount of water treated at the filter plant is not metered. The average use

estimated on the basis of hours of operation of the treatment plant is 0.3 mgd. If water use increases, additional raw water and treatment capacity will be required. Sufficient water to meet future demand could be obtained by providing storage at the raw water intake.

Ground water: The eastern half of town is underlain by slate and undifferentiated volcanic rocks and the western half is underlain by greenstone schist. Prior to construction of the present system, the municipal supply was obtained from four wells with reported yields of 30 to 50 gpm. The yield of two of the wells was reported to have declined significantly. The water was moderately hard and the iron concentration in water from one well was as high as 0.4 mg/l.

Although the town has no plans for future use of ground water as a source of supply, 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 MOUNT PLEASANT



MOUNT PLEASANT, CABARRUS COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	6-24-65	6-24-65	11-16-72	11-16-72
Copper (Cu).....	----------	----------	0.011	0.011
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.020	.012
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.030	.000
Strontium (Sr).....	----------	----------	.002	.001
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.000	.000
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	5.8	8.3	7.0	13
Manganese (Mn).....	.01	.01	.170	.023
Iron (Fe).....	.02	.01	.640	.000
Calcium (Ca).....	13	13	----------	----------
Magnesium (Mg).....	5.1	5.2	----------	----------
Sodium (Na).....	6.8	29	----------	----------
Potassium (K).....	1.1	1.3	----------	----------
Fluoride (F).....	.1	.1	----------	----------
Silica (SiO2).....	19	18	----------	----------
Bicarbonate (HCO3).....	67	101	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	5.8	20	----------	----------
Nitrate (NO3).....	.3	.3	----------	----------
Dissolved Solids.....	94	146	----------	----------
Hardness as CaCO3:				
Total.....	54	54	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	55	83	----------	----------
Specific conductance (micromhos at 25° C)....	131	218	----------	----------
pH.....	7.0	8.0	----------	----------
Temperature (°C).....	20.5	----------	15.5	15.5

CATAWBA COUNTY

WATER-RESOURCES APPRAISAL

Catawba County is in the west-central part of the Piedmont Province. The topography is characterized by rolling hills with moderate to steep land and stream slopes. The Catawba River, which forms the north and east boundaries, and its tributaries drain the entire county. Three lakes on the Catawba River (Hickory, Lookout Shoals, and Norman) used primarily for hydroelectric power development are in the county. The average discharge of unregulated streams ranges from 0.7 mgd per square mile in the eastern part, to 0.9 mgd per square mile in the western part. The 7-day, 2-year low flow averages 0.3 mgd per square mile, and minimum flows generally exceed 0.1 mgd per square mile.

Longview, Maiden, Newton, and Hickory (which also supplies Brookford and Conover) obtain their water supply from surface sources. Catawba and most rural domestic supplies are obtained from ground-water sources. The total population of the county in 1970 was 90,873.

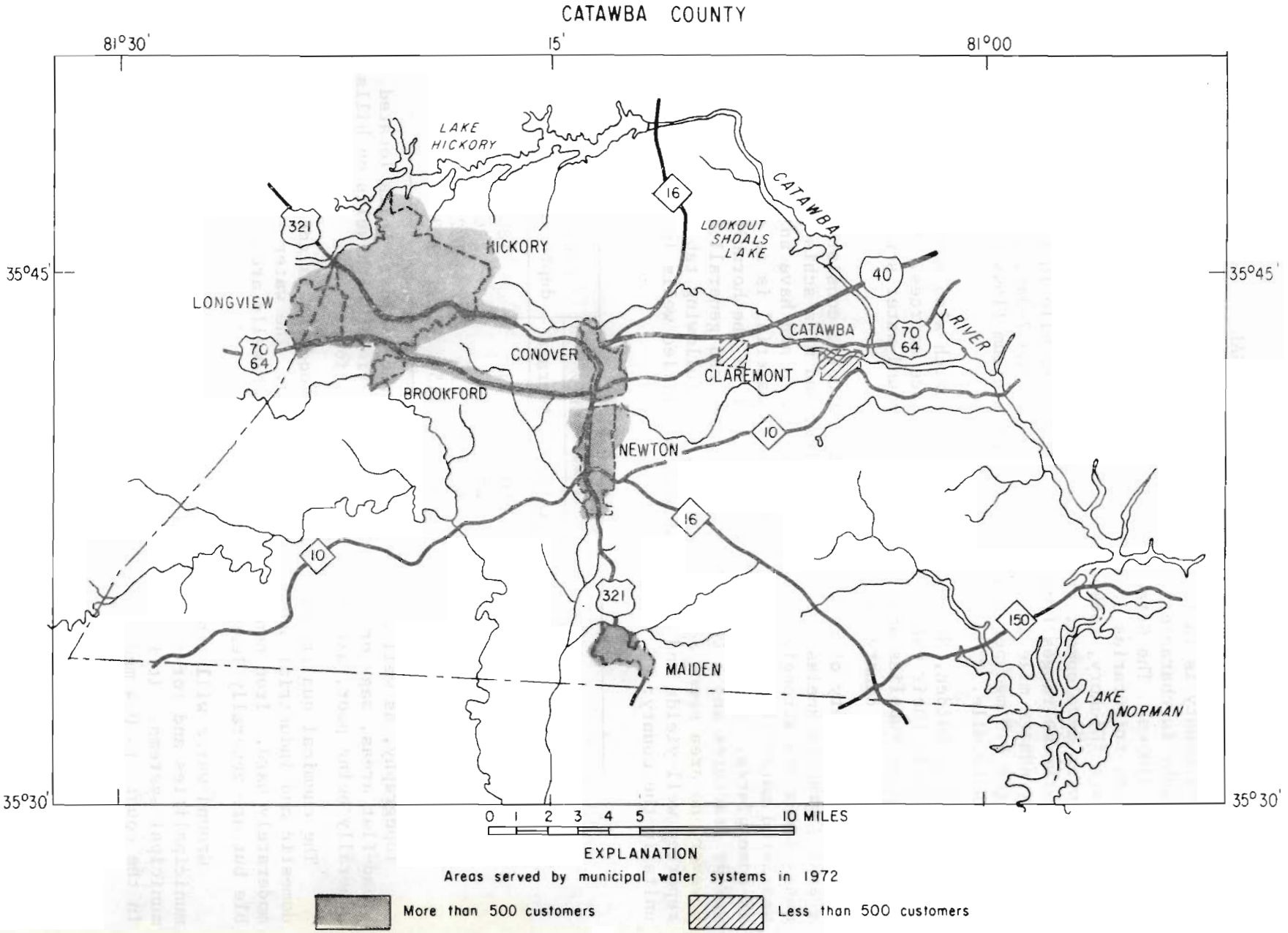
A great variety of rocks underlie the county, consisting principally of granite, granite gneiss, hornblende gneiss, and mica schist. The rocks at most places are strongly foliated and fractured and have an ample covering of weathered material. The depth of weathered material is as much as 150 feet in some places. The more soluble rocks, such as the hornblende gneiss, have larger fractures and a thicker cover of soil, and generally, the best wells. However, no area seems especially poor. The following table shows typical reported well yields and average depths of drilled wells in the major rock units in the county:

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Granite gneiss	180	21	180
Hornblende gneiss	228	22	216
Granite	40	12	132
Mica schist	50	15	173

Topography, as well as geology, affects the yields. Wells located in broad-flat areas, sags or draws have the best yields with wells on hills generally being poor, although there are exceptions.

The chemical quality of ground water is good and is acceptable for most domestic and industrial uses without treatment. The water is soft to moderately hard. Iron concentrations from some wells are higher than desirable but are generally less than 0.3 mg/1.

Ground water will continue to be an important source of supply for small municipalities and for industrial and domestic use in areas remote from municipal systems. It is estimated that the amount of ground water available in the county is 0.4 mgd per square mile.


CATAWBA COUNTY
81°30'
15'
81°00
35°45'
35°30'
LAKE HICKORY
HICKORY
LONGVIEW
CONOVER
BROOKFORD
NEWTON
MAIDEN
CLAREMONT
CATAWBA
LOOKOUT SHOALS LAKE
CATAWBA RIVER
LAKE NORMAN
321
16
40
70
64
10
150
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

HICKORY, CATAWBA COUNTY

OWNERSHIP:

Municipal. Also supplies Brookford and Conover. Total population supplied, about 30,000 in 1971 (7,750 metered customers, 1,400 of which are in suburban districts).

SOURCE:

Catawba River impounded in Lake Hickory. Lake Hickory is used for hydroelectric power generation by Duke Power Company. The intakes are located about 100 feet downstream from the U. S. Highway 321 bridge over Lake Hickory at lat 35°45'19", long 81°22'32". The drainage area at the dam is 1,310 square miles, approximately.

RAW-WATER STORAGE:

Lake Hickory, 41.5 billion gallons. Storage controlled by Duke Power Company.

ALLOWABLE DRAFT:

Not determined. There are no contractual quantity restrictions as to the amount of water that can be withdrawn from Lake Hickory.

TOTAL USE:

Average (1971), 4.5 mgd, metered; maximum daily (8-31-71), 5.25 million gallons.

INDUSTRIAL USE:

2.8 mgd, estimated. Principal users include Hickory Dyeing and Winding Company, Barrtex Dyeing, Shuford Mills, and Collins and Aikman, Inc.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, rapid sand filtration, adjustment of pH with caustic soda, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

7.35 mgd.

PUMPING CAPACITY:

Raw water, 15.2 mgd; finished water, 10.8 mgd plus a 3.5 mgd auxiliary pump.

FINISHED-WATER STORAGE:

Two clear wells, 1 million and 500,000 gallons; two elevated tanks, each of 1 million gallons; one standpipe, 250,000 gallons.

FUTURE PLANS:

Present plans include: (1) expansion of treatment plant to increase capacity to 16.0 mgd by end of 1974; (2) construct a 2.0 million gallon clear well at the treatment plant and a 1.0 million gallon ground storage tank at the airport; and (3) increase raw-water pumping capacity.

HICKORY, CATAWBA COUNTY

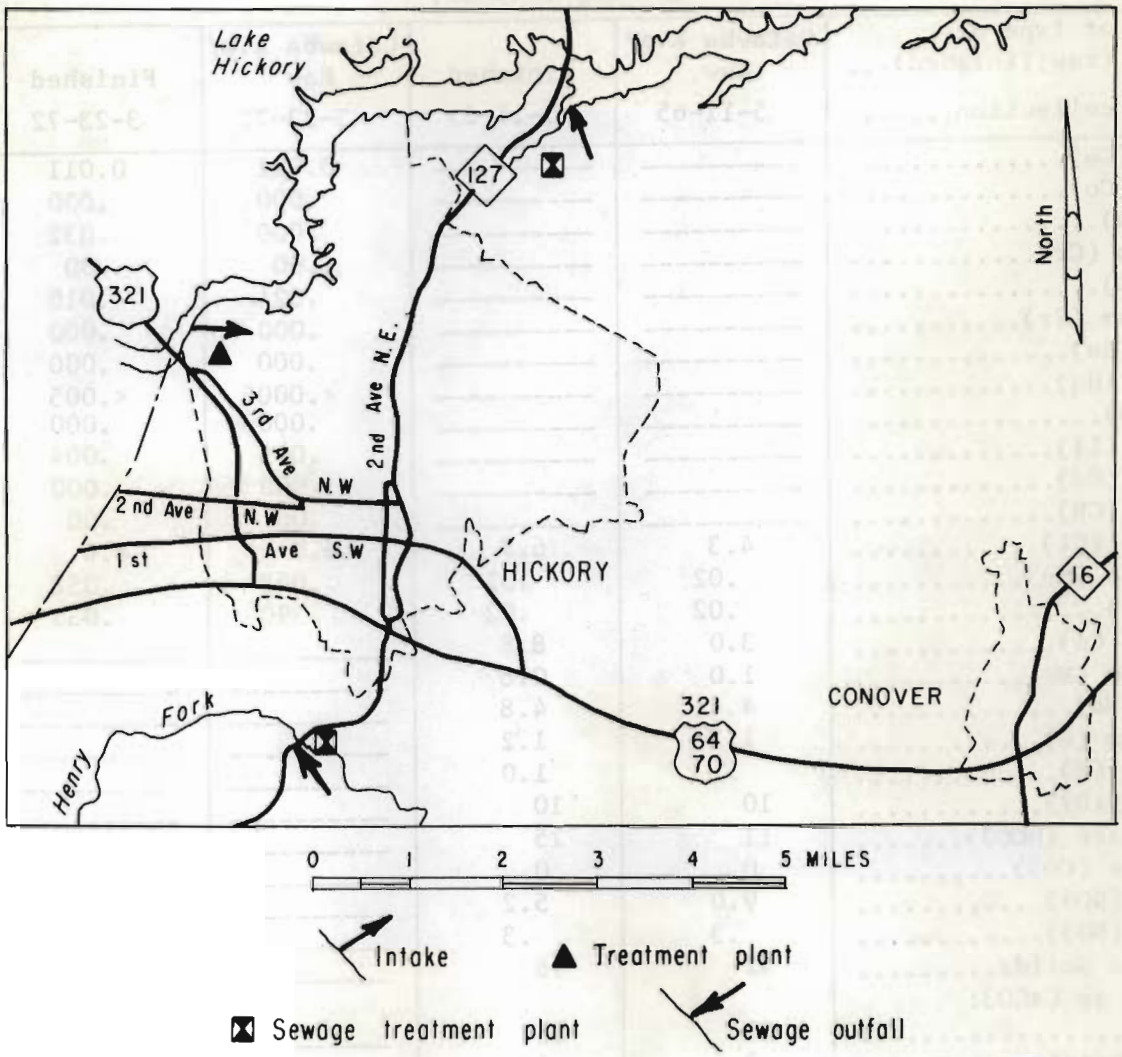
WATER-RESOURCES APPRAISAL:

Surface water: There is ample water in the Catawba River to supply the needs of Hickory for the foreseeable future.

Ground water: Composite gneiss, a light-colored rock, largely granitic, with a pronounced foliation underlies the Hickory area. Reported well casing lengths, an indication of the depth of overlying weathered rock, ranges from 20 to 154 feet and averages 68 feet. Yields as high as 80 gpm have been reported in the area and the average reported yield is 21 gpm. It is not uncommon for wells drilled in favorable locations, such as low flat areas and draws, to yield more than 35 gpm.

The chemical quality of ground-water is good. The water is usually soft, but, locally, may contain undesirable concentrations of iron. Iron concentrations as high as 2.9 mg/l have been reported.

CITY OF HICKORY



HICKORY, CATAWBA COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Catawba R.[a]/ Raw	Finished	Catawba R.[a]/ Raw	Finished
Date of collection.....	5-11-65	5-11-65	3-23-72	3-23-72
Copper (Cu).....	----------	----------	0.011	0.011
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.032
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.024	.010
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.003	.004
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	4.3	6.7	6.0	8.4
Manganese (Mn).....	.02	.01	.058	.058
Iron (Fe).....	.02	.02	.390	.035
Calcium (Ca).....	3.0	8.8	----------	----------
Magnesium (Mg).....	1.0	0.8	----------	----------
Sodium (Na).....	4.4	4.8	----------	----------
Potassium (K).....	1.3	1.2	----------	----------
Fluoride (F).....	.1	1.0	----------	----------
Silica (SiO2).....	10	10	----------	----------
Bicarbonate (HCO3).....	11	25	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	9.0	5.2	----------	----------
Nitrate (NO3).....	.3	.3	----------	----------
Dissolved Solids.....	42	56	----------	----------
Hardness as CaCO3:				
Total.....	12	25	----------	----------
Noncarbonate.....	3	4	----------	----------
Alkalinity as CaCO3.....	9	20	----------	----------
Specific conductance (micromhos at 25° C)....	47	73	----------	----------
pH.....	6.5	7.2	----------	----------
Temperature (°C).....	19.5	----------	11.5	13

[a]/ Catawba River impounded in Lake Hickory.

LONGVIEW, CATAWBA COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,800 in 1971 (1,350 metered customers, 50 of which are in suburban districts).

SOURCE:

Catawba River impounded in Lake Hickory. The lake was constructed for hydroelectric power generation by Duke Power Company. The water supply intakes are located about 0.2 mile upstream from the U. S. Highway 321 bridge over Lake Hickory at lat 35°45'19", long 81°22'41". The drainage area at the dam is 1,310 square miles, approximately.

RAW-WATER STORAGE:

Lake Hickory, 41.5 billion gallons. Storage controlled by Duke Power Company.

ALLOWABLE DRAFT:

Not determined. There are no contractual limitations as to the amount of water that can be withdrawn from Lake Hickory.

TOTAL USE:

Average (1971) 1.0 mgd, metered; maximum daily (3-21-72) 1.26 million gallons.

INDUSTRIAL USE:

0.6 mgd, estimated. Principal users include J. P. Stevens Co., Old Hickory Fabrics, Inc., Piedmont Linen Supply, and Pepsi Cola Bottling Company.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, Micro-floc filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, and postchlorination when needed.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water, 2.0 mgd; finished water, 1.6 mgd.

FINISHED-WATER STORAGE:

One clear well, 750,000 gallons; two elevated tanks, 300,000 and 100,000 gallons.

FUTURE PLANS:

Plan to install one additional 2.0 mgd raw water pump and one additional 2.0 mgd finished water pump. Fluoridation to be added to the treatment process in 1972.

LONGVIEW, CATAWBA COUNTY

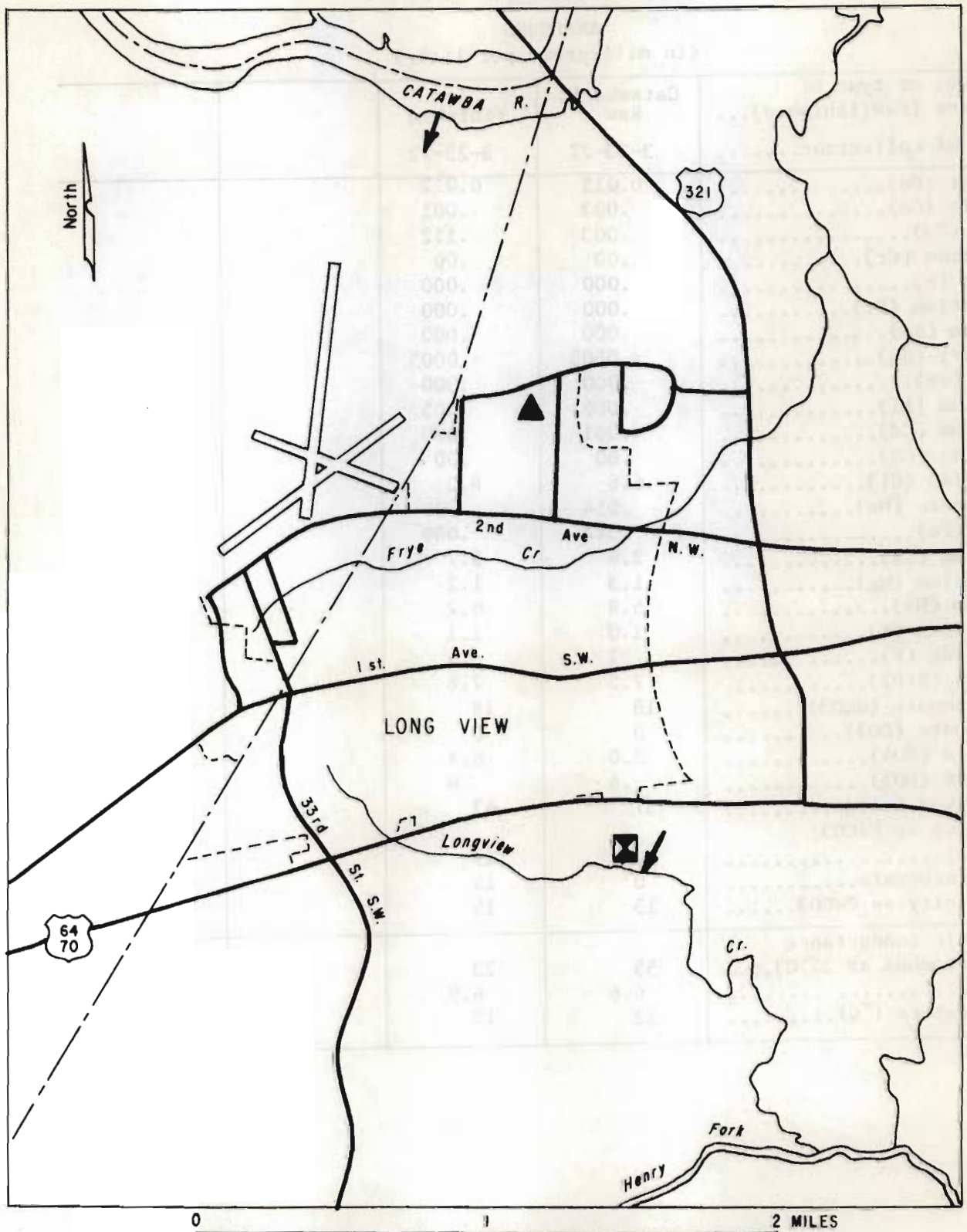
WATER-RESOURCES APPRAISAL:

Surface water: There is ample water in the Catawba River to supply the needs of Longview for the foreseeable future.

Ground water: The predominate rock underlying Longview is gneiss, a light-colored, laregly granitic rock. The gneiss is strongly foliated in the area. The depth of overlying weathered material is known to be 120 feet in some places. The average reported yield of wells in the immediate vicinity is 21 gpm, with a maximum reported yield of 75 gpm. It is estimated that 60 percent of wells drilled in low-flat areas and draws where weathered rock is thickest would yield at least 35 gpm.

The chemical quality of ground water is good. The water is soft, but locally may contain undesirable concentrations of iron.

CITY OF LONGVIEW



LONGVIEW, CATAWBA COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Catawba R. Raw	Finished		
Date of collection.....	3-23-72	3-23-72		
Copper (Cu).....	0.015	0.012		
Cobalt (Co).....	.003	.001		
Zinc (Zn).....	.003	.112		
Chromium (Cr).....	.00	.00		
Boron (B).....	.000	.000		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.005	.005		
Cadmium (Cd).....	<.001	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	6.6	8.0		
Manganese (Mn).....	.054	.000		
Iron (Fe).....	.348	.049		
Calcium (Ca).....	2.6	5.7		
Magnesium (Mg).....	1.3	1.2		
Sodium (Na).....	5.8	6.2		
Potassium (K).....	1.0	1.1		
Fluoride (F).....	.2	.1		
Silica (SiO2).....	7.5	7.8		
Bicarbonate (HCO3).....	18	18		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	2.0	6.4		
Nitrate (NO3).....	.6	.6		
Dissolved Solids.....	37	47		
Hardness as CaCO3:				
Total.....	12	19		
Noncarbonate.....	0	15		
Alkalinity as CaCO3.....	15	15		
Specific conductance (micromhos at 25° C)....	55	73		
pH.....	6.6	6.9		
Temperature (°C).....	12	12		

MAIDEN, CATAWBA COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,400 in 1972 (902 metered customers, 40 of which are in suburban areas).

SOURCE:

Maiden Creek impounded in Maiden Lake. The intakes are located at the dam about 1/2 mile northeast of Maiden at lat 35°35'04", long 81°11'30". The drainage area at the dam is 9.1 square miles, approximately.

RAW-WATER STORAGE:

Maiden Lake, 50 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 2.7 mgd with a storage of 50 million gallons.

TOTAL USE:

Average (1971), 0.86 mgd, metered; maximum daily, (5-10-71) 1.28 million gallons.

INDUSTRIAL USE:

0.6 mgd, estimated. Principal users include Maiden Knitting Mills, Woonsocket Mill, and American-Effird Mills.

TREATMENT:

Prechlorination, coagulation with alum and caustic soda, sedimentation, occasional use of carbon for control of taste and odor, rapid-sand filtration, adjustment of pH with caustic soda, and postchlorination. Occasionally a filter aid (a chemical compound that improves coagulation) is used.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water, 2.0 mgd; finished water, 4.0 mgd.

FINISHED-WATER STORAGE:

Two clear wells, each 500,000 gallons; two elevated tanks, 150,000 and 100,000 gallons; one standpipe, 115,000 gallons.

FUTURE PLANS:

None at present. Fluoridation may be added to the treatment process.

WATER-RESOURCES APPRAISAL:

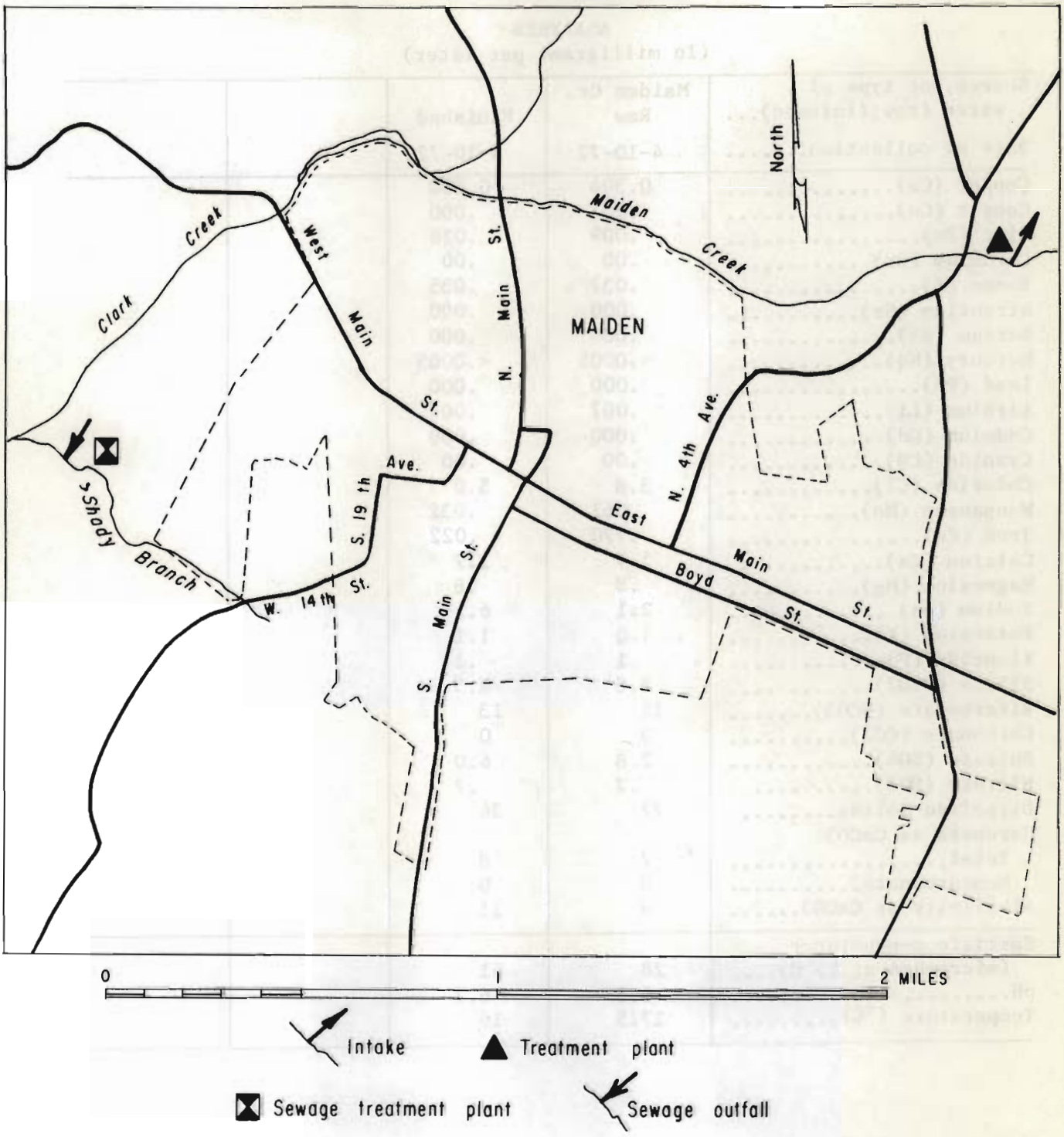
Surface water: Maiden is in an upland area in south-central Catawba County. The area is drained by tributaries of Shady Branch and Maiden Creek. The low flow yield of streams in the immediate vicinity is 0.15 mgd per square mile. The average discharge of streams is 0.9 mgd per square mile and the 7-day, 2-year low flow is 0.3 mgd per square mile. The 50 million gallon reservoir presently in use has sufficient capacity

to meet the needs of the immediate future. The estimated allowable draft is more than three times current use. If demands increase significantly, additional draft could be obtained by increasing the storage capacity of the present reservoir. It is estimated that the allowable draft could be doubled safely.

Ground water: The predominant rock underlying Maiden is hornblende gneiss. The mantle of weathered rock is at least 80 feet thick in some places. Reported well yields are as high as 60 gpm and average 30-40 gpm. Static water levels reportedly average 20 feet below land surface.

Several years ago, Maiden used wells as a source of supply. The water from the wells was of good chemical quality. Analyses of samples from 4 of the town's wells showed less than 52 mg/1 total hardness and less than 0.11 mg/1 iron.

CITY OF MAIDEN



MAIDEN, CATAWBA COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Maiden Cr. Raw	Finished		
Date of collection.....	4-10-72	4-10-72		
Copper (Cu).....	0.304	0.000		
Cobalt (Co).....	.003	.000		
Zinc (Zn).....	.009	.026		
Chromium (Cr).....	.00	.00		
Boron (B).....	.037	.035		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.007	.007		
Cadmium (Cd).....	.000	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	3.8	5.0		
Manganese (Mn).....	.061	.032		
Iron (Fe).....	.770	.022		
Calcium (Ca).....	1.7	1.7		
Magnesium (Mg).....	.8	.8		
Sodium (Na).....	2.1	6.5		
Potassium (K).....	1.0	1.1		
Fluoride (F).....	.1	.1		
Silica (SiO2).....	8.8	8.5		
Bicarbonate (HCO3).....	11	13		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	2.8	6.0		
Nitrate (NO3).....	.7	.7		
Dissolved Solids.....	27	36		
Hardness as CaCO3:				
Total.....	7	8		
Noncarbonate.....	0	0		
Alkalinity as CaCO3.....	9	11		
Specific conductance (micromhos at 25° C)....	28	51		
pH.....	6.3	6.7		
Temperature (°C).....	17.5	16		

NEWTON, CATAWBA COUNTY

OWNERSHIP:

Municipal. Also supplies Claremont. Total population supplied, about 9,000 in 1972 (3,300 metered customers, 165 of which are in suburban areas).

SOURCE:

Jacob Fork impounded by a low dam. The intakes are located about 5 miles west of Newton at lat 35°38'10", long 81°18'32". Water is pumped from Jacob Fork to an off-river reservoir about 2 miles west of town from where it is pumped to the treatment plant. The drainage area at the intake is 101 square miles, approximately.

RAW-WATER STORAGE:

Negligible at Jacob Fork. Approximately 25 million gallons in the off-river reservoir.

ALLOWABLE DRAFT:

Estimated allowable draft is 15.5 mgd without storage.

TOTAL USE:

Average (1971) 2.1 mgd, metered; maximum daily (9-2-71) 2.9 million gallons.

INDUSTRIAL USE:

0.8 mgd, estimated. Principal users include Carolina Mills, Clyde Fabrics, General Electric Company, and Catawba Valley Finishing.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd.

PUMPING CAPACITY:

Raw water 3.0 mgd; finished water, 5.7 mgd.

FINISHED-WATER STORAGE:

Two clear wells, each of 500,000 gallons; two elevated tanks, each of 500,000 gallons.

FUTURE PLANS:

Plan to install an additional 20-inch raw water line to Jacob Fork and increase raw water pumping capacity to 12 mgd. The capacity of the treatment plant is to be increased to 4.5 mgd by changing the media in the filters.

NEWTON, CATAWBA COUNTY

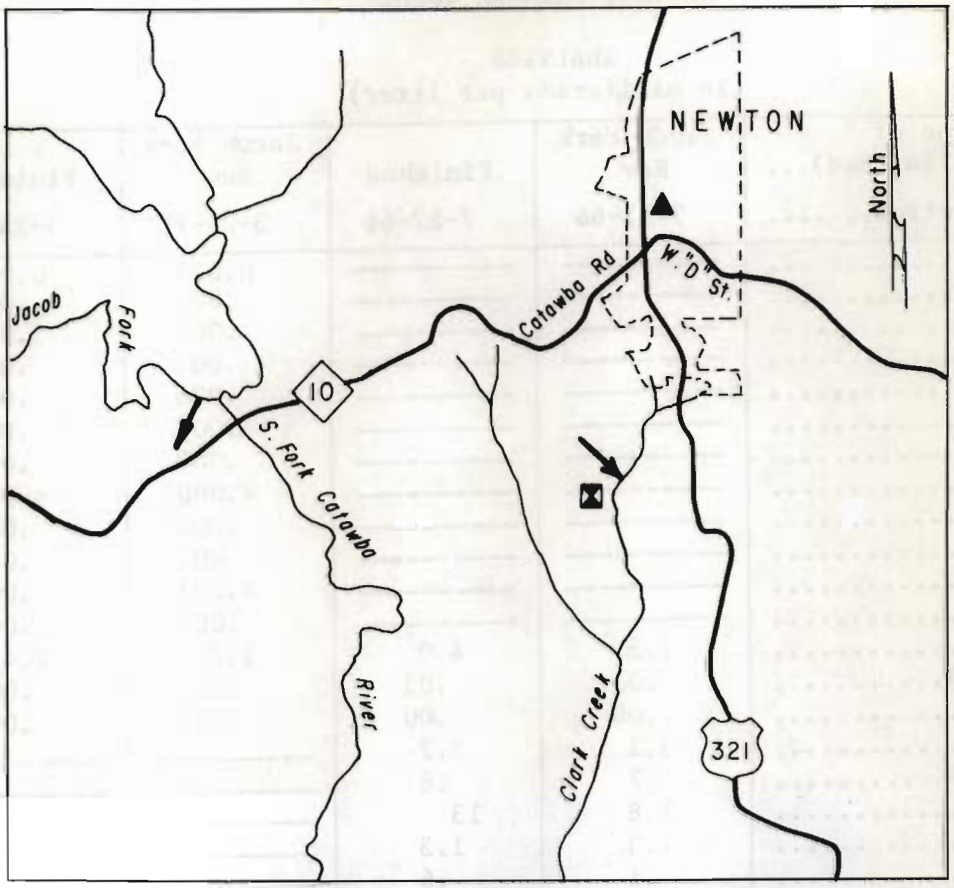
WATER-RESOURCES APPRAISAL:

Surface water: Newton is located in the center of Catawba County where the topography is relatively flat. The town is drained by small tributaries of Clark and McLin Creeks both of which are tributaries of the Catawba River. The low flow yield of streams in the immediate area ranges from 0.15 to 0.20 mgd per square mile. The average discharge is 0.8 mgd per square mile and the 7-day, 2-year low flow is 0.35 mgd per square mile. The low-flow yield of Jacob Fork is adequate to meet the needs of the immediate future.

Ground water: Hornblende gneiss is the predominant rock underlying Newton. The hornblende gneiss is fairly soluble and strongly fractured resulting in a relatively thick layer of soil and weathered material. The fracture characteristics and thick mantle of weathered material are conducive to higher-yielding wells. Yields of 35 gpm are not uncommon from wells penetrating the hornblende gneiss.

The chemical quality of ground water is generally good. The water is soft and usually contains less than 0.3 mg/l of iron.

CITY OF NEWTON



NEWTON, CATAWBA COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Jacob Fork Raw	Finished	Jacob Fork Raw	Finished
Date of collection.....	7-27-66	7-27-66	3-24-72	3-24-72
Copper (Cu).....	----------	----------	0.025	0.017
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.000
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.006	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.003	.003
Cadmium (Cd).....	----------	----------	<.001	.001
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	1.5	4.0	1.2	2.4
Manganese (Mn).....	.01	.02	.027	.002
Iron (Fe).....	.00	.00	.334	.000
Calcium (Ca).....	3.1	3.2	----------	----------
Magnesium (Mg).....	.7	.8	----------	----------
Sodium (Na).....	1.8	13	----------	----------
Potassium (K).....	1.3	1.3	----------	----------
Fluoride (F).....	.1	.6	----------	----------
Silica (SiO2).....	8.5	8.3	----------	----------
Bicarbonate (HCO3).....	17	31	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	1.0	6.8	----------	----------
Nitrate (NO3).....	.2	.2	----------	----------
Dissolved Solids.....	26	53	----------	----------
Hardness as CaCO3:				
Total.....	11	11	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	14	25	----------	----------
Specific conductance (micromhos at 25°C)....	36	80	----------	----------
pH.....	6.6	7.2	---------	----------
Temperature (°C).....	28	28	12	13.5

GASTON COUNTY

WATER-RESOURCES APPRAISAL

Gaston County is in the south-central part of the Piedmont Province. The North Carolina-South Carolina State line is the southern boundary. The topography is hilly, with several pronounced ridges including Kings Mountain Pinnacle, Spencer Mountain, and Crowders Mountain. The Catawba River is the east boundary and receives the drainage of the county. Flow in the Catawba River is highly regulated by several hydroelectric dams. The average discharge of unregulated streams in the county ranges from 0.7 to 0.8 mgd per square mile. Minimum flows of unregulated streams range from 0.015 to 0.16 mgd per square mile and average 0.08 mgd per square mile, and the 7-day, 2-year low flow averages 0.2 mgd per square mile.

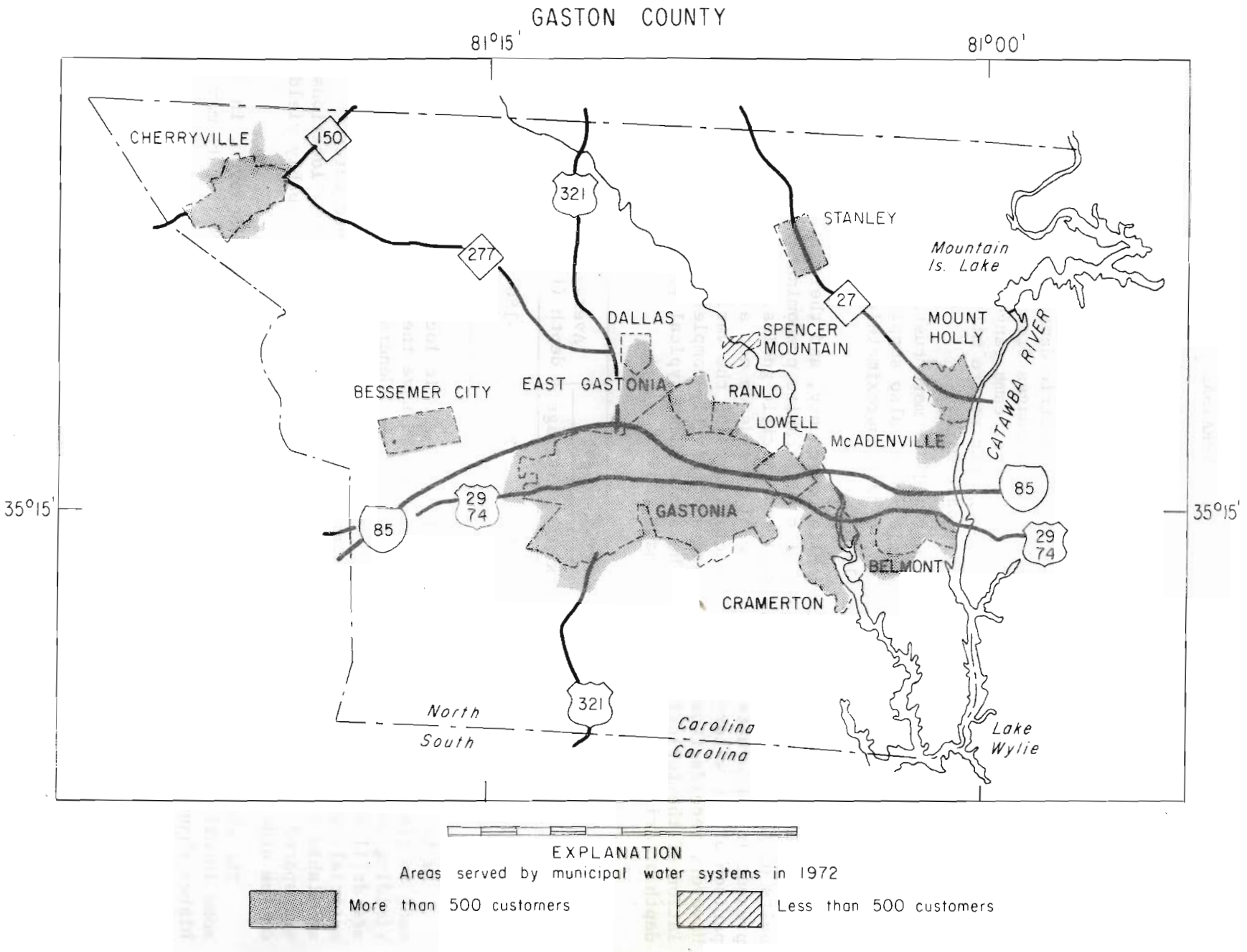
All municipal water supplies with 500 or more customers obtain their water from surface sources. Gastonia, which also supplies Dallas, Ranlo, Lowell, McAdenville, and Cramerton, serves approximately 50 percent of the county's population of 148,415 (1970).

A wide variety of rocks underlie the county, and their relation, one with another is complex. Mica Schist and granite predominate, and several belts of hornblende gneiss, diorite and dioritic gneiss, and quartzite are present in the county. Available well records do not allow a complete comparison of the water-bearing characteristics of the various rock units. However, records from 151 wells are sufficiently complete to allow compilation of the following table. The table shows typical yields and average depth of drilled wells in predominant rocks.

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Schist	150	23	180
Granite	100	18	165

As in most areas of the Piedmont, topographic location is more significant to yield than rock type. Wells on hills have the smallest yield, yielding about half as much as wells in draws. Generally, the best wells are drilled in topographically low areas where the saturated weathered material is thickest. It is estimated that the amount of ground water available is 0.4 mgd per square mile. Wells drilled in favorable locations and spaced to prevent interference between each other, would probably yield on the order of 0.03 to 0.04 mgd per well.

The chemical quality of ground-water is generally good. However, in some localities, iron concentrations and hardness causing constituents may be higher than desirable.


GASTON COUNTY
81°15'
81°00'
35°15'
35°15'
CHERRYVILLE
150
277
321
STANLEY
27
Mountain Is. Lake
DALLAS
SPENCER MOUNTAIN
MOUNT HOLLY
CATAWBA RIVER
BESSEMER CITY
EAST GASTONIA
RANLO
LOWELL
McADENVILLE
85
29
74
GASTONIA
BELMONT
CRAMERTON
North Carolina
South Carolina
Lake Wylie
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

BELMONT, GASTON COUNTY

OWNERSHIP:

Belmont Converting Company. Total population supplied, about 7,500 in 1972. Belmont Converting Company has 4 customers, 3 industrial and the City of Belmont. Belmont has 2,600 metered customers, 700 of which are in suburban areas.

SOURCE:

Catawba River in the headwaters of Lake Wylie. The intakes are located on the eastern edge of town at lat 35°14'23", long 81°00'45". The drainage area at the intakes is 2,060 square miles, approximately.

RAW-WATER STORAGE:

None controlled by Belmont.

ALLOWABLE DRAFT:

Mountain Island Dam and hydroelectric station is about 6 miles upstream from the Belmont intake. The minimum release from Mountain Island Dam as required by the Federal Power Commission is 51.7 mgd, and this is the minimum amount of water available to Belmont.

TOTAL USE:

Average (1971) 2.67 mgd, metered; maximum daily (8-27-71) 3.68 million gallons.

INDUSTRIAL USE:

1.3 mgd, estimated. Principal users include Piedmont Processing Company, Dixie Yarn, Stowe Thread, and Belmont Converting Company.

TREATMENT:

Potassium permanganate is added at the raw-water pumping station for control of taste and odor. Prechlorination, coagulation with alum and soda ash, addition of carbon for control of taste and odor, rapid sand (7 filters) or anthracite filtration (3 filters), addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, post-chlorination when necessary, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

6.5 mgd.

PUMPING CAPACITY:

Raw water, 10.4 mgd; finished water, 4.9 mgd. Two principal industrial users are supplied finished water through gravity lines.

FINISHED-WATER STORAGE

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

FUTURE PLANS:

None.

BELMONT, GASTON COUNTY

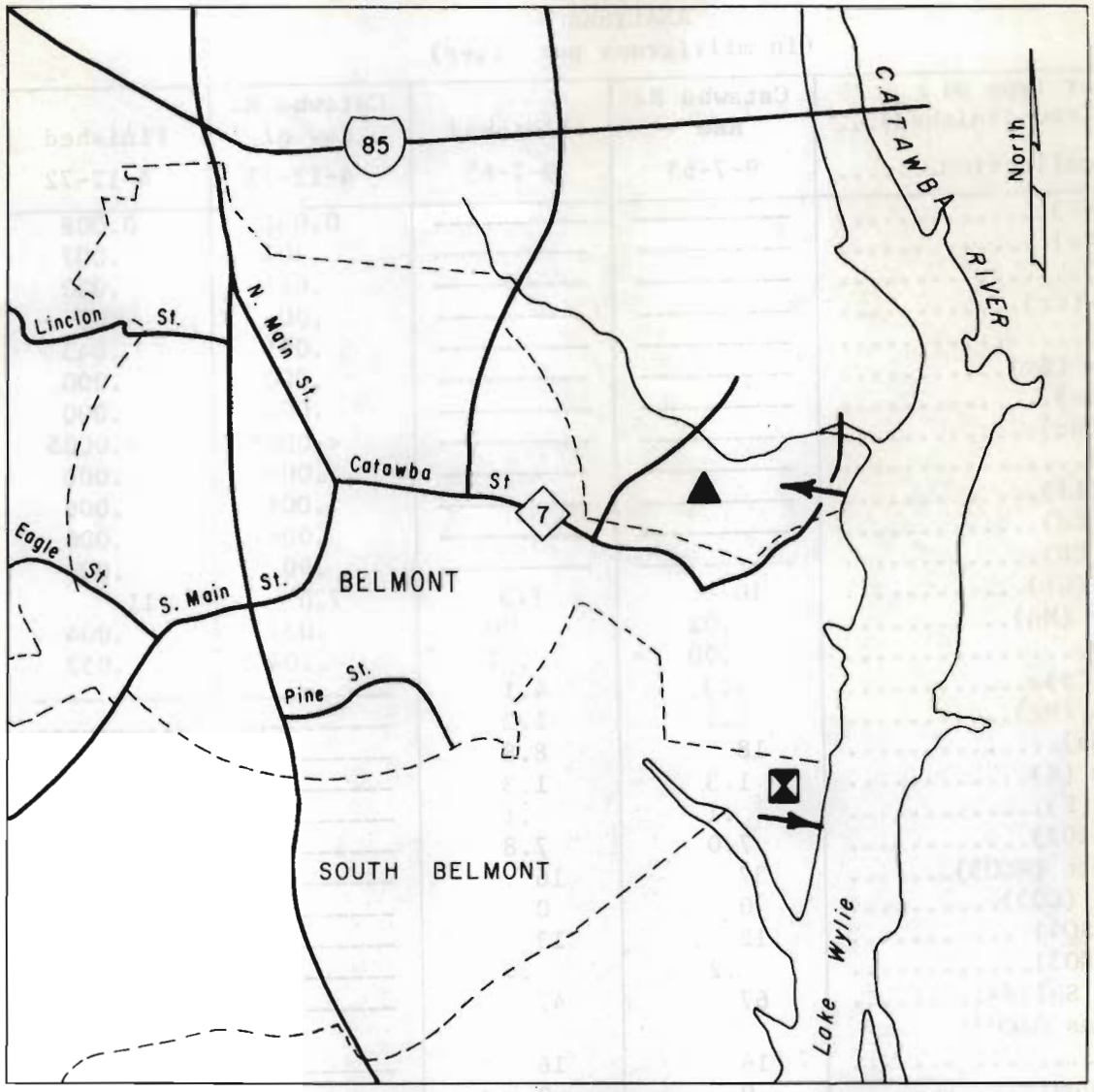
WATER-RESOURCES APPRAISAL:

Surface water: Belmont is on the west bank of the Catawba River, which forms the east boundary of Gaston County. The water supply intakes are in the headwaters of Lake Wylie and about 6 miles downstream from Mountain Island Dam, both lakes are Duke Power Company hydroelectric impoundments. Minimum releases of water from the Mountain Island Impoundment are many times greater than present use and should be adequate to meet the needs of the foreseeable future.

Ground water: Belmont is underlain by crystalline rocks including granite, diorite, and schist. The overlying weathered material is reported to be 90 feet thick in places. Wells usually are drilled between 100 and 175 feet deep and reported yields average 9 gpm with one well yielding 30 gpm.

With the abundance of surface water available, it is not likely that ground water will be used for municipal water supply. However, the potential exists to develop moderate supplies of 0.03 to 0.04 mgd per well.

CITY OF BELMONT



BELMONT, GASTON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Catawba R. Raw	Finished	Catawba R. Raw a/	Finished
Date of collection.....	9-7-65	9-7-65	4-12-72	4-12-72
Copper (Cu).....	----------	----------	0.031	0.008
Cobalt (Co).....	----------	----------	.007	.007
Zinc (Zn).....	----------	----------	.025	.030
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.065	.043
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.006	.006
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	10	7.3	7.0	11
Manganese (Mn).....	.02	.00	.057	.004
Iron (Fe).....	.00	.01	.204	.052
Calcium (Ca).....	4.3	4.1	----------	----------
Magnesium (Mg).....	1.1	1.3	----------	----------
Sodium (Na).....	18	8.8	----------	----------
Potassium (K).....	1.3	1.3	----------	----------
Fluoride (F).....	.1	.1	----------	----------
Silica (SiO2).....	7.0	7.8	----------	----------
Bicarbonate (HCO3).....	37	16	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	12	13	----------	----------
Nitrate (NO3).....	.2	.4	----------	----------
Dissolved Solids.....	67	47	----------	----------
Hardness as CaCO3:				
Total.....	16	16	----------	----------
Noncarbonate.....	0	3	----------	----------
Alkalinity as CaCO3.....	30	13	----------	----------
Specific conductance (micromhos at 25° C)....	113	82	----------	----------
pH.....	7.6	6.3	----------	----------
Temperature (°C).....	-	25	17	16

a/ Potassium permanganate added.

BESSEMER CITY, GASTON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 5,800 in 1972 (1,650 metered customers, 200 of which are in suburban areas).

SOURCE:

Long Creek. The intake is approximately 1/4 mile upstream from bridge on N. C. Highway 274, 2 miles northwest of Bessemer City at lat 38°18'10", long 81°18'20". The drainage area at the intake is 12.7 square miles. Long Creek tributary impounded in City Lake. City Lake is basically an off river reservoir and is filled by pumping from Long Creek.

The Bessemer City system is connected to the Kings Mountain system. Bessemer City purchases supplemental finished water from Kings Mountain.

RAW-WATER STORAGE:

City Lake, 100 million gallons; reservoir at the treatment plant, 1.5 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 2.5 mgd with a storage of 100 million gallons.

TOTAL USE:

Average (1971) 1.06 mgd, metered; maximum daily (2-1-72), 1.28 million gallons. Average use does not include 0.3 to 0.5 mgd of untreated water furnished to industry.

INDUSTRIAL USE:

0.4 mgd. Principal users include Lithium Corporation of America, Kings Point Knitting Mills, Inc., Pyramid Mills Company, Inc., Osage Manufacturing Company and McNeill Spinning Company. Approximately 0.3 to 0.5 mgd of untreated water is also sold to industry.

TREATMENT:

Partial-aeration, prechlorination, coagulation with alum and soda ash, sedimentation, Anthra-filt filtration, addition of potassium permangate for manganese control when necessary, adjustment of pH with soda ash, and postchlorination when required.

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd.

PUMPING CAPACITY:

Raw water: from Long Creek, 1.7 mgd; from City Lake, 2.0 mgd. Finished water, 1.8 mgd.

FINISHED-WATER STORAGE:

One clear well, 100,000 gallons; one elevated tank, 100,000 gallons; one ground tank, 200,000 gallons.

BESSEMER CITY, GASTON COUNTY

FUTURE PLANS:

None.

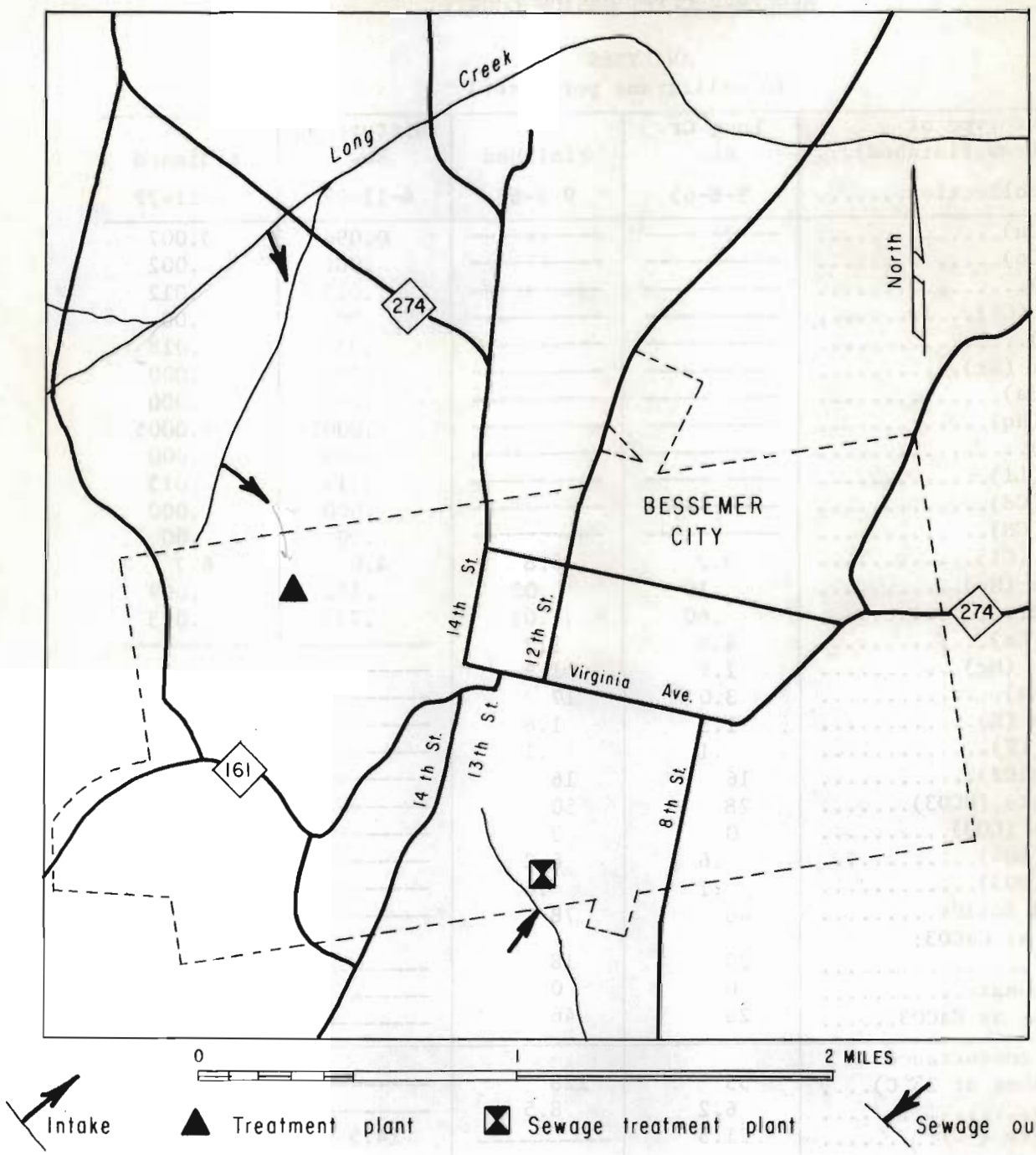
WATER-RESOURCES APPRAISAL:

Surface water: Bessemer City is in western Gaston County. The northern half of the city is drained by tributaries of Long Creek and the southern half is drained by tributaries of Abernathy and Crowders Creeks. The average discharge of streams draining the immediate area is 0.8 mgd per square mile. The low flow yield of streams generally exceeds 0.08 mgd per square mile and the 7-day, 2-year low flow averages 0.21 mgd per square mile. The city treatment plant was operating at capacity before supplemental water was obtained from Kings Mountain in 1972. If water use continues to increase, an increasing amount will have to be purchased or the treatment plant capacity enlarged. Additional draft could be developed by providing storage at the present source.

Ground water: Mica schist and granite are the predominant rocks underlying Bessemer City. These rocks have weathered to depths of slightly over 100 feet in places. Wells in the area are generally drilled to depths of 100 to 250 feet, and are reported to yield as much as 50 gpm.

A partial analysis of water from one well near Bessemer City 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 and iron content may be a problem.

CITY OF BESSEMER CITY



BESSEMER CITY, GASTON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Long Cr. Raw	Finished	Mixture a/ Raw	Finished
Date of collection.....	9-8-65	9-8-65	4-11-72	4-11-72
Copper (Cu).....	----------	----------	0.094	0.007
Cobalt (Co).....	----------	----------	.002	.002
Zinc (Zn).....	----------	----------	.023	.012
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.037	.018
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.014	.013
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	3.2	5.8	4.0	6.7
Manganese (Mn).....	.10	.02	.152	.009
Iron (Fe).....	.60	.01	.733	.093
Calcium (Ca).....	4.6	3.7	----------	----------
Magnesium (Mg).....	1.9	1.9	----------	----------
Sodium (Na).....	3.0	17	----------	----------
Potassium (K).....	1.5	1.8	----------	----------
Fluoride (F).....	.1	.1	----------	----------
Silica (SiO2).....	16	16	----------	----------
Bicarbonate (HCO3).....	28	50	----------	----------
Carbonate (CO3).....	0	3	----------	----------
Sulfate (SO4).....	.6	6.2	----------	----------
Nitrate (NO3).....	.1	.6	----------	----------
Dissolved Solids.....	46	78	----------	----------
Hardness as CaCO3:				
Total.....	20	18	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	23	46	----------	----------
Specific conductance (micromhos at 25° C)....	55	123	----------	----------
pH.....	6.2	8.5	----------	----------
Temperature (°C).....	21.5	----------	14.5	13.5

a/ Mixture of water from Long Creek and city lake.

CHERRYVILLE, GASTON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 5,500 in 1972 (1,880 metered customers, 150 of which are in suburban areas).

SOURCE:

Indian Creek. The intake is about 3 miles north of Cherryville at lat 35°25'11", long 81°21'59". The drainage area at the intake is 39 square miles, approximately. Water is pumped from Indian Creek to a storage reservoir at the treatment plant. Water flows by gravity from the reservoir to the treatment plant.

RAW-WATER STORAGE:

Reservoir at the treatment plant, 17.5 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 5.2 mgd with a storage of 17.5 million gallons.

TOTAL USE:

Average (1971) 0.81 mgd, metered; maximum daily (1-17-72) 1.36 million gallons.

INDUSTRIAL USE:

0.5 mgd, estimated. Principal users include Cherryville Dyeing and Finishing Co., Gaston Industries, Central Industries, and Burlington Industries, Inc.

TREATMENT:

Prechlorination, coagulation with alum and lime, 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:

1.5 mgd.

PUMPING CAPACITY:

Raw water, 1.5 mgd, finished water, 3.0 mgd.

FINISHED-WATER STORAGE:

One clear well, 500,000 gallons; one elevated tank, 100,000 gallons; one standpipe, 289,000 gallons.

FUTURE PLANS:

Plan to increase the treatment plant capacity to 3.5 mgd with the addition of two filters and increase finished water storage capacity by construction of a 500,000 gallon clear well or a 750,000 to 1 million gallon elevated tank. The bond issue for this expansion was approved by the voters in November 1971.

CHERRYVILLE, GASTON COUNTY

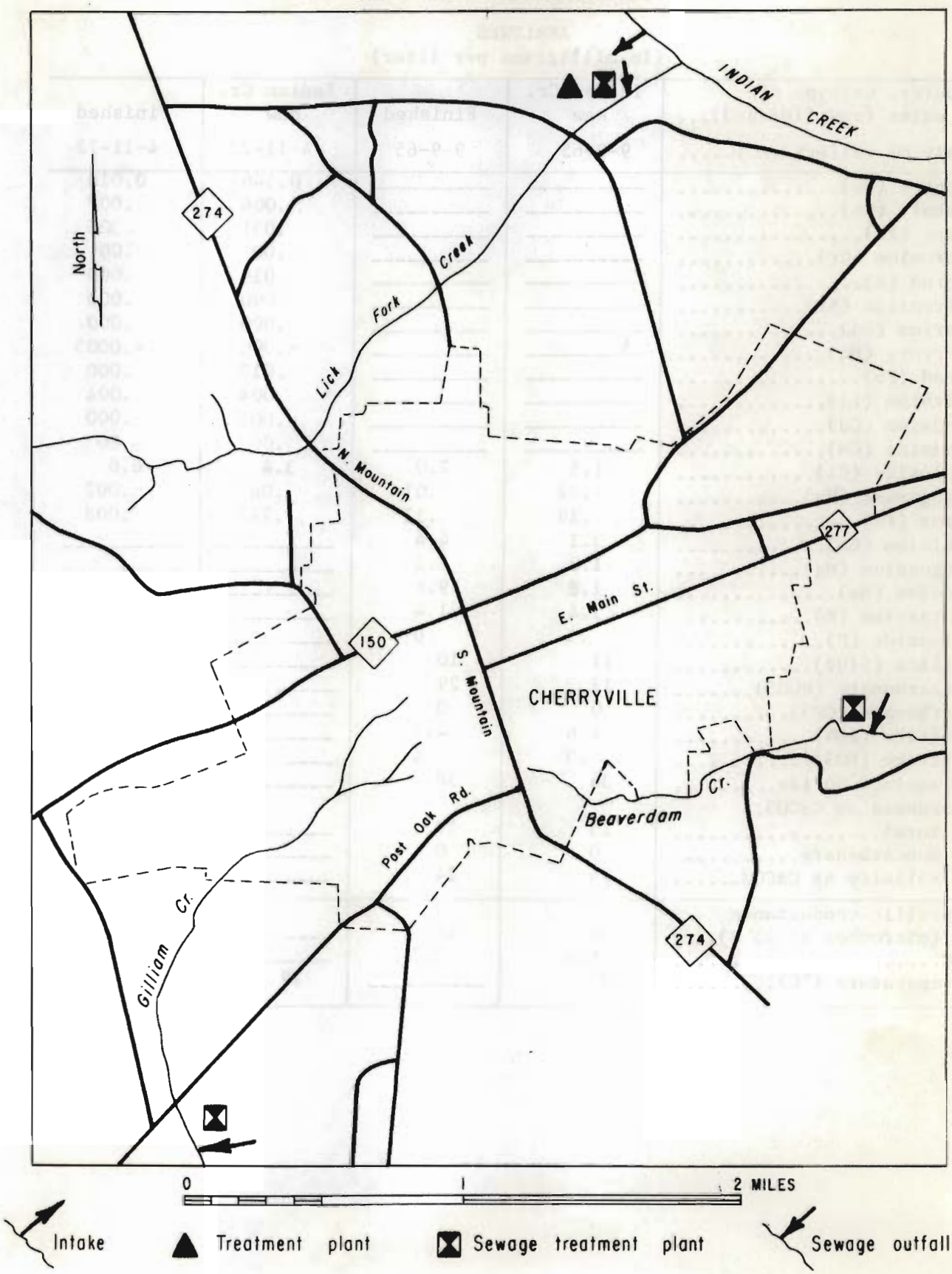
WATER-RESOURCES APPRAISAL:

Surface water: Cherryville is in the northwest corner of Gaston County on the drainage divide of the Broad and Catawba Rivers. The town is drained by tributaries of Indian Creek, Beaverdam Creek, and Muddy Fork Creek. The low flow yield of streams in the immediate vicinity generally exceeds 0.10 mgd per square mile. Their average discharge is 0.85 mgd per square mile, and their 7-day, 2-year low flow averages 0.30 mgd per square mile. The present source of water is adequate to meet the needs of the immediate future. The estimated allowable draft is more than 5 times greater than present use. The allowable draft of the present source could be increased significantly with additional storage.

Ground water: Crystalline volcanic rocks underlie Cherryville. Several years ago, the municipal water supply was obtained from wells. The wells ranged from 132 to 238 feet deep and yielded from 10 to 75 gpm. Records of 27 wells used for municipal or industrial supplies showed an average well depth of 176 feet and an average yield of 27 gpm.

The chemical quality of ground water was good and the water was used without treatment. Iron concentrations in water from some wells was higher than desirable.

CITY OF CHERRYVILLE



CHERRYVILLE, GASTON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Indian Cr. Raw	Finished	Indian Cr. Raw	Finished
Date of collection.....	9-9-65	9-9-65	4-11-72	4-11-72
Copper (Cu).....	----------	----------	0.546	0.018
Cobalt (Co).....	----------	----------	.006	.007
Zinc (Zn).....	----------	----------	.031	.305
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.010	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.017	.000
Lithium (Li).....	----------	----------	.004	.004
Cadmium (Cd).....	----------	----------	.003	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	1.5	7.0	3.4	6.6
Manganese (Mn).....	.02	.01	.067	.002
Iron (Fe).....	.19	.12	.747	.008
Calcium (Ca).....	3.1	4.4	----------	----------
Magnesium (Mg).....	1.0	1.2	----------	----------
Sodium (Na).....	1.8	9.6	----------	----------
Potassium (K).....	1.4	1.4	----------	----------
Fluoride (F).....	.0	.0	----------	----------
Silica (SiO2).....	11	10	----------	----------
Bicarbonate (HCO3).....	17	29	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	4.6	4.0	----------	----------
Nitrate (NO3).....	.3	.4	----------	----------
Dissolved Solids.....	36	58	----------	----------
Hardness as CaCO3:				
Total.....	13	17	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	14	24	----------	----------
Specific conductance (micromhos at 25° C)....	36	81	----------	----------
pH.....	6.6	7.1	----------	----------
Temperature (°C).....	24	----------	19	15.5

GASTONIA, GASTON COUNTY

OWNERSHIP:

Municipal. Also supplies Cramerton, Dallas, Lowell, McAdenville, and Ranlo. Total population supplied, about 75,000 in 1972 (18,000 metered customers in Gastonia).

SOURCE:

South Fork Catawba River: The intake is located about 4 miles northeast of Gastonia at lat 35°19'12", long 81°07'39". The drainage area at the intake is 561 square miles, approximately. Long Creek: The intake is located about 1 mile north of Gastonia at lat 35°17'44", long 81°11'38". The drainage area at the intake is 38 square miles, approximately.

RAW-STORAGE:

Lake Rankin, 280 million gallons; lake adjoining Lake Rankin, 60 million gallons. Both lakes are off-river reservoirs that are filled by pumping from Long Creek and South Fork Catawba River.

ALLOWABLE DRAFT:

Estimated allowable draft is 60 mgd with a storage of 340 million gallons.

TOTAL USE:

Average (1971) 14.93 mgd, metered; maximum daily (6-29-71) 19.92 million gallons.

INDUSTRIAL USE:

6.0 mgd, estimated. Principal users include Threads, Inc., Central Yarn and Dyeing, Armtex, Inc., Gurney Industries, and Groves Thread.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, addition of carbon or potassium permanganate for control of taste and odor, rapid-sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

21 mgd.

PUMPING CAPACITY:

Raw water: South Fork Catawba River, 14 mgd, Long Creek, 14 mgd; Rankin Lake 28 mgd. Finished water, 30 mgd.

FINISHED-WATER STORAGE:

Two clear wells, each of 3 million gallons capacity; three elevated tanks, each of 1 million gallons capacity.

FUTURE PLANS:

Current plans are to (1) increase treatment plant capacity by 4.5 mgd, (2) add an additional 20-day raw water supply by raising Rankin Lake 5 feet, (3) install a 30 inch raw-water line to South Fork Catawba River,

and (4) increasing raw water pumping capacity from South Fork Catawba River by 28 mgd.

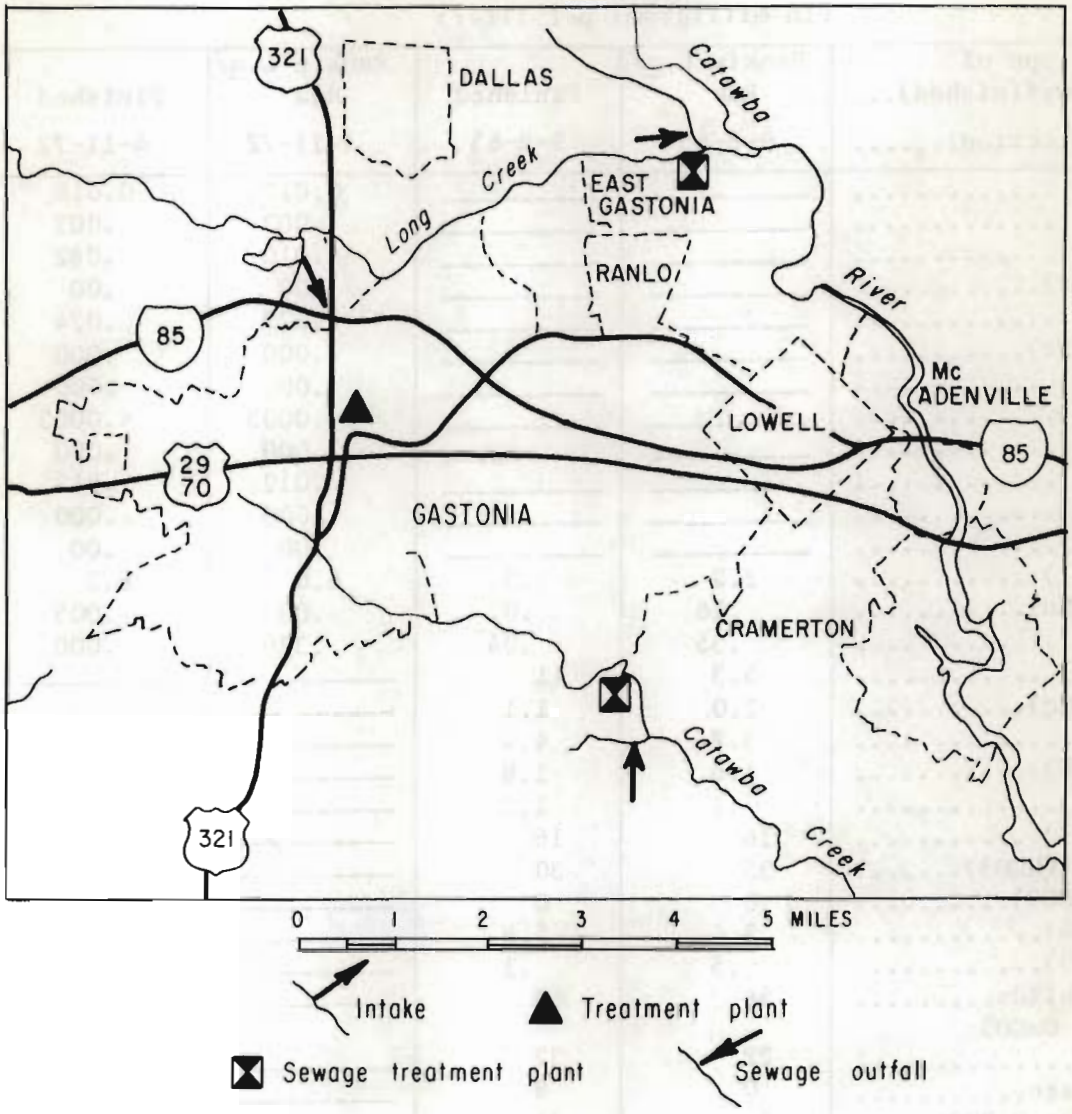
WATER-RESOURCES APPRAISAL:

Surface Water: Gastonia is in the center of Gaston County. The immediate area is drained by many small tributaries of the South Fork Catawba and Catawba Rivers. The low flow yield of streams generally exceeds 0.08 mgd per square mile and streams rarely go dry. The average discharge of streams is 0.78 mgd per square mile, and the 7-day, 2-year low flow averages 0.20 mgd per square mile. The present sources of water are adequate to meet the needs of the foreseeable future. The proposed increase in raw-water pumping capacity and raw water storage will greatly enhance the dependability of the system.

Ground-water: Gastonia is underlain by crystalline rocks, principally granite and schist. The overlying mantle of weathered rock ranges in thickness from a few inches to as much as 100 feet. Wells normally are drilled to depths of 50 to 200 feet and reported yields range from about 2 to 80 gpm.

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 GASTONIA



GASTONIA, GASTON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Rankin L.a/ Raw	Finished	Rankin L.a/ Raw	Finished
Date of collection.....	9-8-65	9-8-65	4-11-72	4-11-72
Copper (Cu).....	----------	----------	0.012	0.018
Cobalt (Co).....	----------	----------	.002	.003
Zinc (Zn).....	----------	----------	.010	.082
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.027	.024
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.012	.012
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	2.2	7.5	6.0	8.2
Manganese (Mn).....	.16	.02	.037	.005
Iron (Fe).....	.35	.04	.326	.000
Calcium (Ca).....	5.3	11	----------	----------
Magnesium (Mg).....	2.0	1.1	----------	----------
Sodium (Na).....	3.8	4.4	----------	----------
Potassium (K).....	1.8	1.8	----------	----------
Fluoride (F).....	.1	1.2	----------	----------
Silica (SiO2).....	16	16	----------	----------
Bicarbonate (HCO3).....	35	30	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	3.4	5.8	----------	----------
Nitrate (NO3).....	.5	.1	----------	----------
Dissolved Solids.....	56	68	----------	----------
Hardness as CaCO3:				
Total.....	22	32	----------	----------
Noncarbonate.....	0	8	----------	----------
Alkalinity as CaCO3.....	29	25	----------	----------
Specific conductance (micromhos at 25° C)....	66	97	----------	----------
pH.....	6.8	6.7	----------	----------
Temperature (°C).....	24.5	----------	15	16

a/ Water pumped from South Fork Catawba River and Long Creek to Rankin Lake, an off river reservoir.

MOUNT HOLLY, GASTON COUNTY

OWNERSHIP:

Municipal. Also supplies Catawba Heights. Total population supplied, about 7,500 in 1972 (1,750 metered customers, 200 of which are in suburban areas).

SOURCE:

Catawba River. The intakes are approximately 1/2 mile northeast of Mount Holly in the headwaters of Lake Wylie at lat 35°18'52", long 80°59'38". The drainage area at the intakes is 1,870 square miles, approximately.

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Mountain Island Dam and hydroelectric station is approximately 1-1/2 miles upstream from the Mount Holly intakes. The minimum release from Mountain Island Lake as specified by the Federal Power Commission is 51.7 mgd and this is the minimum amount of water available to Mount Holly.

TOTAL USE:

Average (1971), 1.33 mgd, metered; maximum daily (5-30-71) 1.92 million gallons.

INDUSTRIAL USE:

0.3 mgd, estimated. Principal users include Sou-Tex Chemical Co., Inc., Leaksville Woolen Mill, Gaston County Dyeing Machine Co., and Adrian-Madora Mill.

TREATMENT:

Prechlorination, coagulation with alum, anthracite filtration, adjustment of pH with soda ash, and postchlorination. Equipment for addition of carbon to control taste and odor is available if needed.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water, 2.0 mgd; finished water, 1.6 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 300,000 and 250,000 gallons; two standpipes, 177,000 and 300,000 gallons.

FUTURE PLANS:

None in April 1972.

WATER-RESOURCES APPRAISAL:

Surface water: The water available to Mount Holly from the Catawba River is many times greater than present use and should be adequate for the

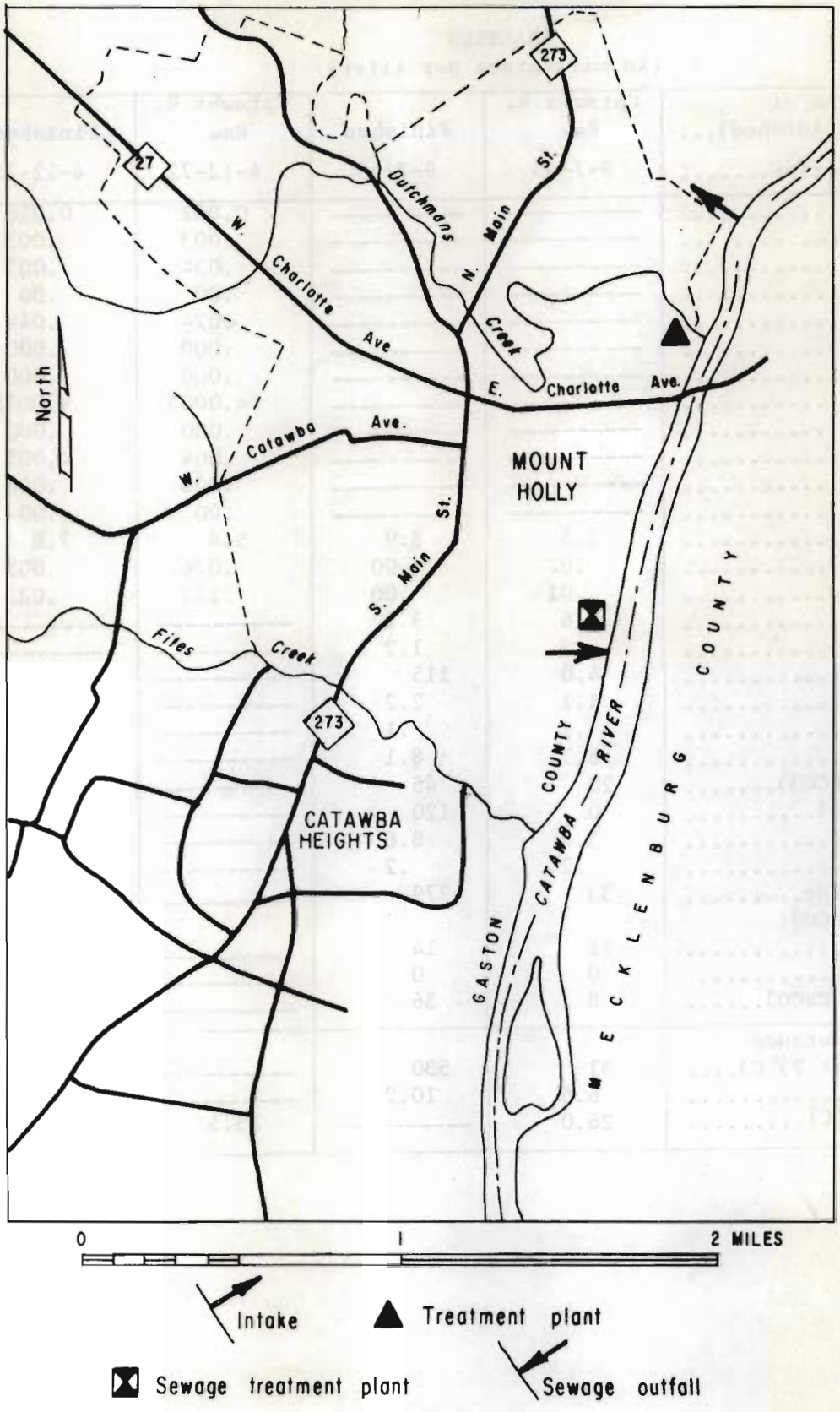
foreseeable future.

Ground water: Diorite and granite are the predominant rocks underlying Mount Holly. Wells in the immediate vicinity are generally drilled to depths of 60 to 200 feet, and are reported to yield from 0 to 18 gpm.

With the abundance of surface water available to the city, 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. It is estimated, that wells drilled in topographic low areas with thick soil cover will yield 0.02 to 0.03 mgd.

Ground water is generally of good chemical quality and is suitable for most uses with little or no treatment. The water is usually soft to moderately hard and in some places may contain iron concentrations in excess of 0.3 mg/1.

CITY OF MOUNT HOLLY



MOUNT HOLLY, GASTON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)...	Catawba R. Raw	Finished	Catawba R. Raw	Finished
Date of collection.....	9-7-65	9-7-65	4-12-72	4-12-72
Copper (Cu).....	----------	----------	0.032	0.016
Cobalt (Co).....	----------	----------	.003	.003
Zinc (Zn).....	----------	----------	.034	.003
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.024	.049
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hg).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.004	.005
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	3.5	8.9	5.4	7.8
Manganese (Mn).....	.02	.00	.026	.003
Iron (Fe).....	.01	.00	.141	.022
Calcium (Ca).....	3.6	3.8	----------	----------
Magnesium (Mg).....	.3	1.2	----------	----------
Sodium (Na).....	4.0	115	----------	----------
Potassium (K).....	1.1	2.2	----------	----------
Fluoride (F).....	.1	.1	----------	----------
Silica (SiO_2).....	6.7	8.1	----------	----------
Bicarbonate (HCO_3).....	20	45	----------	----------
Carbonate (CO_3).....	0	120	----------	----------
Sulfate (SO_4).....	3.8	8.6	----------	----------
Nitrate (NO_3).....	.2	.2	----------	----------
Dissolved Solids.....	33	279	----------	----------
Hardness as $CaCO_3$:				
Total.....	11	14	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as $CaCO_3$.....	8	36	----------	----------
Specific conductance (micromhos at 25° C)....	51	530	----------	----------
pH.....	6.6	10.2	----------	----------
Temperature (°C).....	26.0	----------	15.5	15.5

STANLEY, GASTON COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,350 in 1972 (950 metered customers).

SOURCE:

Hoyles Creek impounded by a low dam. Water is diverted from Hoyle Creek through a culvert to an off-river storage reservoir adjacent to the creek. It is then pumped to the water treatment plant. The intakes in Hoyle Creek are about 2 miles west of Stanley at lat 35°21'01", long 81°08'06". The drainage area at the intakes is 21.6 square miles.

RAW-WATER STORAGE:

Storage reservoir, 1.5 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.5 mgd with negligible storage.

TOTAL USE:

Average (1971) 0.8 mgd, estimated; maximum daily not available.

INDUSTRIAL USE:

0.6 mgd, estimated. Principal users include Tallon Division of Textron, J. P. Stevens Co., Inc., and Gaston County Dyeing Machine Company.

TREATMENT:

Prechlorination, coagulation with alum and soda ash, rapid Anthra-filt filtration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.8 mgd.

PUMPING CAPACITY:

Raw water, 0.8 mgd; finished water, 1.2 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 95,000 and 135,000 gallons; one elevated tank 95,000 gallons; one ground storage tank 1,000,000 gallons.

FUTURE PLANS:

Preliminary plans for a general expansion of the system are being formulated. No definite plans at this time (April 1972).

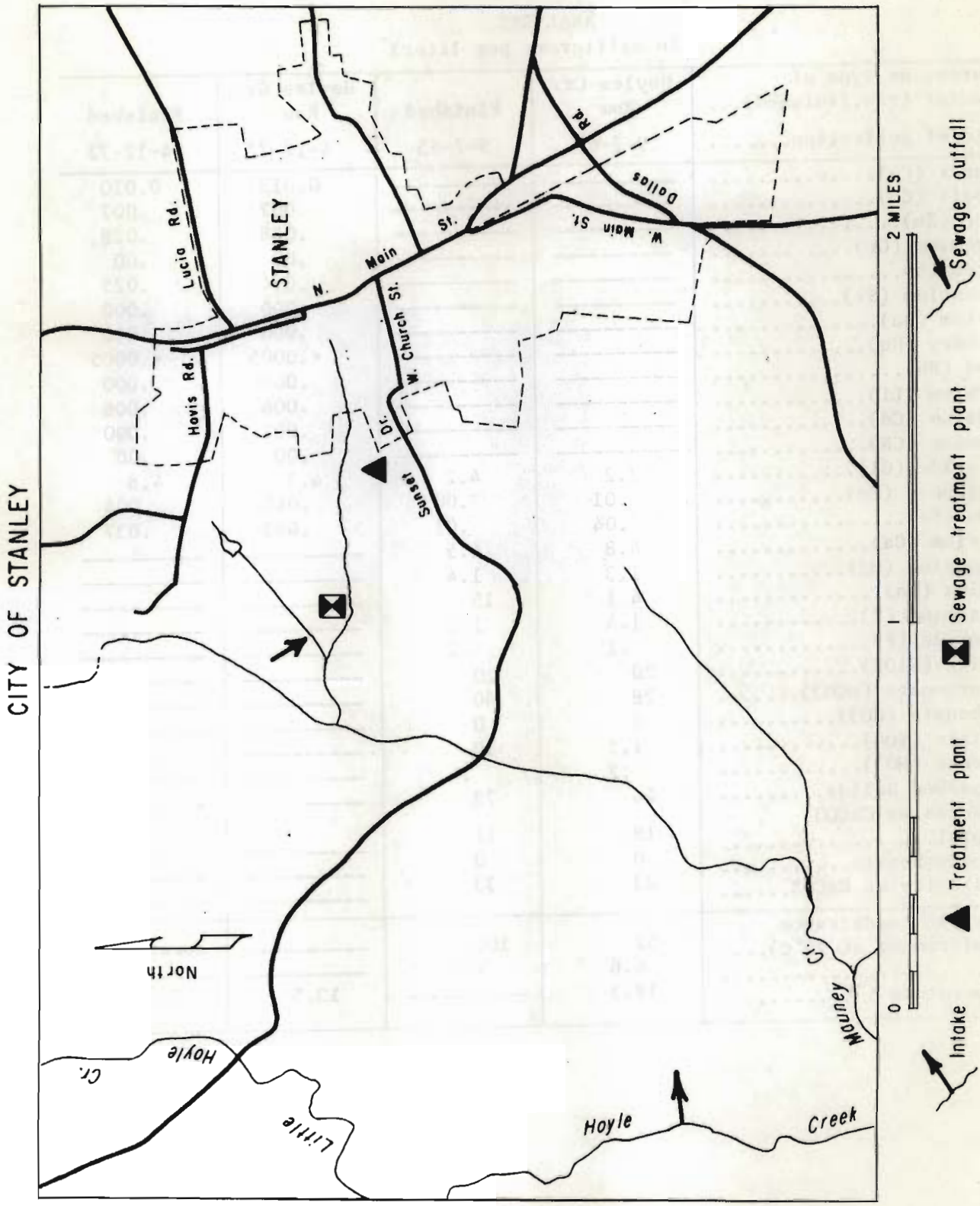
WATER-RESOURCES APPRAISAL:

Surface water: Stanley is in the northeastern part of Gaston County. The topography is relatively flat. Tributaries of Hoyle and Stanley Creeks drain the town. The low flow yield of streams in the immediate vicinity generally exceeds 0.05 mgd per square mile; their average discharge is 0.75 mgd per square mile; and their 7-day, 2-year low flow averages 0.15

mgd per square mile. The estimated allowable draft of Hoyle Creek at the intakes is twice current use. If additional raw water is needed in the future, additional draft could be developed by providing storage at the Hoyle Creek intakes. The South Fork Catawba River, which is about 1/2 mile west of the present intakes, is another possible source that might be considered.

Ground water: Granite is the predominant rock underlying Stanley. Several years ago, the water supply was obtained from four wells. The water from the wells contained slightly above average amounts of mineral matter and was slightly hard. One sample of water from one of the wells contained 4.9 mg/l of iron. The reported yield ranged from 15 to 45 gpm.

Although the town has no plans for future use of ground water, wells could be considered as a source for supplemental or emergency supply.


CITY OF STANLEY
STANLEY
Lucia Rd.
Hovis Rd.
N. Main St.
W. Main St.
Dallas Rd.
W. Church St.
Dr.
Sunset
North
Hoyle Cr.
Little Hoyle Creek
Mauney Cr.
0
1
2 MILES
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

STANLEY, GASTON COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Hoyles Cr. Raw	Finished	Hoyles Cr. Raw	Finished
Date of collection.....	9-7-65	9-7-65	4-12-72	4-12-72
Copper (Cu).....	----------	----------	0.013	0.010
Cobalt (Co).....	----------	----------	.007	.007
Zinc (Zn).....	----------	----------	.088	.028
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.034	.025
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hg).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.006	.006
Cadmium (Cd).....	----------	----------	.001	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	2.2	4.2	4.2	4.8
Manganese (Mn).....	.01	.00	.065	.004
Iron (Fe).....	.04	.01	.685	.037
Calcium (Ca).....	4.8	4.5	----------	----------
Magnesium (Mg).....	1.3	1.4	----------	----------
Sodium (Na).....	4.1	15	----------	----------
Potassium (K).....	1.4	1.5	----------	----------
Fluoride (F).....	.1	.1	----------	----------
Silica (SiO2).....	20	20	----------	----------
Bicarbonate (HCO3).....	28	40	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	1.2	10	----------	----------
Nitrate (NO3).....	.2	.4	----------	----------
Dissolved Solids.....	44	78	----------	----------
Hardness as CaCO3:				
Total.....	18	17	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	23	33	----------	----------
Specific conductance (micromhos at 25° C)....	52	100	----------	----------
pH.....	6.6	7.3	----------	----------
Temperature (°C).....	18.5	----------	13.5	14.5

HARNETT COUNTY

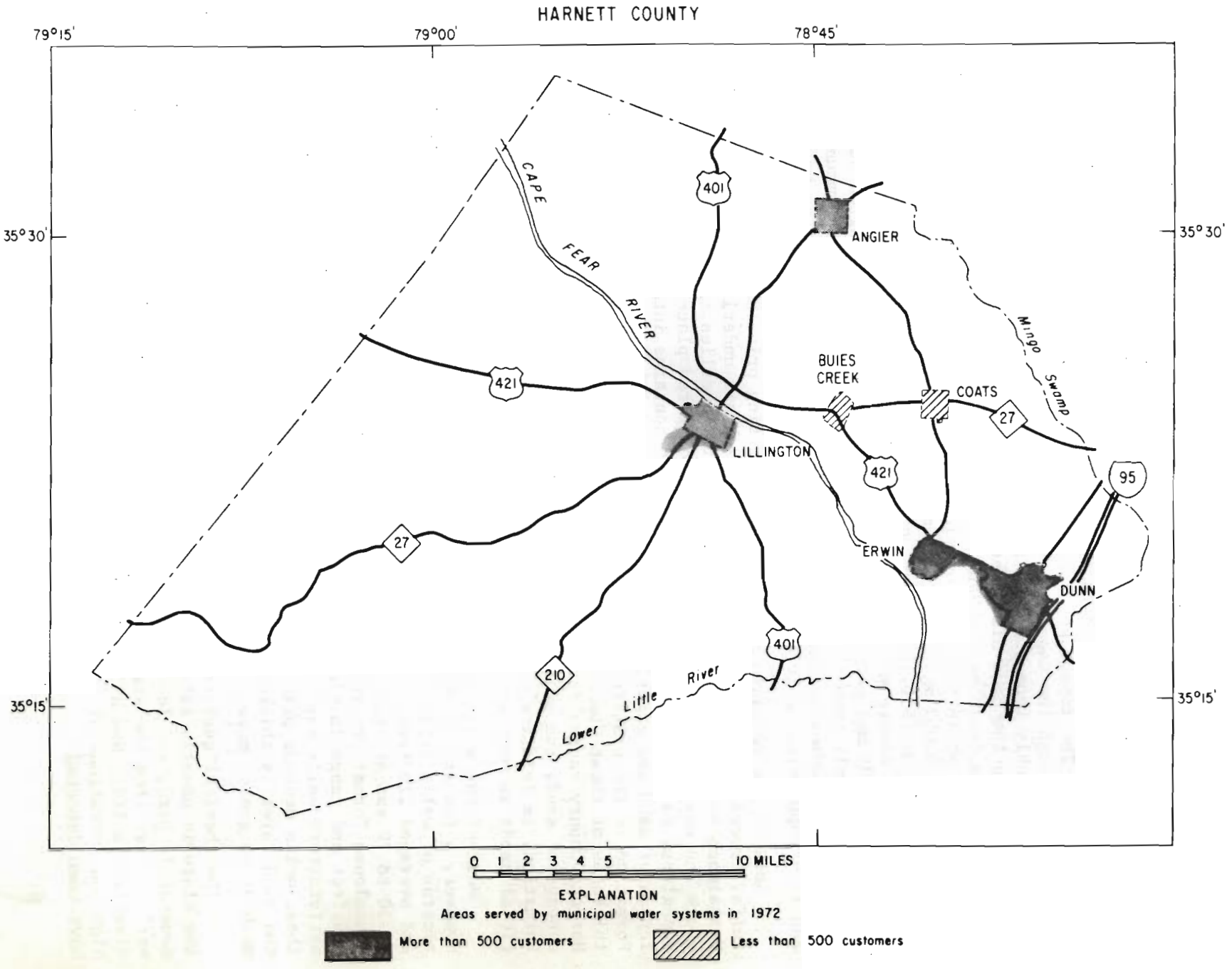
WATER-RESOURCES APPRAISAL

Harnett County is in east-central North Carolina. The Fall Zone, a poorly-defined boundary between the Piedmont and Coastal Plain Provinces, passes through the county and the southern third lies entirely within the Coastal Plain. The topography ranges from flat and undulating to hilly. Drainage is through the Cape Fear River and its tributaries. Streamflow varies considerably from place to place, the higher yielding streams being those that drain the Sand Hills section of the Coastal Plain. The low flow yield of streams draining the Sand Hills section generally exceeds 0.06 mgd per square mile while the low flow yield of streams in the remainder of the county averages 0.003 mgd per square mile. The 7-day, 2-year low flow for Sand Hills streams is 0.15 mgd per square mile and for the remaining streams is 0.06 mgd per square mile. For all streams, the average discharge ranges from 0.75 to 0.85 mgd per square mile. Dunn, Erwin, and Lillington obtain their water supply from surface sources. Angier, other smaller communities, and most rural domestic supplies are obtained from ground water. The county's population in 1970 was 49,667.

Rock of the volcanic slate series consisting principally of interbedded tuffs, breccia, flows, shales, slates, and schists underlie the county. The Tuscaloosa Formation, a Coastal Plain deposit, overlies the slate in the south and east parts of the county and in scattered places in the north. The Tuscaloosa Formation is principally clay but contains interbedded layers and lenses of sand and gravel. The Black Creek Formation overlies the Tuscaloosa Formation in the eastern corner of the county in the vicinity of Dunn. The thickness of these Coastal Plain deposits increases from west to east and in Harnett County ranges from a few inches to approximately 200 feet. The percentage of sand, the principal water-bearing material in the Tuscaloosa Formation, is relatively minor in Harnett County. In the western part surficial sands as much as 50 feet thick overlie the Tuscaloosa formation.

Most of the wells in the county are drilled into the underlying slate; however, a few are screened in the Coastal Plains deposits. From available records of wells drilled in the slate, the depth ranges from 60 to 500 feet and averages 215 feet, and the yield ranges from 1 to 200 gpm. Well yields of 50 to 70 gpm are not uncommon. Only a few records of wells tapping the Tuscaloosa Formation are available. These wells range in depth from 75 to 150 feet and range in yield from 10 to 45 gpm. In the Sand Hills area, satisfactory wells may be developed from the surficial sands. The yield of these wells depends primarily on the thickness of the sand layer. Generally, the sand layer is thickest on hills and wells drilled on hills may yield as much as 50 gpm or more.

The chemical quality of ground water is generally good. The water from the slate is usually slightly acidic to slightly alkaline, soft or only moderately hard, and locally may contain iron concentrations in excess of 0.3 mg/1. Water from the surficial sands usually contains less than 50 mg/1 of dissolved solids, has a low pH and is corrosive, and may contain unusually high concentrations of nitrate. Nitrate concentrations as high as 18 mg/1 have been detected.


HARNETT COUNTY
79°15'
79°00'
78°45'
35°30'
35°15'
CAPE FEAR RIVER
401
ANGIER
BUIES CREEK
COATS
Mingo Swamp
421
27
LILLINGTON
95
ERWIN
DUNN
210
Lower Little River
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

ANGIER, HARNETT COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,500 in 1972 (625 metered customers, 25 of which are in suburban areas).

SOURCE:

Four wells (Nos. 1-4).

Well No. 1, Hr-2, located at lat 35°30'47", long 78°44'24". Driller: Heater Well Company. Date drilled 1936. Total depth _____. Diam.: 8 in. Cased to: 120 ft. Type of finish: open hole. Topography: flat. Aquifer: slate. Static water level: _____. Yield: 60 gpm. Type pump: submersible. Pump setting: _____.

Well No. 2, Hr-4, located at lat 35°30'16", long 78°44'25". Driller: _____. Date drilled: _____. Total depth: _____. Diam. 6 in. Cased to: _____. Type of finish: _____. Topography: slope. Aquifer: _____. Static water level: _____. Yield: 50 gpm. Type pump: turbine. Pump setting: _____.

Well No. 3, Hr-3, located at lat 35°30'09", long 78°44'30". Driller: Heater Well Company. Date drilled: _____. Total depth: _____. Diam. 8 in. Cased to: _____. Type of finish: _____. Topography: slope. Aquifer: _____. Static water level: _____. Yield: 50 gpm. Type pump: submersible. Pump setting: _____.

Well No. 4, Hr-51, located at lat 35°30'54", long 78°44'36". Driller: Heater Well Company. Date drilled: May 1971. Total depth: 225 ft. Diam: 8 in. Cased to: 95 ft. Type of finish: open hole. Topography: slope. Aquifer: slate. Static water level: 13 ft. Yield: 88 gpm. Type pump: submersible. Pump setting _____.

TOTAL USE:

Average (1972), 0.15 mgd, estimated; maximum daily, not available.

INDUSTRIAL USE:

0.005 mgd, estimated. Principal users include Comm/Scope, Angier Knitting Company, and Blue Bell, Inc.

TREATMENT:

Aeration, chlorination, sedimentation, rapid-sand filtration and addition of caustic soda for iron removal.

RATED CAPACITY OF TREATMENT PLANT.

0.22 mgd.

PUMPING CAPACITY:

Raw water 0.33 mgd; finished water, 0.22 mgd.

RAW-WATER STORAGE:

None.

ANGIER, HARNETT COUNTY

FINISHED-WATER STORAGE:

One elevated tank, 100,000 gallons; one standpipe, 750,000 gallons.

FUTURE PLANS:

None. System considered adequate at present.

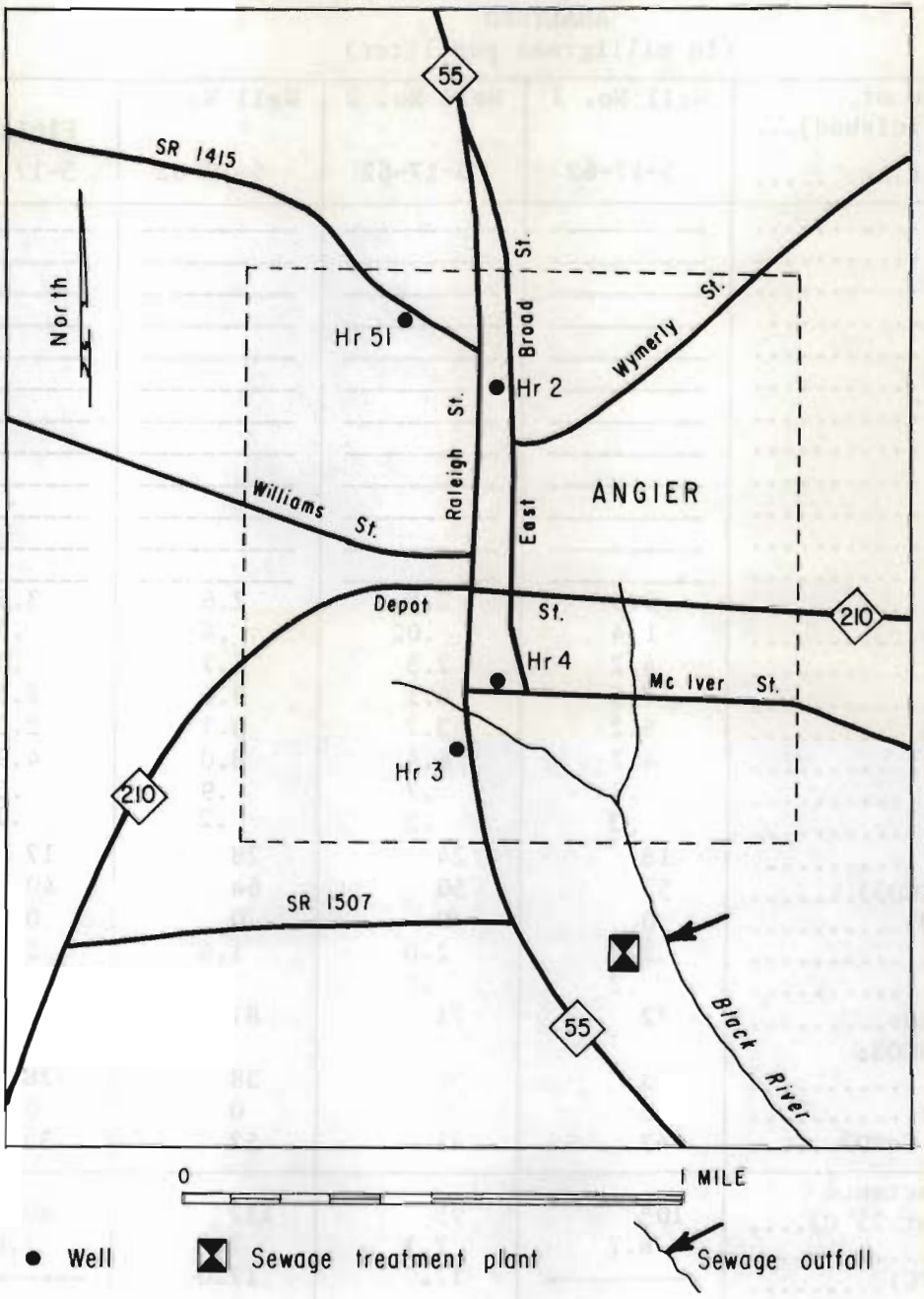
WATER-RESOURCES APPRAISAL:

Surface water: Angier is in northeastern Harnett County where the topography is relatively flat to mildly rolling. The immediate area is drained by small tributaries of Neals Creek and Black River of the Cape Fear River system. The low-flow yield of streams is small, in the range of 0.001 to 0.003 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 0.04 mgd per square mile.

If the town decides to use surface water in the future, Neals Creek with adequate storage would supply sufficient water to meet the demand.

Ground water: Angier is underlain by rocks of the volcanic slate series. Coastal Plain sediments of the Tuscaloosa Formation approximately 100 to 140 feet thick overlie the slate. Angier obtains its water supply from four wells that reportedly yield from 50 to 88 gpm. The driller's records for wells 1-3 were destroyed by fire and construction details of these wells is not known. Available records indicate the depth of wells ranges from about 190 to 290 feet. All wells are finished in the slate but one is reported to have slotted casing set in the Tuscaloosa Formation. The wells are spaced at least 900 feet apart. It is not known whether significant pumping interference exists between wells. Additional wells can be constructed in the present town limits when the need for water exceeds the yield of existing wells. The water contains excessive concentrations of iron which is removed prior to use.

CITY OF ANGIER



ANGIER, HARNETT COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 1	Well No. 2	Well No. 3	Finished
Date of collection.....	5-17-62	5-17-62	5-17-62	5-17-62
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	2.8	2.6	3.5
Manganese (Mn).....	1.4	.02	.4	.02
Iron (Fe).....	4.2	2.3	5.7	.07
Calcium (Ca).....	7.5	6.1	9.6	7.5
Magnesium (Mg).....	5.2	3.7	3.1	2.0
Sodium (Na).....	4.7	6.4	8.0	4.9
Potassium (K).....	.7	.7	.9	.5
Fluoride (F).....	.3	.2	.2	.1
Silica (SiO2).....	18	24	28	17
Bicarbonate (HCO3).....	57	50	64	40
Carbonate (CO3).....	0	0	0	0
Sulfate (SO4).....	2.8	2.0	1.6	2.0
Nitrate (NO3).....	.2	.1	.2	.1
Dissolved Solids.....	72	71	87	59
Hardness as CaCO3:				
Total.....	43	30	38	28
Noncarbonate.....	0	0	0	0
Alkalinity as CaCO3.....	47	41	52	33
Specific conductance (micromhos at 25° C)....	105	95	112	80
pH.....	6.7	7.1	7.0	7.6
Temperature (°C).....	----------	17.0	17.0	----------

Note: See next page for additional analyses.

ANGIER, HARNETT COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 1	Finished		
Date of collection.....	8-2-72	8-2-72		
Copper (Cu).....	0.000	0.000		
Cobalt (Co).....	.000	.000		
Zinc (Zn).....	.000	.000		
Chromium (Cr).....	.00	.00		
Boron (B).....	.000	.020		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.005	.005		
Cadmium (Cd).....	.000	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	4.8	6.4		
Manganese (Mn).....	.039	.070		
Iron (Fe).....	2.412	.326		
Calcium (Ca).....	----------	----------		
Magnesium (Mg).....	----------	----------		
Sodium (Na).....	----------	----------		
Potassium (K).....	----------	----------		
Fluoride (F).....	----------	----------		
Silica (SiO_2).....	----------	----------		
Bicarbonate (HCO_3).....	----------	----------		
Carbonate (CO_3).....	----------	----------		
Sulfate (SO_4).....	----------	----------		
Nitrate (NO_3).....	----------	----------		
Dissolved Solids.....	----------	----------		
Hardness as $CaCO_3$:				
Total.....	----------	----------		
Noncarbonate.....	----------	----------		
Alkalinity as $CaCO_3$.....	----------	----------		
Specific conductance (micromhos at 25° C)....	----------	----------		
pH.....	----------	----------		
Temperature (°C).....	----------	----------		

DUNN, HARNETT COUNTY

OWNERSHIP:

Municipal. Also supplies the City of Erwin. Total population supplied, about 13,500 in 1972 (3,900 metered customers, 200 of which are in suburban areas).

SOURCE:

Cape Fear River: the intake is on the east bank of the river, just above Stuart Creek, 1-1/4 miles west of Erwin at lat 35°20'00", long 78°42'00". The drainage area at the intake is 3,690 square miles, approximately.

RAW-WATER STORAGE:

Pond at treatment plant, 4-5 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 20 mgd without storage.

TOTAL USE:

Average 1972, 1.05 mgd, metered; maximum daily (6-12-66), 2.58 million gallons.

INDUSTRIAL USE:

0.30 mgd, estimated. Principal users include Burlington Industries, Lundy Packing Company, and H. P. Cannon & Son. Burlington Industries obtain process water from a company-owned treatment plant in Erwin.

TREATMENT:

Prechlorination, coagulation with alum and occasionally caustic soda, sedimentation, addition of carbon for control of taste and odor, rapid-anthracite filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

4.0 mgd.

PUMPING CAPACITY:

Raw water, 2 mgd; finished water 10.4 mgd.

FINISHED-WATER STORAGE:

One clear well, 1,500,000 gallons; one elevated tank, 1,000,000 gallons; one standpipe, 500,000 gallons.

FUTURE PLANS:

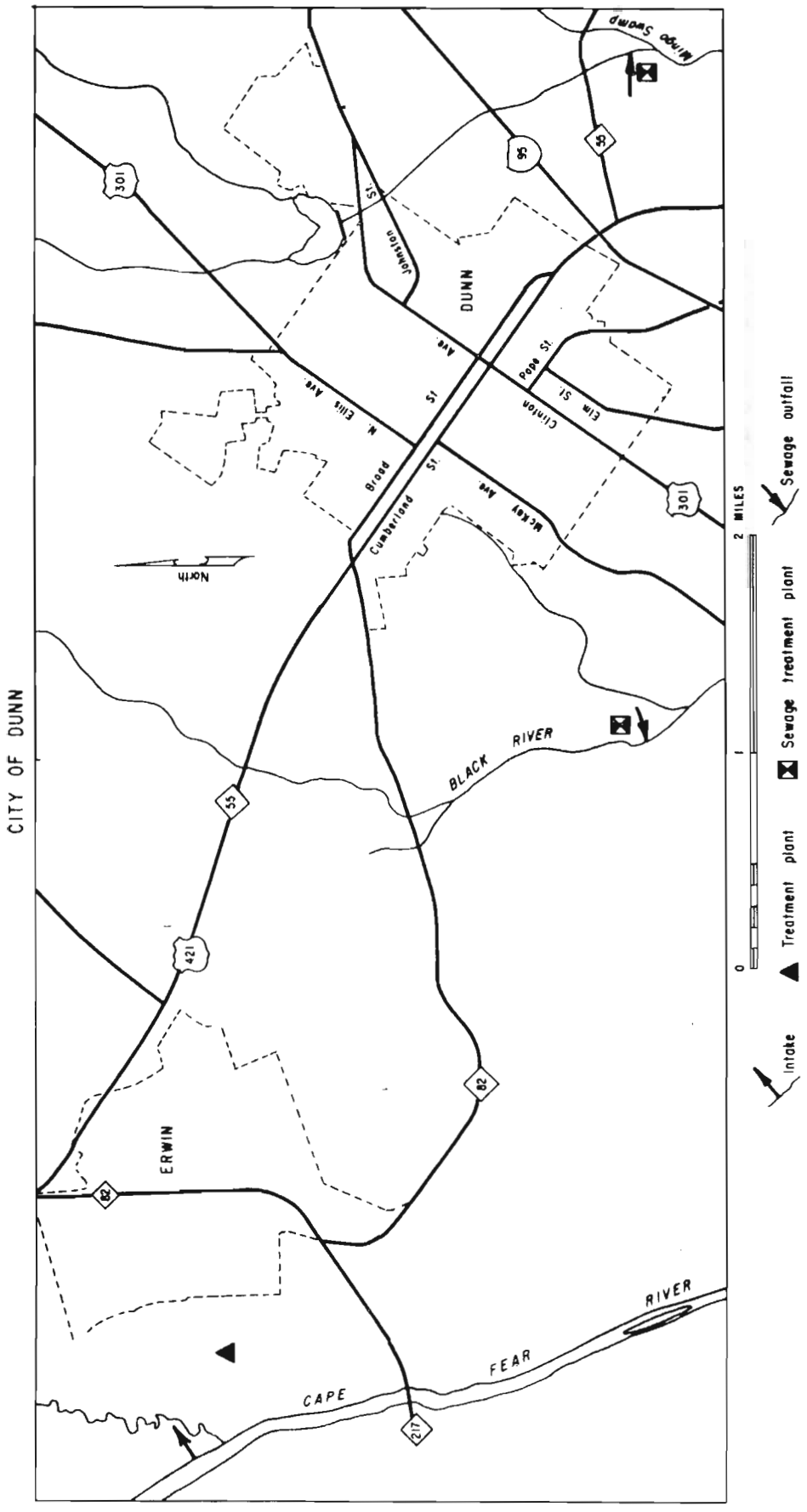
Treatment plant constructed in 1969 is readily expandable to 8 mgd capacity when needed.

WATER-RESOURCES APPRAISAL:

Surface water: Dunn obtains its water supply from the Cape Fear River. This is the most dependable source available. Records of flow of the

river have been collected at Lillington since 1923. The minimum flow of record, 7.1 mgd, occurred during the drought of 1954. Minimum releases from the New Hope Dam will probably greatly exceed the flow experienced in 1954. If the quality of water in the Cape Fear River is protected, there will be ample water to supply future demand.

Ground water: Dunn is in the southeastern corner of Harnett County. The basement rocks are of the volcanic slate series. Coastal Plain sediments of the Tuscaloosa Formation overlie the slate and the Black Creek Formation overlies the Tuscaloosa. Available records do not show the thickness of the Coastal Plain deposits in the Dunn area but it is probably in the range of 150 to 200 feet. Some wells are screened in the sand layers and some are drilled into the basement rocks. For screened wells, reported depths range from 40 to 150 feet and reported yields range from 10 to 45 gpm. One well 434 feet deep finished in the slate was reported to yield 200 gpm.


CITY OF DUNN
DUNN
ERWIN
BLACK RIVER
CAPE FEAR RIVER
Minor Swamp
Johnston St.
Blood St.
N. Ellis Ave.
Cumberland St.
McKay Ave.
Pope St.
Elm St.
Clinton Ave.
301
95
55
421
82
217
NORTH
0
1
2 MILES
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

DUNN, LARNETT COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	12-1-65	12-1-65	8-3-72	8-3-72
Copper (Cu).....	----------	----------	0.000	0.010
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.025	.000
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.020	.030
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.003	.003
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	23	25	8.6	26
Manganese (Mn).....	.02	.01	.022	.003
Iron (Fe).....	.08	.18	.419	.000
Calcium (Ca).....	8.8	13	----------	----------
Magnesium (Mg).....	1.9	2.7	----------	----------
Sodium (Na).....	26	26	----------	----------
Potassium (K).....	3.2	3.0	----------	----------
Fluoride (F).....	.2	2.8	----------	----------
Silica (SiO2).....	6.1	7.5	----------	----------
Bicarbonate (HCO3).....	55	53	----------	----------
Carbonate (CO3).....	0.0	0.0	----------	----------
Sulfate (SO4).....	12	22	----------	----------
Nitrate (NO3).....	2.2	.4	----------	----------
Dissolved Solids.....	117	138	----------	----------
Hardness as CaCO3:				
Total.....	31	48	----------	----------
Noncarbonate.....	0	4	----------	----------
Alkalinity as CaCO3.....	44	43	----------	----------
Specific conductance (micromhos at 25°C)....	194	224	----------	----------
pH.....	7.3	7.0	----------	----------
Temperature (°C).....	5.5	----------	----------	----------

LILLINGTON, HARNETT COUNTY

OWNERSHIP:

Municipal. Also supplies Shawtown. Total population supplied, about 2,150 in 1972 (610 metered customers).

SOURCE:

Cape Fear River: The intakes are on the south bank of the river at the eastern city limits, 250 yards north of the treatment plant at lat 35°24'39", long 78°49'16". The drainage area at the intake is 3,440 square miles, approximately.

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft is 19 mgd without storage.

TOTAL USE:

Average 1971, 0.22 mgd, metered; maximum daily (7-3-67) 0.357 million gallons.

INDUSTRIAL USE:

None in industrial processes.

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 soda ash, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

0.5 mgd.

PUMPING CAPACITY:

Raw water, 1.15 mgd; finished water, 1.8 mgd.

FINISHED-WATER STORAGE:

One clear well, 200,000 gallons; one standpipe 880,000 gallons.

FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

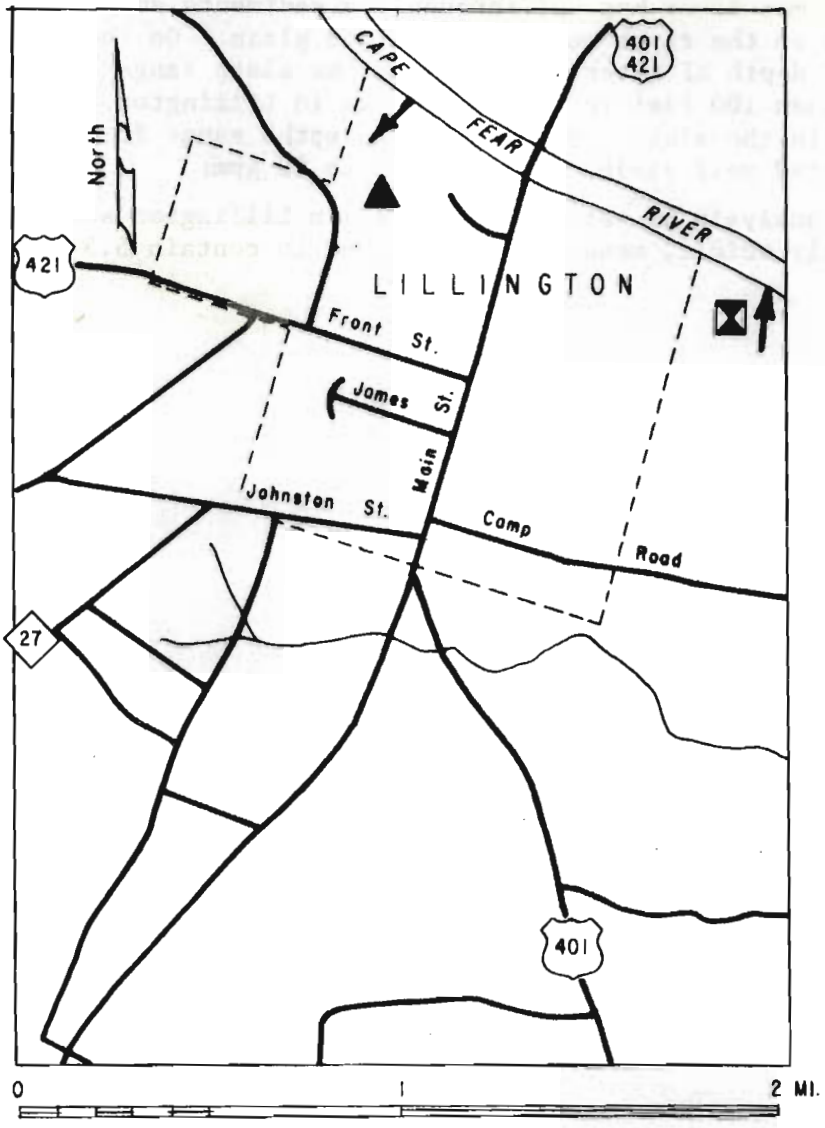
Surface water: Lillington is on the south bank of the Cape Fear River in central Harnett County. There is ample water in the Cape Fear River to meet the needs of Lillington for the foreseeable future. Streamflow records have been collected near the intake since 1923. The minimum flow recorded was 7.1 mgd in 1954 and this is more than 30 times present use. When the New Hope Dam is completed, minimum releases from the reservoir will probably greatly exceed the flow recorded in 1954.

LILLINGTON, HARNETT COUNTY

Ground water: Rocks of the volcanic slate series underlie Lillington. Coastal Plain sediments of the Tuscaloosa Formation overlie the slate. The Cape Fear River has cut through the sediments and bedrock crops out in places in the river channel and flood plain. On the south side of the city, the depth of material overlying the slate ranges from about 30 feet to more than 100 feet in places. Wells in Lillington are usually finished in the slate. Reported well depths range from 75 to 465 feet and reported well yields range from 3 to 90 gpm.

One analysis of water from a well in Lillington showed the water to be slightly acidic, moderately hard, and to contain 5.5 mg/l of iron.

CITY OF LILLINGTON



Intake

Treatment plant

Sewage treatment plant

Sewage outfall

LILLINGTON, HARNETT COUNTY
ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	12-1-65	12-1-65	8-2-72	8-2-72
Copper (Cu).....	----------	----------	0.007	0.007
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.000
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.020	.030
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.004	.004
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.01	.00
Chloride (Cl).....	----------	----------	14	26
Manganese (Mn).....	0.03	0.02	.006	.028
Iron (Fe).....	.00	.02	.047	.155
Calcium (Ca).....	7.5	8.7	----------	----------
Magnesium (Mg).....	3.2	2.7	----------	----------
Sodium (Na).....	25	41	----------	----------
Potassium (K).....	3.4	3.4	----------	----------
Fluoride (F).....	.4	1.1	----------	----------
Silica (SiO2).....	8.2	8.4	----------	----------
Bicarbonate (HCO3).....	57	65	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	11	26	----------	----------
Nitrate (NO3).....	.4	2.0	----------	----------
Dissolved Solids.....	115	171	----------	----------
Hardness as CaCO3:				
Total.....	32	34	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	47	53	----------	----------
Specific conductance (micromhos at 25° C)....	197	273	----------	----------
pH.....	6.5	7.3	----------	----------
Temperature (°C).....	10.0		27	28

HOKE COUNTY

WATER-RESOURCES APPRAISAL

Hoke County is in the western part of the Coastal Plain Province in southern North Carolina. The northern two-thirds of the county is in the Sand Hills section, where the topography is characterized by rolling, relatively flat-topped hills. The southern third is in the Flatwoods section where the topography is level to gently rolling. Tributaries of the Cape Fear River drain the northern half of the county, and tributaries of the Lumber River drain the remainder. The average discharge of streams ranges from 0.75 to 0.85 mgd per square mile. Minimum flows of streams whose headwaters are in the Sand Hills section are relatively high, ranging from 0.20 to 0.45 mgd per square mile and averaging 0.32 mgd per square mile. These streams rarely go dry. The minimum flow of streams originating in the Flatwoods section is considerably lower, averaging 0.02 mgd per square mile. Streams in this section with as much as 30 square miles drainage area have gone dry. The average 7-day, 2-year low-flow of streams originating in the Sand Hills is 0.45 mgd per square mile and of streams originating in the Flatwoods is 0.10 mgd per square mile.

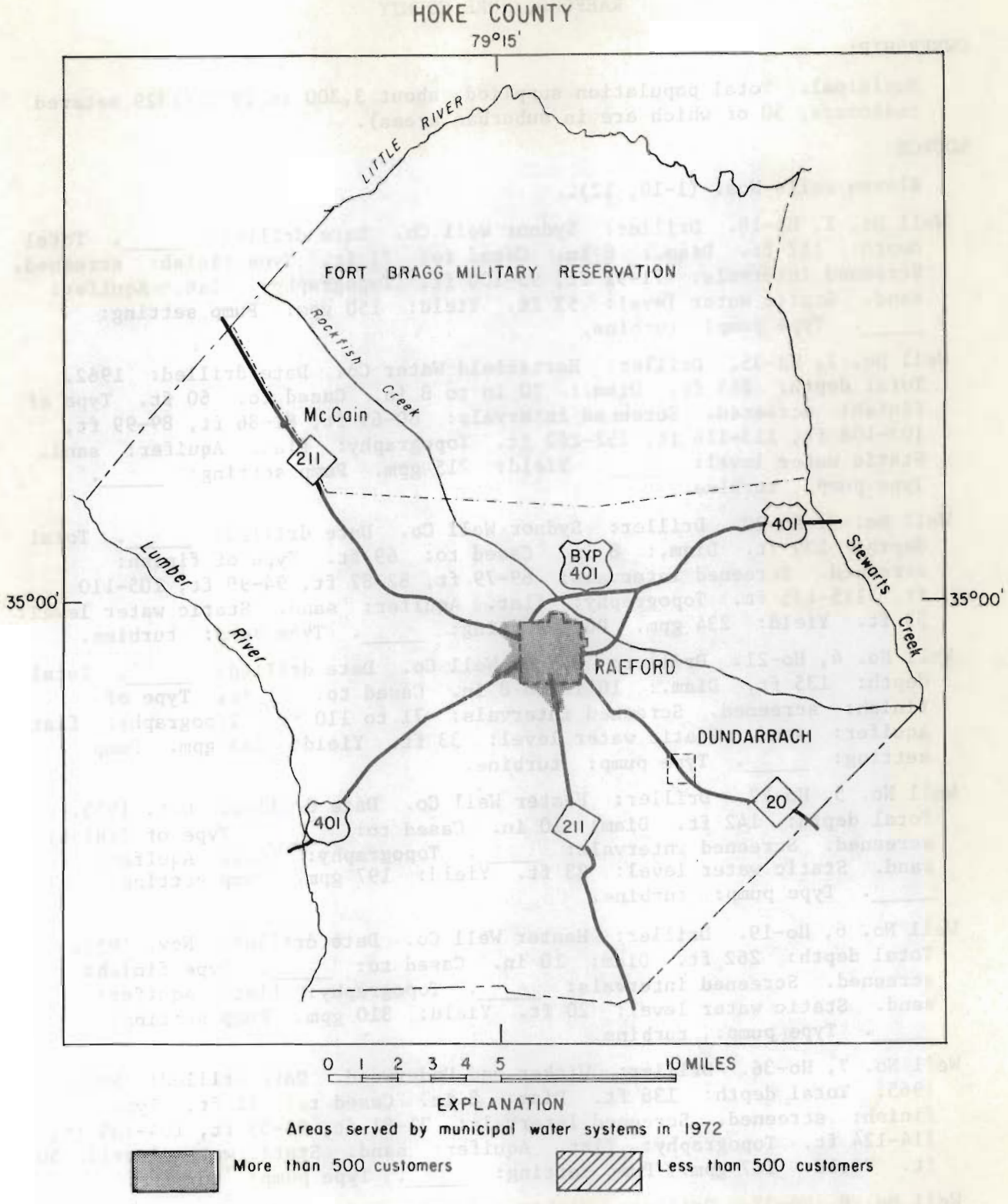
There are no municipal water supplies in the county using surface water. Raeford, the only municipal system in the county, uses ground water. Raeford furnishes water to 3,300 of the county's population of 16,436 (1970). Ground water is also used at the Sanatorium at McCain.

Rocks of the volcanic slate series underlie Hoke County. Coastal Plain sediments of the Tuscaloosa and Black Creek Formations overlie the volcanic slate. The Tuscaloosa Formation crops out in the area generally north of Raeford and dips under the Black Creek Formation south of Raeford. The Coastal Plain sediments thicken to the southeast and are about 300 feet thick in the Raeford area. The sediments consist of complexly interlayered beds of sand and clay. In practically all parts of the county, surficial sands overlie the sediments.

The yield of wells drilled in these sediments depends largely on the thickness and extent of sand layers penetrated. Most of the sand strata are permeable and yield large quantities of water to wells. In most areas south of Fort Bragg, the total thickness of sand penetrated by a well averages about one-third of the total depth. Yields as high as 900 gpm have been reported from gravel-packed wells. In Raeford, the average reported yield of wells is 180 gpm.

The surficial sands which blanket the Coastal Plain deposits are permeable but yields are low due to the thinness of the aquifer. In upland areas, where the sands are thicker, yields may be as high as 50 gpm.

Ground water is generally very soft and acidic with pH values less than 6.0 being common. Locally, iron concentrations exceed 0.3 mg/l.


HOKE COUNTY
79°15'
LITTLE RIVER
FORT BRAGG MILITARY RESERVATION
Rockfish Creek
McCain
211
401
BYP 401
Stewarts Creek
35°00'
35°00'
Lumber River
RAEFORD
DUNDARRACH
20
401
211
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

RAEFORD, HOKE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,300 in 1972 (1329 metered customers, 50 of which are in suburban areas).

SOURCE:

Eleven wells Nos. (1-10, 12).

Well No. 1, Ho-18. Driller: Sydnor Well Co. Date drilled: _____. Total depth: 112 ft. Diam.: 8 in. Cased to: 71 ft. Type finish: screened. Screened intervals: 71-91 ft, 95-100 ft. Topography: flat. Aquifer: sand. Static water level: 53 ft. Yield: 150 gpm. Pump setting: _____. Type pump: turbine.

Well No. 2, Ho-35. Driller: Hartsfield Water Co. Date drilled: 1962. Total depth: 265 ft. Diam.: 20 in to 8 in. Cased to: 60 ft. Type of finish: screened. Screened intervals: 60-65 ft, 81-86 ft, 89-99 ft, 103-108 ft, 113-118 ft, 252-262 ft. Topography: flat. Aquifer: sand. Static water level: _____. Yield: 215 gpm. Pump setting: _____. Type pump: turbine.

Well No. 3, Ho-20. Driller: Sydnor Well Co. Date drilled: _____. Total depth: 139 ft. Diam.: 8 in. Cased to: 69 ft. Type of finish: screened. Screened intervals: 69-79 ft, 82-87 ft, 94-99 ft, 105-110 ft. 115-125 ft. Topography: flat. Aquifer: sand. Static water level: 53 ft. Yield: 234 gpm. Pump setting: _____. Type pump: turbine.

Well No. 4, Ho-21. Driller: Sydnor Well Co. Date drilled: _____. Total depth: 135 ft. Diam.: 10 in to 8 in. Cased to: 71 ft. Type of finish: screened. Screened intervals: 71 to 110 ft. Topography: flat. Aquifer: sand. Static water level: 33 ft. Yield: 243 gpm. Pump setting: _____. Type pump: turbine.

Well No. 5, Ho-22. Driller: Heater Well Co. Date drilled: Oct. 1953. Total depth: 142 ft. Diam: 10 in. Cased to: _____. Type of finish: screened. Screened intervals: _____. Topography: flat. Aquifer: sand. Static water level: 23 ft. Yield: 197 gpm. Pump setting: _____. Type pump: turbine.

Well No. 6, Ho-19. Driller: Heater Well Co. Date drilled: Nov. 1955. Total depth: 262 ft. Diam: 10 in. Cased to: _____. Type finish: screened. Screened intervals: _____. Topography: flat. Aquifer: sand. Static water level: 20 ft. Yield: 310 gpm. Pump setting: _____. Type pump: turbine.

Well No. 7, Ho-36. Driller: Wicker and Underwood. Date drilled: Nov. 1965. Total depth: 138 ft. Diam: 8 in. Cased to: 71 ft. Type finish: screened. Screened intervals: 71-81 ft, 90-95 ft, 104-109 ft, 114-124 ft. Topography: flat. Aquifer: sand. Static water level: 50 ft. Yield: 167 gpm. Pump setting: _____. Type pump: turbine.

Well No. 8, Ho-37. Driller: Wicker and Underwood. Date drilled: Aug. 1970. Total depth: 108 ft. Diam: 8 in. Cased to: 71 ft. Type of finish: screened. Screened intervals: 71-91 ft, 95-100 ft. Topography:

flat. Aquifer: sand. Static water level: 27 ft. Yield: 125 gpm. Pump setting: _____. Type pump: turbine.

Well No. 9, Ho-38. Driller: C. R. Underwood. Date drilled: Jan. 1971. Total depth: 114 ft. Diam.: 8 in. Cased to: 60 ft. Type of finish: screened. Screened intervals: 60-70 ft, 75-80 ft, 84-89 ft, 93-98 ft, 103-108 ft. Topography: flat. Aquifer: sand. Static water level: 30 ft. Yield: 55 gpm. Pump setting: _____. Type pump: turbine.

Well No. 10, Ho-39. Driller: C. R. Underwood. Date drilled: Nov. 1970. Total depth: 135 ft. Diam: 8 in. Cased to: 61 ft. Type of finish: screened. Screened intervals: 61-71 ft, 75-80 ft, 88-98 ft, 122-127 ft. Topography: flat. Aquifer: sand. Static water level: _____. Yield: 150 gpm. Pump setting: _____. Type pump: turbine.

Well No. 12, Ho-40. Driller: Carolina Well & Pump Co. Date drilled: Nov. 1971. Total depth: 140 ft. Diam: 8 in. Cased to: 80 ft. Type finish: screened. Screened intervals: 80-110 ft, 115-130 ft. Topography: flat. Aquifer: sand. Static water level: 64 ft. Yield: 190 gpm. Pump setting: _____. Type pump: turbine.

TOTAL USE:

Average (1971) 2.04 mgd, estimated; maximum daily not available.

INDUSTRIAL USE:

1.5 mgd, estimated. Principal users include Knit-A-Way, Inc., Burlington Industries, Inc., and Raeford Turkey Farms, Inc.

TREATMENT:

Aeration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, and chlorination. Water from wells 3, 8, 9 and 12 is furnished untreated to industrial customers.

RATED CAPACITY OF TREATMENT PLANT:

0.5 mgd.

PUMPING CAPACITY:

Raw water, 2.9 mgd, approximately equal to combined reported yield of wells; finished water, 2.4 mgd.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks, 500,000 and 100,000 gallons; one ground storage tank, 200,000 gallons.

FUTURE PLANS:

A test drilling program was underway in 1972-73. A new 3.0 mgd treatment plant and a 1.0 million gallon ground storage tank are planned for construction in 1973.

RAEFORD, HOKE COUNTY

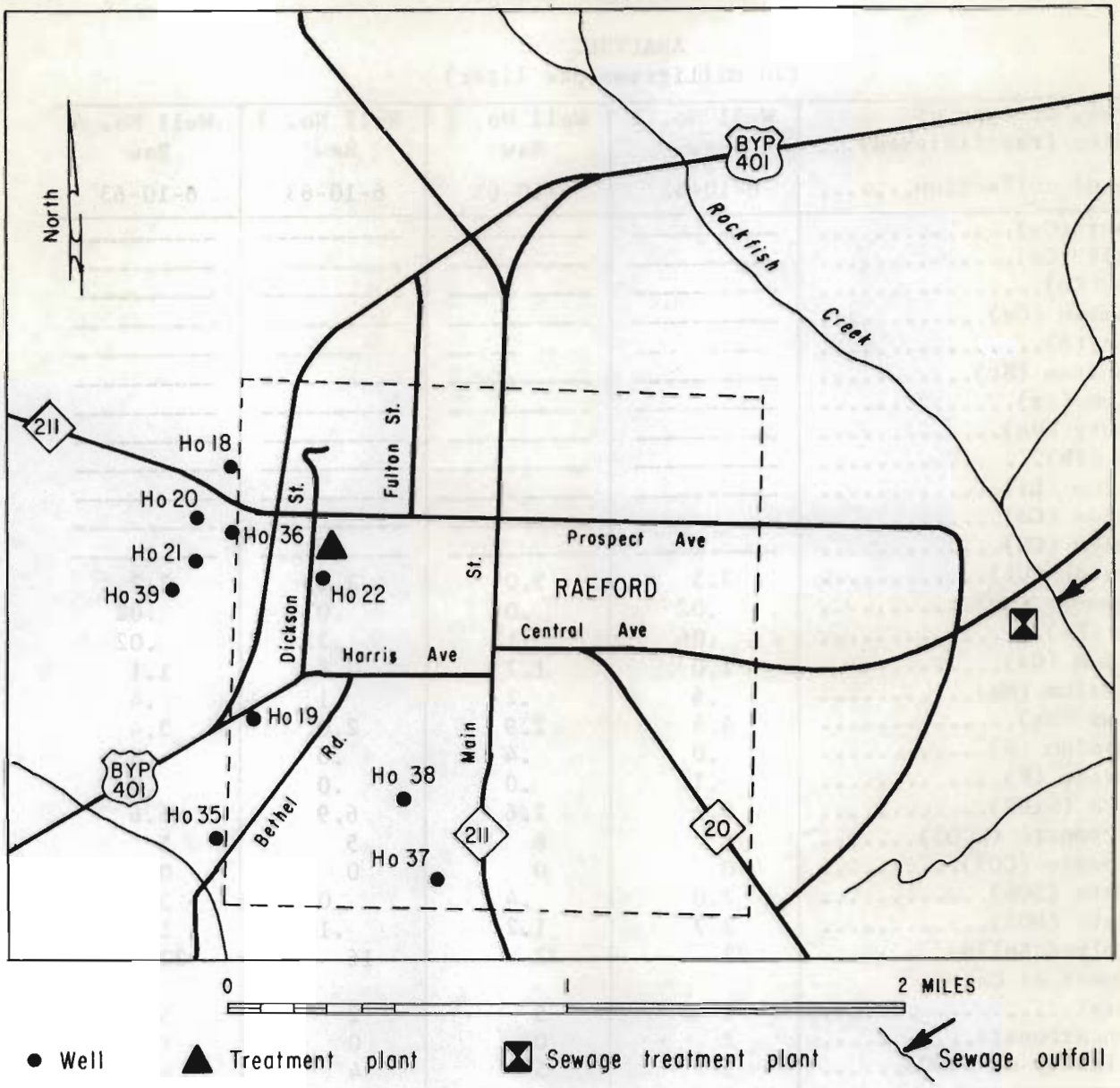
WATER-RESOURCES APPRAISAL:

Surface water: Raeford is in central Hoke County on the drainage divide of the Cape Fear and Lumber River basins. The topography is flat to gently rolling. The northeast part of town is drained by tributaries of Rockfish Creek of the Cape Fear River basin, and the remainder is drained by tributaries of Raft Swamp of the Lumber River basin. The average discharge of streams draining the area is 0.85 mgd per square mile. Minimum flows are quite variable. The low-flow yield of Rockfish Creek is 0.25 mgd per square mile while many small tributary streams occasionally go dry. The 7-day, 2-year low flow averages 0.35 mgd per square mile. Rockfish Creek above the sewage treatment plant is probably the best surface water source available for municipal supply.

Ground water: Raeford is underlain by complexly interlayered beds of sand and clay. These beds are overlain by surficial sand. The overall thickness of these deposits is about 300 feet. The thickness and extent of the sand layers are variable in the area but generally are sufficient for construction of productive wells.

Existing town wells reportedly have yields ranging from 55 to 310 gpm and average 180 gpm. These range in depth from 108 to 262 ft, with the majority being between 100 to 140 feet deep. It is not known whether pumping interference exists between wells. It is estimated that wells spaced to prevent significant interference would yield up to 0.5 mgd per well. Generally, the water is soft and corrosive.

CITY OF RAEFORD



RAEFORD, HOKE 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	Well No. 4 Raw
Date of collection.....	6-10-63	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).....	----------	----------	----------	----------
Cadmium (Cd).....	----------	----------	----------	----------
Cyanide (CN).....	----------	----------	----------	----------
Chloride (Cl).....	3.5	5.0	2.1	2.2
Manganese (Mn).....	.02	.04	.01	.02
Iron (Fe).....	.06	.12	.32	.02
Calcium (Ca).....	1.0	1.7	.8	1.1
Magnesium (Mg).....	.6	.2	.1	.4
Sodium (Na).....	4.4	2.9	2.0	3.4
Potassium (K).....	.0	.4	.0	.0
Fluoride (F).....	.1	.0	.0	.0
Silica (SiO2).....	6.1	7.6	6.9	6.6
Bicarbonate (HCO3).....	4	6	5	5
Carbonate (CO3).....	0	0	0	0
Sulfate (SO4).....	2.0	.4	.0	3.4
Nitrate (NO3).....	3.7	1.2	.1	1.5
Dissolved Solids.....	22	22	16	22
Hardness as CaCO3:				
Total.....	5	5	2	5
Noncarbonate.....	2	0	0	1
Alkalinity as CaCO3.....	3	5	4	4
Specific conductance (micromhos at 25° C)....	28	27	14	24
pH.....	6.5	5.8	5.8	6.1
Temperature (°C).....	18.0	18.5	18.0	18.0

Note.--Additional analyses on next page.

RAEFORD, HOKE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 6 Raw	Finished	Wells 1-9a/ Raw	Wells 1-9a/ Finished
Date of collection.....	6-10-63	6-10-63	11-14-72	11-14-72
Copper (Cu).....	----------	----------	0.027	0.029
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.025	.020
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	----------	----------
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.000	.000
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	3.9	4.0	5.4	6.2
Manganese (Mn).....	.01	.01	.004	.012
Iron (Fe).....	.04	.10	.000	.083
Calcium (Ca).....	1.0	3.7	----------	----------
Magnesium (Mg).....	.3	.3	----------	----------
Sodium (Na).....	3.0	2.9	----------	----------
Potassium (K).....	.3	.1	----------	----------
Fluoride (F).....	.0	.0	----------	----------
Silica (SiO2).....	7.1	6.9	----------	----------
Bicarbonate (HCO3).....	5	12	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	.4	.6	----------	----------
Nitrate (NO3).....	2.8	1.9	----------	----------
Dissolved Solids.....	25	28	----------	----------
Hardness as CaCO3:				
Total.....	4	10	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	4	10	----------	----------
Specific conductance (micromhos at 25° C)....	29	37	----------	----------
pH.....	5.9	6.5	----------	----------
Temperature (°C).....	18.5	29.0	----------	----------

a/ Sample collected at treatment plant and is from wells 1-9.

IREDELL COUNTY

WATER-RESOURCES APPRAISAL

Iredell County is in the west-central part of the Piedmont Province. The topography of the county is characterized by gently rolling hills with moderate slopes. The South Yadkin River and its tributaries drain the northern two-thirds of the county, and the Catawba River, which is the southwest boundary of the county, and its tributaries drain the remainder. The average discharge of streams ranges from 0.65 mgd per square mile in the southern half of the county to 1.0 mgd per square mile in the northwest corner and averages about 0.7 mgd per square mile. The low flow yield of streams averages 0.12 mgd per square mile, and the 7-day, 2-year low flow averages 0.25 mgd per square mile.

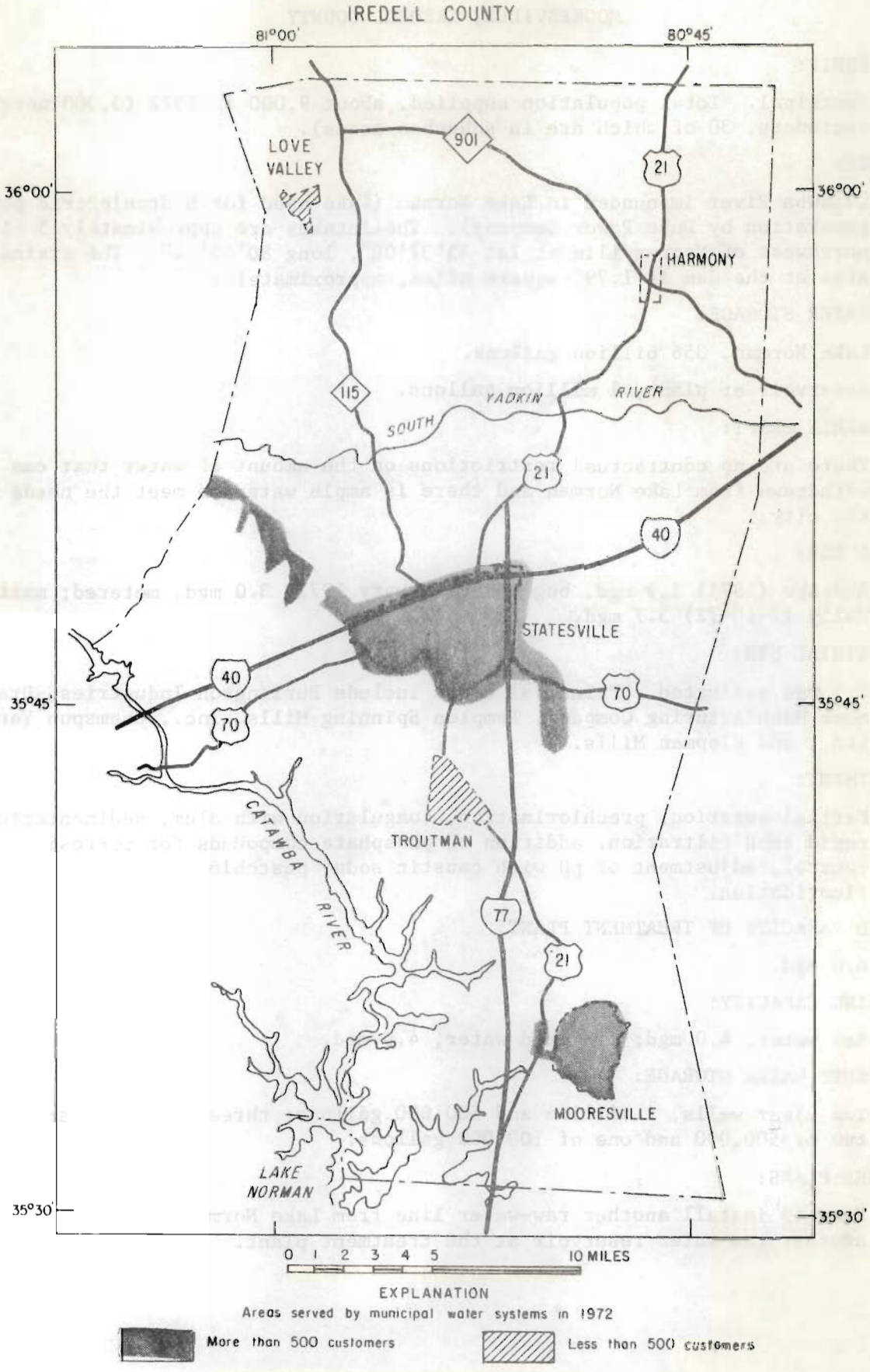
Statesville and Mooresville obtain their water supplies from surface sources. Other smaller towns, most rural domestic, and some small industrial users are supplied by wells or springs. The Statesville and Mooresville water supply systems serve 36,000 of the county population of 72,200.

Many varieties of igneous and metamorphic rocks underlie the county. The most abundant is gneiss with smaller bodies of granite, mica schist, gabbro, and diorite. Generally, the rocks are intimately interlayered and their relation, one to another, is complex. A thick layer of weathered rock overlies the bedrock in most places as indicated by the 70 foot average depth of well casing in available well records. The fracturing and bedding characteristics of the rocks and the thick cover of weathered rock are favorable for large-yielding wells.

Except locally, there is not much difference in the water-bearing characteristics of rocks in different parts of the county. The average reported yield of drilled wells 6 inches or more in diameter is 19 gpm with one well reported to yield over 500 gpm. The reported depth of 129 drilled wells ranges from 49 to 1,100 feet and averages 230 feet.

The chemical quality of ground water is acceptable for most uses with little or no treatment. In some parts of each rock unit however, concentrations of iron 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. Where higher yielding wells are needed, care should be taken in the location and management of well fields. The better supplies are generally obtained from wells drilled in draws and small valleys where thick soil cover is present. The average amount of ground water available in Iredell county is in the range of 0.35 to 0.45 mgd per square mile.


IREDELL COUNTY
81°00'
80°45'
36°00'
35°45'
35°30'
LOVE VALLEY
901
21
HARMONY
115
YADKIN RIVER
SOUTH
40
STATESVILLE
70
TROUTMAN
CATAWBA RIVER
77
MOORESVILLE
LAKE NORMAN
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

MOORESVILLE, IREDELL COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 9,000 in 1972 (3,300 metered customers, 30 of which are in suburban areas).

SOURCE:

Catawba River impounded in Lake Norman (lake used for hydroelectric power generation by Duke Power Company): The intakes are approximately 5 miles northwest of Mooresville at lat 35°37'00", long 80°53'34". The drainage area at the dam is 1,790 square miles, approximately.

RAW-WATER STORAGE:

Lake Norman, 356 billion gallons.

Reservoir at plant, 1 million gallons.

ALLOWABLE DRAFT:

There are no contractual restrictions on the amount of water that can be withdrawn from Lake Norman and there is ample water to meet the needs of the city.

TOTAL USE:

Average (1971) 1.9 mgd, beginning January 1972, 3.0 mgd, metered; maximum daily (2-10-72) 3.7 mgd.

INDUSTRIAL USE:

2.1 mgd estimated. Principal users include Burlington Industries, Draymore Manufacturing Company, Templon Spinning Mills, Inc., Chemspun Yarns Ltd., and Klopman Mills.

TREATMENT:

Partial-aeration, prechlorination, coagulation with alum, sedimentation, rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

6.0 mgd.

PUMPING CAPACITY:

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

FINISHED-WATER STORAGE:

Two clear wells, 1 million and 500,000 gallons; three elevated tanks, two of 500,000 and one of 100,000 gallons.

FUTURE PLANS:

Plan to install another raw-water line from Lake Norman and possibly another raw-water reservoir at the treatment plant.

MOORESVILLE, IREDELL COUNTY

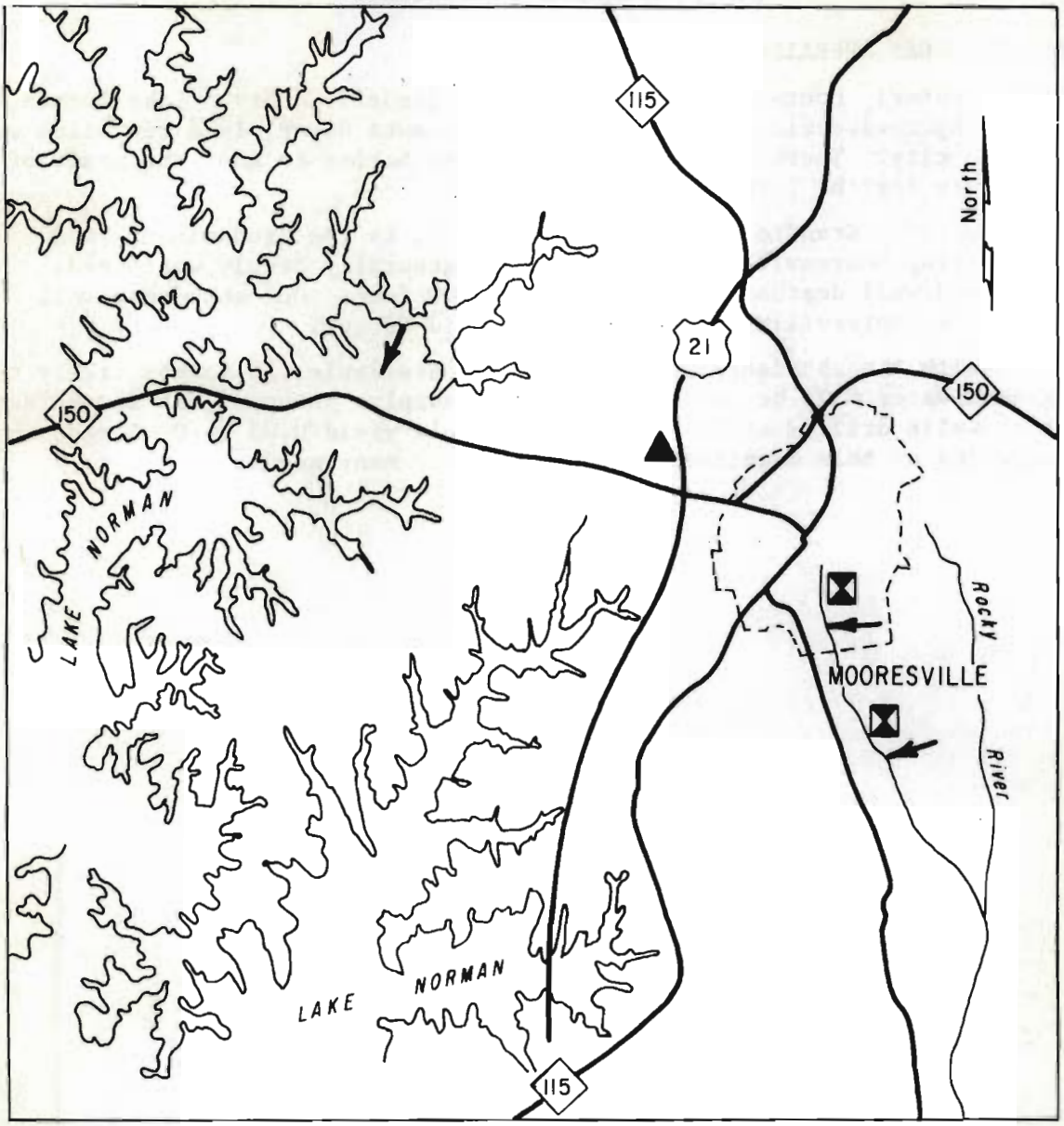
WATER-RESOURCES APPRAISAL:

Surface water: Mooresville is in southern Iredell County. Lake Norman, a large hydroelectric impoundment on the Catawba River, is a few miles west of the city. There is ample water in Lake Norman to meet the needs of the city for the foreseeable future.

Ground water: Granite, commonly porphyritic, is the predominant rock underlying Mooresville. The granite is generally deeply weathered. Reported well depths range from 140 to 400 feet. One abandoned well owned by Mooresville was reported to yield 80 gpm.

With the abundance of surface water available, it is not likely that ground water will be used for municipal supply. However, it is estimated that wells drilled at favorable sites would yield 0.03 to 0.04 mgd, and supplies of this magnitude are adequate for many needs.

CITY OF MOORESVILLE



MOORESVILLE, IREDELL COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	L.Norman Raw	Finished	L.Norman Raw	Finished
Date of collection.....	11-29-65	11-29-65	5-10-72	5-10-72
Copper (Cu).....	----------	----------	0.018	0.016
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.017	.042
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.014	.026
Strontium (Sr).....	----------	----------	.020	.020
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.005
Lead (Pb).....	----------	----------	.002	.000
Lithium (Li).....	----------	----------	.003	.003
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	5.1	7.7	6.0	8.6
Manganese (Mn).....	.02	.02	.028	.010
Iron (Fe).....	.00	.01	.055	.000
Calcium (Ca).....	4.3	5.5	----------	----------
Magnesium (Mg).....	1.1	.7	----------	----------
Sodium (Na).....	4.9	16	----------	----------
Potassium (K).....	1.4	1.4	----------	----------
Fluoride (F).....	.1	1.0	----------	----------
Silica (SiO2).....	9.4	9.1	----------	----------
Bicarbonate (HCO3).....	21	41	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	3.4	9.2	----------	----------
Nitrate (NO3).....	.4	.5	----------	----------
Dissolved Solids.....	41	70	----------	----------
Hardness as CaCO3:				
Total.....	15	16	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	17	34	----------	----------
Specific conductance (micromhos at 25°C)....	55	115	----------	----------
pH.....	6.5	7.7	----------	----------
Temperature (°C).....	13	----------	20.5	21.5

STATESVILLE, IREDELL COUNTY

OWNERSHIP:

Municipal. Also supplies Barium Spring Community. Total population supplied, about 27,000 in 1971 (7,483 metered customers, 823 of which are in suburban areas).

SOURCE:

South Yadkin River (primary source). The intakes are at the upstream side of secondary road 1892 approximately 4.5 miles north of Statesville at lat 35°53'16", long 80°52'54". The drainage area at the intakes is 120 square miles, approximately. Fourth Creek: The intake is approximately 0.2 mile north of the treatment plant at lat 35°48'49", long 80°52'56". The drainage area at the intakes is 15.8 square miles, approximately.

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft of South Yadkin River is 13.5 mgd without storage and of Fourth Creek is 2.0 mgd without storage.

TOTAL USE:

Average (1971) 5.5 mgd, metered; maximum daily (4-17,28-1971) 6.0 million gallons.

INDUSTRIAL USE:

2.0 mgd, estimated. Principal users include Beaunit, Southern Screw Co., Hunt Manufacturing Co., Thonet Industries, Inc., Thornburg Hosiery Mill and Carnation Co.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

15 mgd.

PUMPING CAPACITY:

Raw water, 7.3 mgd at South Yadkin River and 3.4 mgd at Fourth Creek; finished water, 10 mgd.

FINISHED-WATER STORAGE:

Two clear wells 2 million and 1 million gallons; two elevated tanks of 1 million gallons each.

FUTURE PLANS:

Plan to install a 12 mgd pump at South Yadkin River. Within the next

STATESVILLE, IREDELL COUNTY

5-10 years plan either a 50 million gallon raw water reservoir or to use a proposed Soil Conservation Service 2,000 million gallon reservoir on Snow Creek.

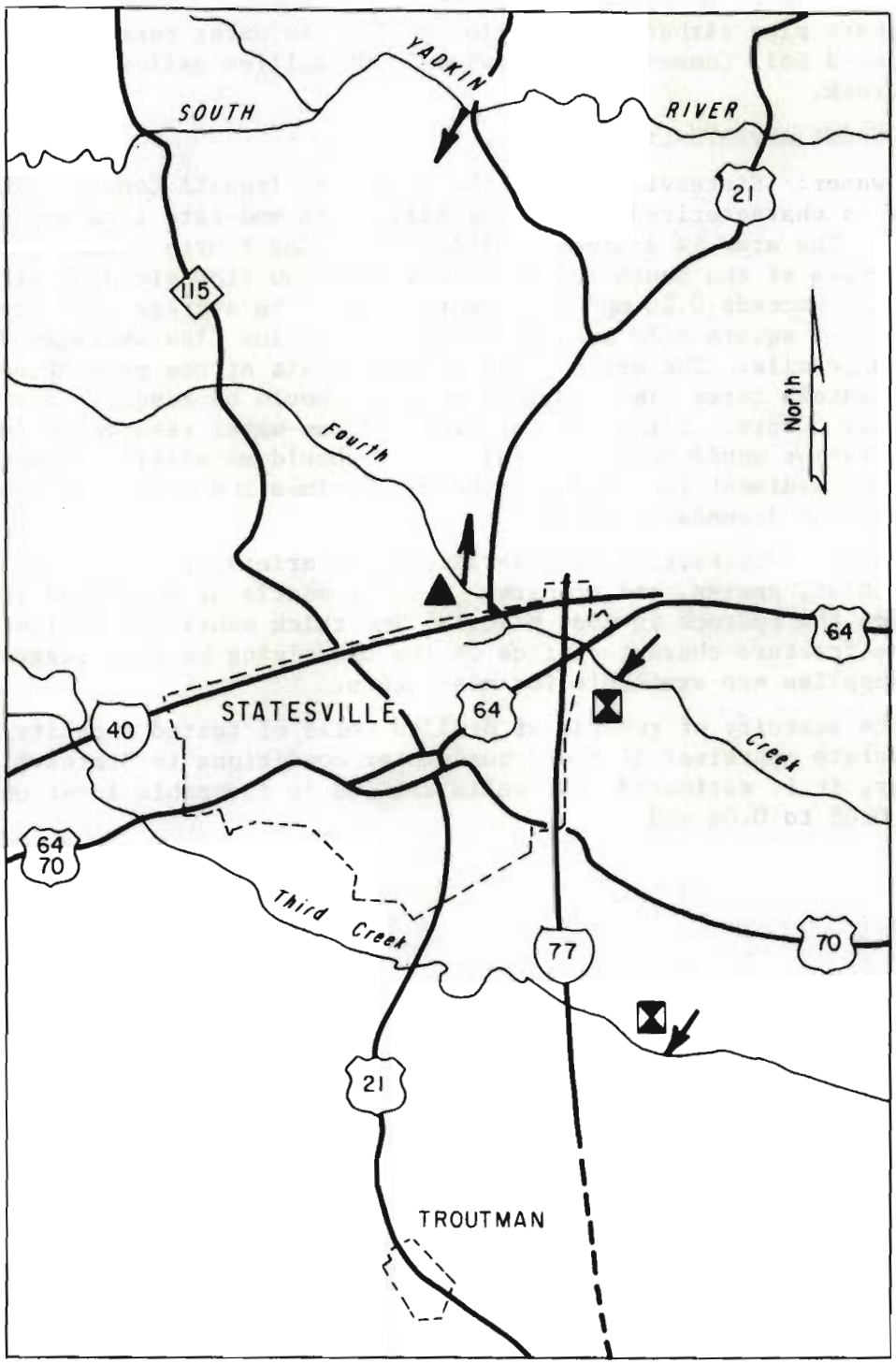
WATER-RESOURCES APPRAISAL:

Surface water: Statesville is in the center of Iredell County. The topography is characterized by rolling hills with moderate land and stream slopes. The area is drained by Third Creek and Fourth Creek, both tributaries of the South Yadkin River. The low flow yield of streams generally exceeds 0.10 mgd per square mile. The average discharge is 0.7 mgd per square mile and the 7-day, 2-year low flow averages 0.25 mgd per square mile. The estimated allowable draft of the present sources is approximately three times current use and should be adequate for the immediate future. Either of the proposed raw-water reservoirs under consideration would be beneficial. They should materially reduce the suspended-sediment load which is heavy at times and would, of course, increase the dependable yield.

Ground water: Statesville is underlain by a variety of rocks, including mica-schist, gneiss, and granite. A thick mantle of weathered rocks overlies the bedrock in most places. The thick mantle of weathered rock and the fracture characteristics of the underlying bedrock suggest that well supplies are available for most needs.

The scarcity of records of drilled wells of tested capacity prevents an accurate appraisal of the ground-water conditions in Statesville. However, it is estimated that wells drilled in favorable locations would yield 0.05 to 0.06 mgd.

CITY OF STATESVILLE



STATESVILLE, IREDELL COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	S.Yadkin R. Raw	Finished		
Date of collection.....	3-22-72	3-22-72		
Copper (Cu).....	0.208	0.014		
Cobalt (Co).....	.008	.001		
Zinc (Zn).....	.038	.000		
Chromium (Cr).....	.00	.00		
Boron (B).....	.016	.000		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.014	.000		
Lithium (Li).....	.005	.005		
Cadmium (Cd).....	.001	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	3.0	5.5		
Manganese (Mn).....	1.120	.000		
Iron (Fe).....	4.559	.000		
Calcium (Ca).....	3.2	3.2		
Magnesium (Mg).....	2.2	1.3		
Sodium (Na).....	2.1	6.5		
Potassium (K).....	3.5	1.1		
Fluoride (F).....	.2	.7		
Silica (SiO2).....	5.8	11		
Bicarbonate (HCO3).....	11	21		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	8.6	3.6		
Nitrate (NO3).....	5.4	1.3		
Dissolved Solids.....	46	45		
Hardness as CaCO3:				
Total.....	17	14		
Noncarbonate.....	8	0		
Alkalinity as CaCO3.....	9	17		
Specific conductance (micromhos at 25° C)....	54	61		
pH.....	6.1	6.8		
Temperature (°C).....	----------	----------		

LEE COUNTY

WATER-RESOURCES APPRAISAL

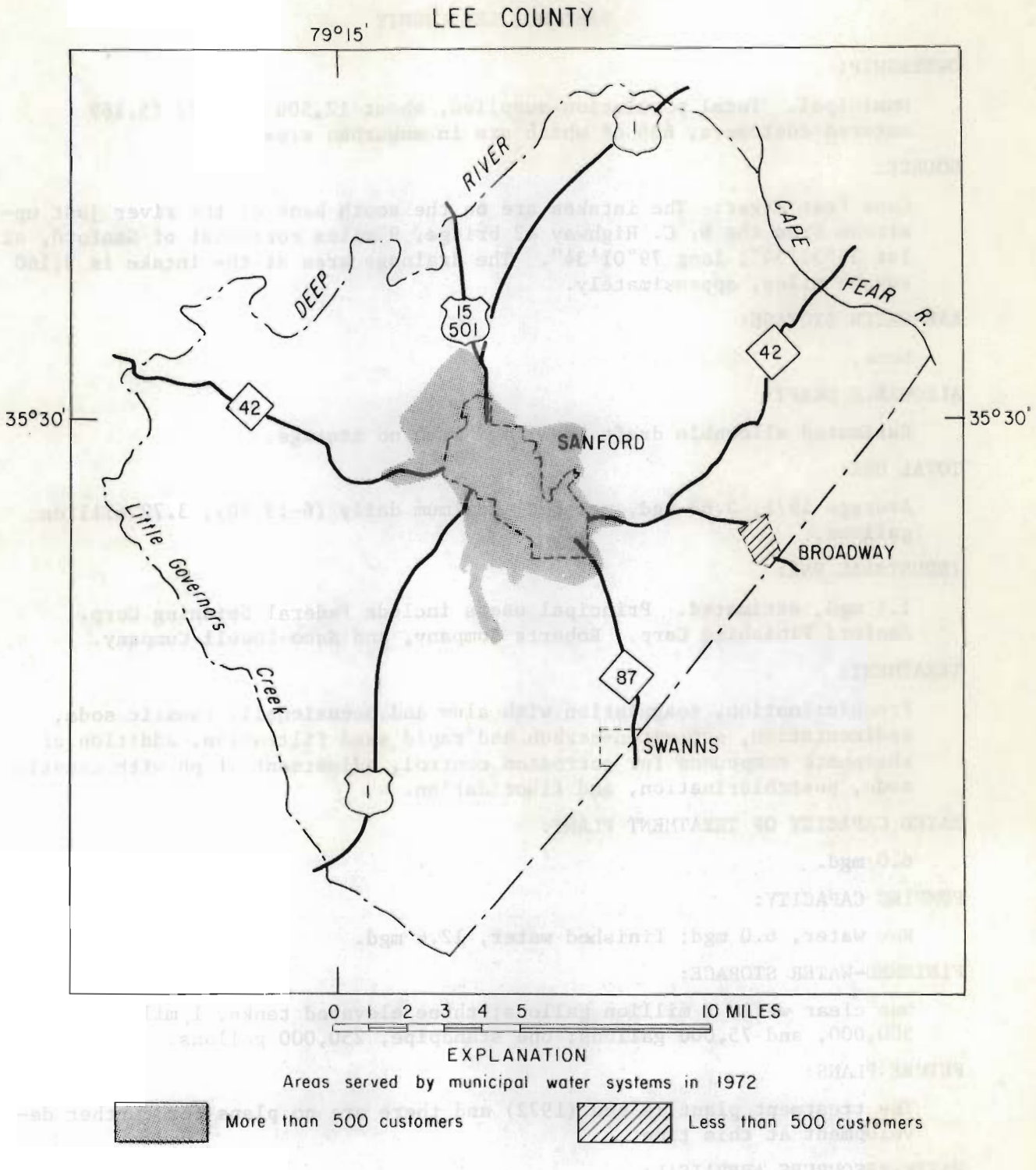
Lee County is located in the central part of North Carolina. The Fall Zone passes through the county, with the north and northwest half being in the Piedmont Province and the remainder in the Coastal Plain Province. The topography is characterized by gently rolling and undulating hills with gentle stream and land slopes. The Deep and Cape Fear River form the northern boundary and drainage is through tributaries of these rivers. The average discharge of streams ranges from 0.65 to 0.80 mgd per square mile. Minimum flows are low, generally ranging from 0.005 to 0.015 mgd per square mile. Streams with less than 10 square miles drainage area occasionally go dry. The 7-day, 2-year low flow ranges from 0.02 to 0.20 mgd per square mile and averages 0.08 mgd per square mile.

Sanford obtains its water supply from the Cape Fear River. Broadway and most rural domestic water supplies use wells. Approximately 13,200 of the county's population of 30,467 (1970) are served by municipal water systems.

Rocks of the volcanic slate series crop out in the northern tip of the county and in the southeastern third where they are overlain by Coastal Plain deposits of the Tuscaloosa Formation. Water in the slate moves through fractures and along planes of bedding, cleavage, and schistosity, and is stored in the overlying mantle of weathered rock. The higher yielding wells are those drilled in draws, sags, and low flat areas where the mantle of weathered rock is thickest. In such areas, yields as much as 50 gpm may be obtained. The Coastal Plain strata are thin in Lee County and yields of wells are small. Triassic rocks (shale, sandstone, claystone, and clay derived from weathered shale) occupy most of the northwestern two-thirds of the county. Compaction and cementation have reduced the permeability and porosity of the Triassic rocks, and well yields in this rock unit are generally low. The following table shows typical reported yields and average depth of wells in the slate and Triassic rocks (these data are for domestic wells, and yields are probably low).

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Slate	30	11	88
Triassic	20	9	107

The chemical quality of ground water is generally good and suitable for use with little or no treatment. Water from the slate is slightly acidic and usually soft. Water from the Triassic is alkaline, is moderately hard, and locally may contain as much as 250 mg/1 of chloride.


LEE COUNTY
79°15'
35°30'
35°30'
RIVER
DEEP
CAPE FEAR R.
15
501
42
42
1
SANFORD
BROADWAY
Little Governors Creek
87
SWANNS
1
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

SANFORD, LEE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 12,500 in 1972 (5,169 metered customers, 638 of which are in suburban areas).

SOURCE:

Cape Fear River: The intakes are on the south bank of the river just upstream from the N. C. Highway 42 bridge, 9 miles northeast of Sanford, at lat 35°32'54", long 79°01'34". The drainage area at the intake is 3,160 square miles, approximately.

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft is 17 mgd with no storage.

TOTAL USE:

Average 1971, 2.63 mgd, metered; maximum daily (6-19-70), 3.72 million gallons.

INDUSTRIAL USE:

1.1 mgd, estimated. Principal users include Federal Spinning Corp., Sanford Finishing Corp., Roberts Company, and Saco-Lowell Company.

TREATMENT:

Prechlorination, coagulation with alum and occasionally caustic soda, sedimentation, activated-carbon and rapid sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

6.0 mgd.

PUMPING CAPACITY:

Raw water, 6.0 mgd; finished water, 12.6 mgd.

FINISHED-WATER STORAGE:

One clear well, 2 million gallons; three elevated tanks, 1 million, 500,000, and 75,000 gallons; one standpipe, 250,000 gallons.

FUTURE PLANS:

The treatment plant is new (1972) and there are no plans for further development at this time.

WATER-RESOURCES APPRAISAL:

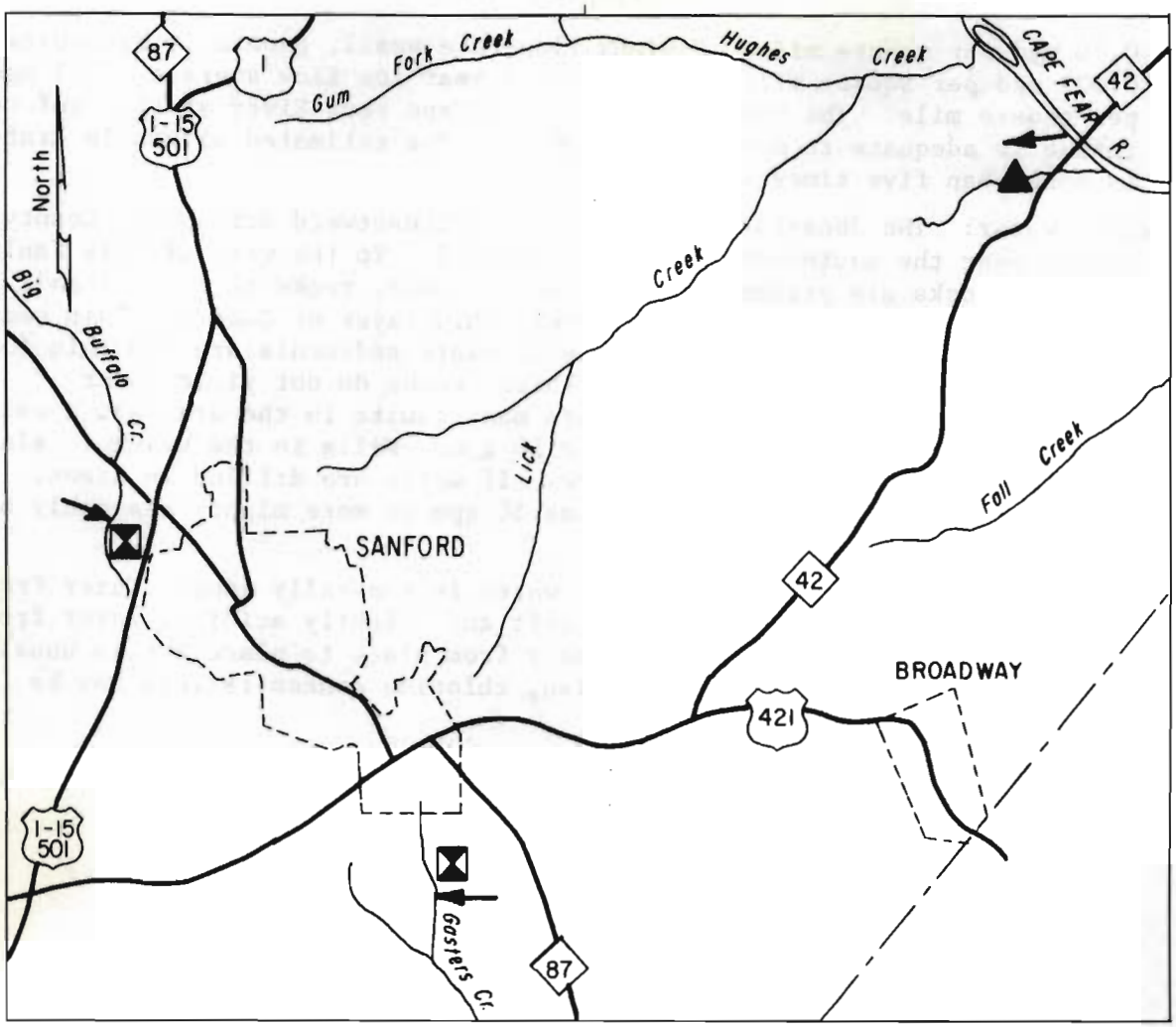
Surface water: Sanford is in the center of Lee County where the topography is characterized by gently rolling hills with gentle land and stream slopes. The area is drained by many small tributaries of the Cape Fear River. The average discharge of streams draining the immediate area is

0.70 mgd per square mile. Minimum flows are small, generally exceeding 0.003 mgd per square mile. The 7-day, 2-year low flow averages 0.03 mgd per square mile. The minimum flow of the Cape Fear River at the Sanford intake is adequate to meet future demand. The estimated allowable draft is more than five times current use.

Ground water: The Jonesboro fault trends northeastward across Lee County and is near the southeastern edge of Sanford. To the west of this fault, Triassic rocks are predominant, and to the east, rocks of the volcanic slate series predominate. A relatively thin layer of Coastal Plain sediments overlie these rocks. The Coastal Plain sediments are too thin for successful wells. Generally the Triassic rocks do not yield water readily to wells. However, there are many faults in the area and a well penetrating a fault might yield over 50 gpm. Wells in the volcanic slate are reported to yield 30 gpm or more. If wells are drilled in draws, sags, or low areas, yields as high as 50 gpm or more might reasonably be expected.

The chemical quality of ground water is generally good. Water from wells in the slate is usually very soft and slightly acidic. Water from the Triassic rocks varies considerably from place to place but is usually alkaline and hard to very hard. Also, chloride concentrations may be higher than desirable.

CITY OF SANFORD



SANFORD, LEE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished		
Date of collection.....	8-3-72	8-3-72		
Copper (Cu).....	0.019	0.017		
Cobalt (Co).....	.000	.000		
Zinc (Zn).....	.000	.000		
Chromium (Cr).....	.00	.00		
Boron (B).....	.020	.035		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.003	.002		
Cadmium (Cd).....	.000	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	13	19		
Manganese (Mn).....	.010	.010		
Iron (Fe).....	.093	.031		
Calcium (Ca).....	6.8	7.1		
Magnesium (Mg).....	2.2	2.8		
Sodium (Na).....	14	25		
Potassium (K).....	3.2	2.9		
Fluoride (F).....	.3	.9		
Silica (SiO2).....	12	10		
Bicarbonate (HCO3).....	33	22		
Carbonate (CO3).....	0.0	0		
Sulfate (SO4).....	11	36		
Nitrate (NO3).....	4.0	1.8		
Dissolved Solids.....	118	123		
Hardness as CaCO3:				
Total.....	26	29		
Noncarbonate.....	0	11		
Alkalinity as CaCO3.....	27	18		
Specific conductance (micromhos at 25° C)....	120	185		
pH.....	6.7	6.5		
Temperature (°C).....				

LINCOLN COUNTY

WATER-RESOURCES APPRAISAL

Lincoln County is in the south-western part of the Piedmont Province in North Carolina. The topography is rolling to hilly with moderate to steep land and stream slopes. The South Fork Catawba River and other tributaries of the Catawba River drain the county. The Catawba River and Lake Norman, a hydroelectric power development, form the east boundary of the county. The low flow yield of streams ranges from 0.03 mgd per square mile in the eastern half of the county to 0.14 mgd per square mile in the western half. The average discharge of streams, excluding the highly regulated Catawba River, ranges from 0.7 mgd per square mile in the east to 0.9 mgd per square mile in the west, and likewise, the 7-day, 2-year low flow ranges from 0.11 mgd per square mile in the east to 0.29 mgd per square mile in the west.

Lincolnton, the only municipal water system in the county, obtains its water from surface sources. Lincolnton supplies water to 9,000 of the county's population of 32,682 (1970).

Mica schist and granite are the prevalent rocks in Lincoln County. The granite has penetrated the schist to varying degrees. In some areas the schist is predominant and in others the granite predominates. A belt of schist with very little granite extends northeastward through the center of the county passing east of Lincolnton. The eastern third of the county is predominately underlain by granite. Hornblende gneiss occurs interlayered with other rocks in most of the county.

Records of wells indicate that higher yields are obtained from wells in schist, the average yield being almost twice as great as that in granite. The yield of wells varies considerably from place to place in the same rock unit, depending largely on the thickness of overlying weathered material and topographic location. Wells drilled in draws have an average yield twice as great as wells on hills in the same rock unit.

The following table shows typical reported yields and the average depth of wells in granite and schist in the county.

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Schist	58	14	139
Granite	100	8	114

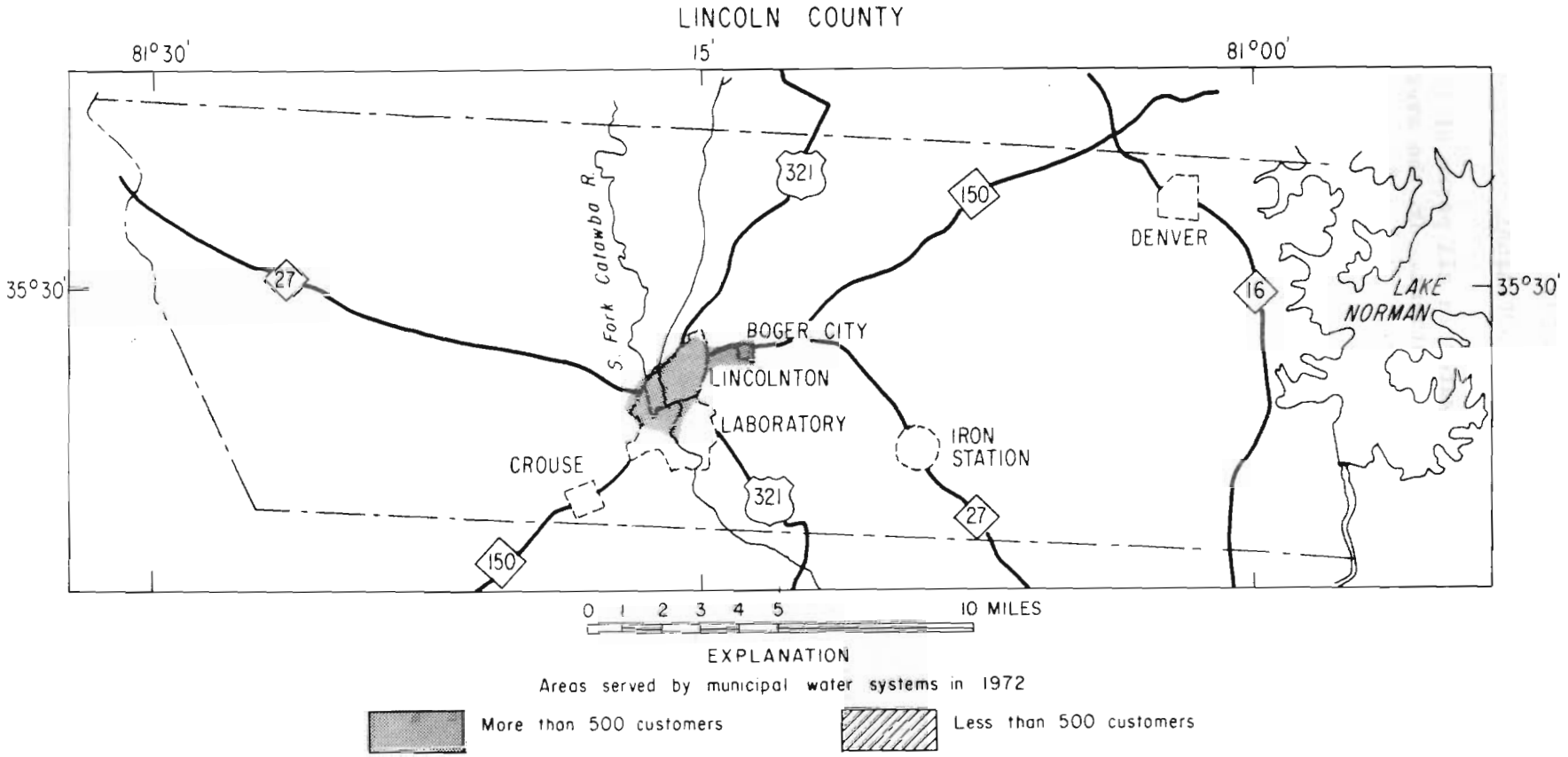
The yields in the table are based largely on wells used for domestic supplies and are low because domestic wells are usually drilled at sites close to the point of use rather than in sites selected for high yield. The average yield of 27 wells drilled for industrial use is 23 gpm.

The higher-yielding wells are those drilled in low, flat areas or draws where the saturated weathered rock is thickest. It is estimated that the amount of ground water available for development ranges from 0.35 mgd per square mile in the east to 0.50 mgd per square mile in the west.

LINCOLN COUNTY

WATER-RESOURCES APPRAISAL

The chemical quality of ground water in all parts of the county is good and acceptable for most uses without treatment. On the average, the water is soft containing less than 50 ppm hardness.


LINCOLN COUNTY
81°30'
15'
81°00'
35°30'
35°30'
321
150
27
16
S. Fork Catawba R.
DENVER
LAKE NORMAN
BOGER CITY
LINCOLNTON
LABORATORY
IRON STATION
CROUSE
321
27
150
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

LINCOLNTON, LINCOLN COUNTY

OWNERSHIP:

Municipal. Also supplies Boger City Sanitary District which has 900 metered customers. Total population supplied, about 9,000 in 1972 (2,500 metered customers, 125 of which are in suburban areas).

SOURCE:

South Fork Catawba River: The intakes are at the upstream side of N. C. Highway 27 bridge at lat 35°28'15", long 81°16'07". The drainage area at the intake is 392 square miles, approximately. Walker Branch impounded by a low dam (primarily a pumping pool): The intakes are at the old treatment plant at lat 35°29'00", long 81°15'35". The drainage area at the intakes is 4.7 square miles, approximately.

RAW-WATER STORAGE:

Walker Branch pumping pool, 6-8 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft of the combined sources is 39 mgd, with negligible storage.

TOTAL USE:

Average (1971), 2.39 mgd, metered; maximum daily not available.

INDUSTRIAL USE:

1.8 mgd, estimated. Principal users include Mohican Mills, Leslie Fay Corporation and North Carolina Spinning Mill.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid Anthra-filt filtration, adjustment of pH with soda ash, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

Old plant, 1.0 mgd. New plant 2.0 mgd.

PUMPING CAPACITY:

Raw water: Old plant, 1.0 mgd; New plant, 2.0 mgd.

Finished water: Old plant, 1.4 mgd; New plant, 4.6 mgd.

FINISHED-WATER STORAGE

Two clear wells, each of 500,000 gallons; three elevated tanks, 500,000, 150,000 and 75,000 gallons.

FUTURE PLANS:

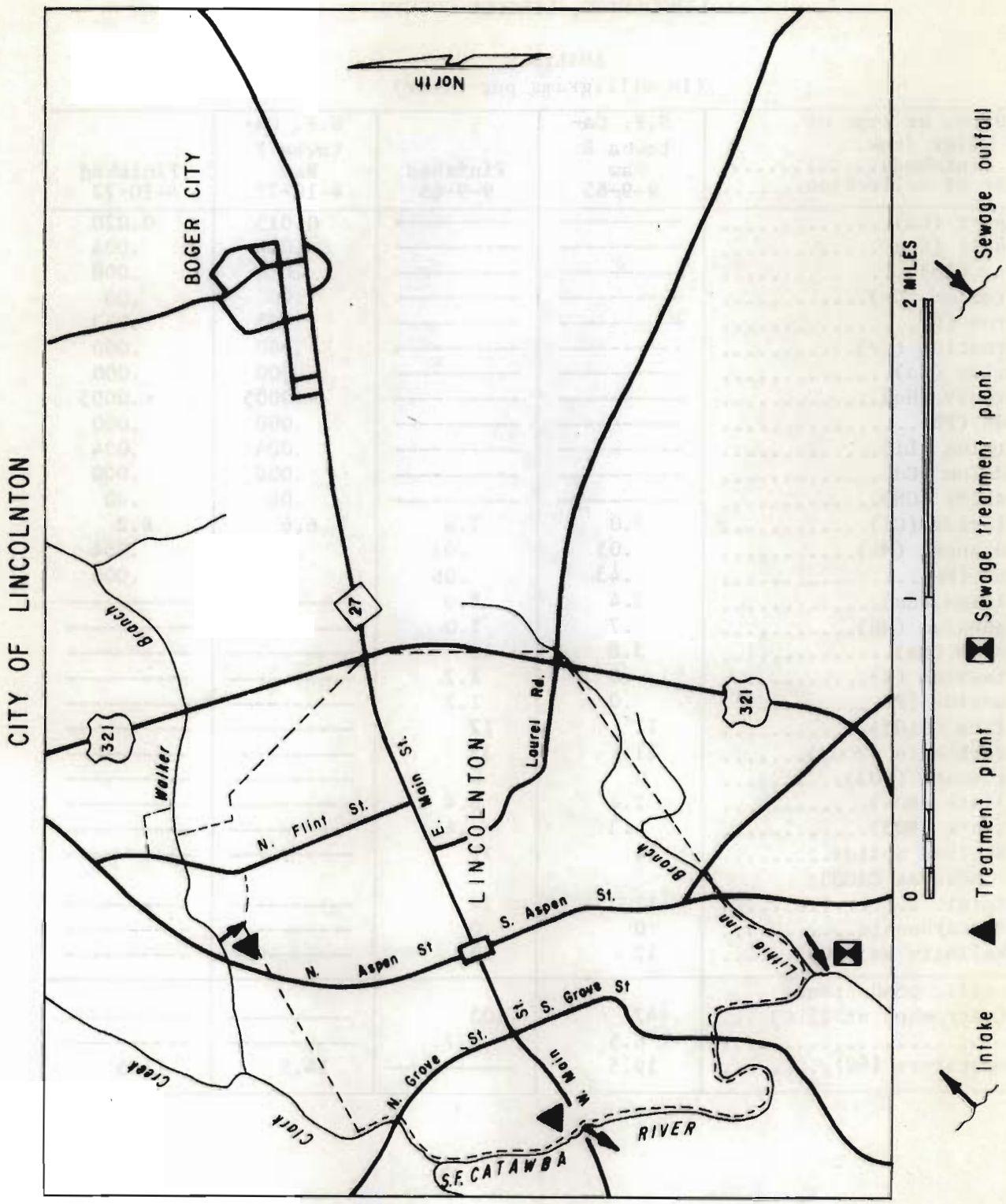
Fluoridation is to be added to the treatment process. Additions and modifications of the new plant were in progress in April 1972, including: raising treatment capacity to 6.0 mgd; construction of a 1.0 million gallon clear well; construction of 20 million gallon raw water reservoir

and a new raw water intake; and installing additional raw and finished water pumps.

WATER-RESOURCES APPRAISAL:

Surface water: Lincolnton is in the center of Lincoln County on an east-west trending ridge between Lithia Inn Branch and Walker Branch. The South Fork Catawba River flows along the west side of the city. The low flow yield of streams draining the area generally exceeds 0.10 mgd per square mile. The average discharge of streams is 0.8 mgd per square mile and the 7-day, 2-year low flow averages 0.25 mgd per square mile. There is ample water available at the present sources to meet the needs of the foreseeable future. The estimated allowable draft is more than 15 times current use.

Ground water: The city of Lincolnton is underlain by granite. The city owns 6 wells which were used to supplement the surface water supply. When the new plant was completed, the wells were taken out of service. These wells range in depth from 142 to 200 feet and have a combined yield estimated at 300 gpm with continuous pumping. The water is of good chemical quality.


CITY OF LINCOLNTON
North
BOGER CITY
LINCOLNTON
321
27
321
Walker
Branch
N. Flint St.
E. Main St.
Laurel Rd.
Branch
S. Aspen St.
N. Aspen St
Lithia Inn
S. Grove St
N. Grove St.
N. Main St.
Clark Creek
S.F. CATAWBA RIVER
0
1
2 MILES
Sewage outfall
Sewage treatment plant
Treatment plant
Intake

LINCOLNTON, LINCOLN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)..... Date of collection.....	S.F. Catawba R. Raw 9-9-65	Finished 9-9-65	S.F. Catawba R. Raw 4-10-72	Finished 4-10-72
Copper (Cu).....	----------	----------	0.015	0.020
Cobalt (Co).....	----------	----------	.004	.004
Zinc (Zn).....	----------	----------	.010	.008
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.025	.053
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.004	.004
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	3.0	7.6	6.6	6.2
Manganese (Mn).....	.05	.01	.033	.004
Iron (Fe).....	.43	.06	.518	.000
Calcium (Ca).....	3.4	8.0	----------	----------
Magnesium (Mg).....	.7	1.0	----------	----------
Sodium (Na).....	3.8	11	----------	----------
Potassium (K).....	.9	1.2	----------	----------
Fluoride (F).....	.0	1.2	----------	----------
Silica (SiO2).....	12	12	----------	----------
Bicarbonate (HCO3).....	21	35	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	2.4	8.4	----------	----------
Nitrate (NO3).....	.3	.4	----------	----------
Dissolved Solids.....	44	71	----------	----------
Hardness as CaCO3:				
Total.....	12	24	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	17	29	----------	----------
Specific conductance (micromhos at 25° C)....	47	103	----------	----------
pH.....	6.5	6.7	----------	----------
Temperature (°C).....	19.5	----------	14.5	11.5

MECKLENBURG COUNTY

WATER-RESOURCES APPRAISAL

Mecklenburg County is in the Piedmont Province in south-central North Carolina with the State line being the southern boundary. Topographically, the county is level to gently rolling becoming more hilly near the larger streams. The Catawba River is the west boundary of the county. Flow of the river is highly regulated by hydroelectric dams. Three of the lakes formed by these dams, Lake Wylie, Lake Norman, and Mountain Island Lake are partly in the county. Tributaries of the Catawba River drain all but the northeast quarter of the county which is drained by the Rocky River and its tributaries. The average discharge of streams in the county is 0.65 mgd per square mile. Minimum flows are quite variable, ranging from 0.001 to 0.09 mgd per square mile and averaging 0.018 mgd per square mile. The 7-day, 2-year low-flow averages 0.07 mgd per square mile.

The Charlotte-Mecklenburg Utility Department, Huntersville, and Davidson obtain their water supply from Catawba River impoundments. These municipal systems serve approximately 286,000 of the county population of 354,656 (1970).

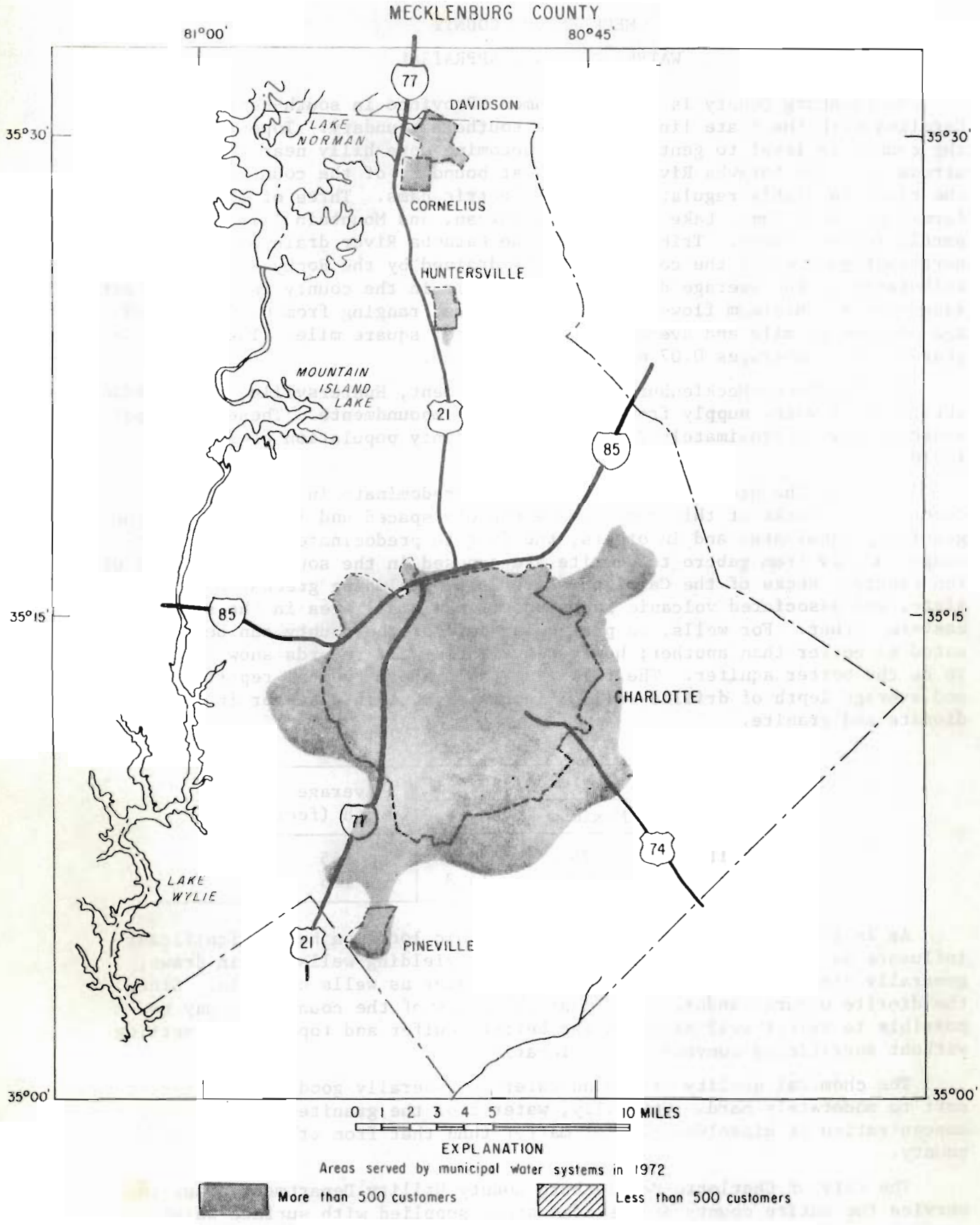
Rocks of the diorite and granite group predominate in Mecklenburg County. The rocks of this complex are closely spaced and in some areas the granite predominates and in others, the diorite predominates. Rocks that range locally from gabbro to diorite are exposed in the southwestern part of the county. Rocks of the Carolina slate belt, including greenstone, schist, slate, and associated volcanic rocks underlie a small area in the southeastern corner. For wells, no particular part of the county can be designated as better than another; however available well records show the diorite to be the better aquifer. The following table shows typical reported yields and average depth of drilled wells 3 inches or more in diameter in the diorite and granite.

Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Diorite	75	22.6	155
Granite	100	14.8	136

As is typical of the Piedmont, topographic location has a significant influence on the yield of wells. The higher yielding wells are in draws, generally yielding more than twice as much water as wells on hills. Since the diorite occurs randomly in almost all parts of the county, it may be possible to select well sites in the better aquifer and topographic setting without sacrificing convenience of location.

The chemical quality of ground water is generally good. The water is soft to moderately hard. Generally, water from the granite has a smaller concentration of dissolved mineral matter than that from other rocks in the county.

The city of Charlotte-Mecklenburg County Utility Department plans to service the entire county and is adequately supplied with surface water.


MECKLENBURG COUNTY
81°00'
80°45'
35°30'
35°15'
35°00'
77
DAVIDSON
LAKE NORMAN
CORNELIUS
HUNTERSVILLE
MOUNTAIN ISLAND LAKE
21
85
85
CHARLOTTE
77
74
LAKE WYLIE
21
PINEVILLE
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

CHARLOTTE-MECKLENBURG UTILITY DEPARTMENT, MECKLENBURG COUNTY

OWNERSHIP:

Municipal. Also supplies Pineville and Matthews. Total population supplied, about 280,000 in 1972 (82,000-85,000 metered customers).

SOURCE:

Catawba River impounded in Mountain Island Lake: The intake is about 6 miles northwest of Charlotte at lat 35°20'56", long 80°56'36". The drainage area at the dam is 1,860 square miles, approximately. Water is pumped to two raw-water reservoirs. Mountain Island Lake is used primarily for hydroelectric power generation by Duke Power Company.

RAW-WATER STORAGE:

Mountain Island Lake, 18.7 billion gallons.

Two reservoirs, 60 and 40 million gallons.

ALLOWABLE DRAFT:

Allowable draft not determined. However, there is ample water to meet future needs.

TOTAL USE:

Average (1971), 33.83 mgd, metered; maximum daily (6-19-70), 48.2 million gallons.

INDUSTRIAL USE:

11.3 mgd (1971), estimated. Principal users include Barnhardt Manufacturing Co., Celanese Corporation, Lance Incorporated, Southeastern Poultry, and Southern Dairy.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANTS:

Hoskins Plant, 36 mgd.

Vest Plant, 25 mgd.

PUMPING CAPACITY:

Raw water, 90 mgd; finished water, more than 100 mgd.

FINISHED-WATER STORAGE:

Hoskins Plant; two clear wells, 12,000,000 and 6,000,000 gallons. Vest plant; three interconnected clear wells, combined storage of 12,000,000 gallons. Seven elevated tanks, 2,000,000, 1,500,000, 1,250,000, 1,000,000, 1,000,000, 500,000 and 500,000 gallons.

FUTURE PLANS:

The Charlotte-Mecklenburg Utility Department was recently formed. The

CHARLOTTE-MECKLENBURG UTILITY DEPARTMENT, MECKLENBURG COUNTY

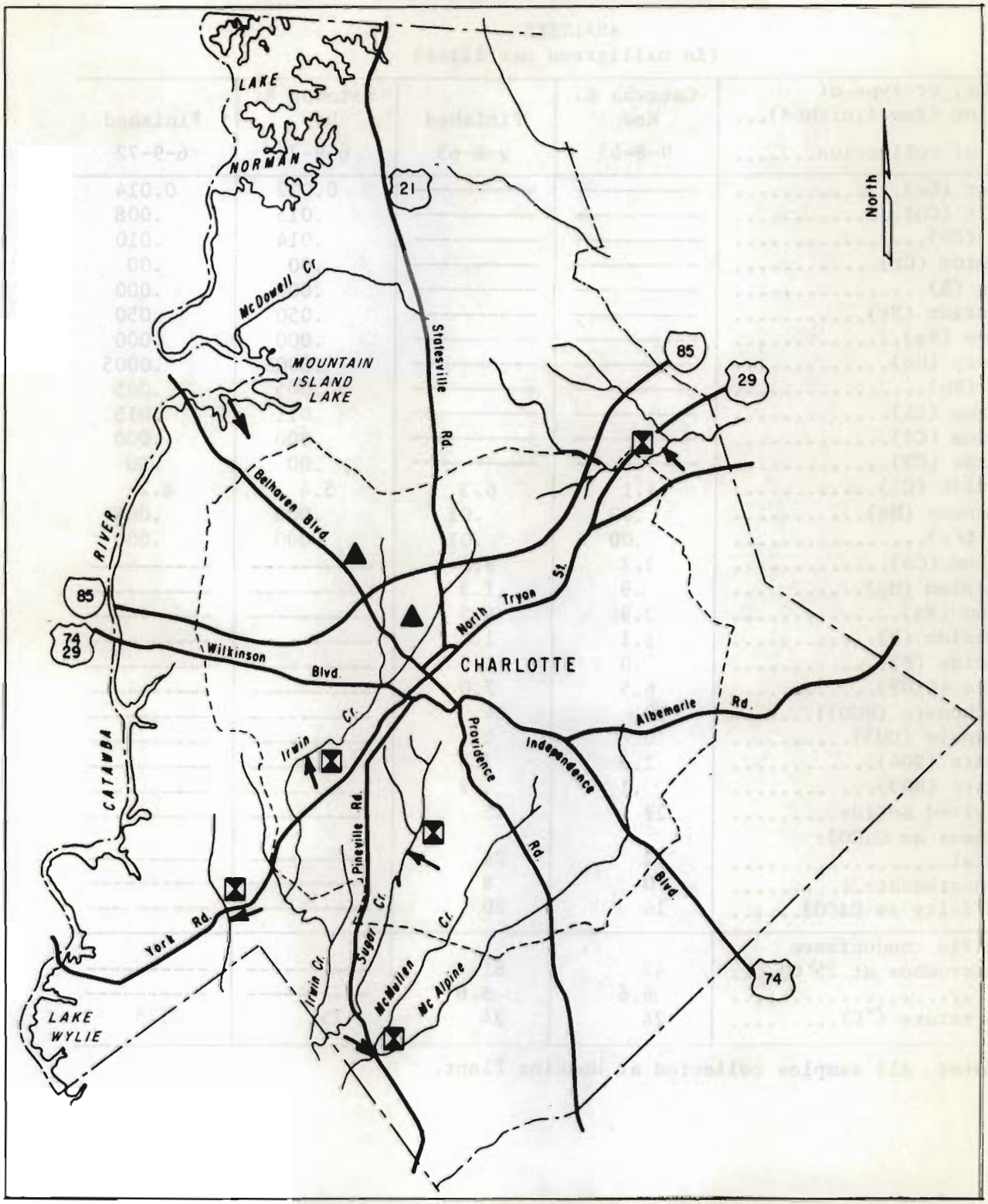
Department will eventually supply all of Mecklenburg County. Initial planning for expansion of the distribution system has been completed.

WATER-RESOURCES APPRAISAL:

Surface water: The flow in the Catawba River is ample to meet the needs of Charlotte for the foreseeable future.

Ground water: For a discussion of the ground water conditions, see Mecklenburg County p. 139.

CHARLOTTE - MECKLENBURG UTILITY DEPARTMENT



CHARLOTTE-MECKLENBURG UTILITY DEPARTMENT, MECKLENBURG COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Catawba R. Raw	Finished	Catawba R. Raw	Finished
Date of collection.....	9-8-65	9-8-65	6-9-72	6-9-72
Copper (Cu).....	----------	----------	0.022	0.014
Cobalt (Co).....	----------	----------	.015	.008
Zinc (Zn).....	----------	----------	.014	.010
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.000	.000
Strontium (Sr).....	----------	----------	.050	.050
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.005	.005
Lithium (Li).....	----------	----------	.011	.015
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	4.1	6.3	5.4	8.2
Manganese (Mn).....	.00	.01	.008	.008
Iron (Fe).....	.00	.01	.000	.000
Calcium (Ca).....	3.7	9.0	----------	----------
Magnesium (Mg).....	.9	1.3	----------	----------
Sodium (Na).....	3.9	4.5	----------	----------
Potassium (K).....	1.1	1.2	----------	----------
Fluoride (F).....	.0	1.0	----------	----------
Silica (SiO2).....	6.5	7.0	----------	----------
Bicarbonate (HCO3).....	19	24	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	2.8	7.4	----------	----------
Nitrate (NO3).....	.1	.2	----------	----------
Dissolved Solids.....	29	45	----------	----------
Hardness as CaCO3:				
Total.....	12	28	----------	----------
Noncarbonate.....	0	8	----------	----------
Alkalinity as CaCO3.....	16	20	----------	----------
Specific conductance (micromhos at 25° C)....	47	81	----------	----------
pH.....	6.6	8.6	----------	----------
Temperature (°C).....	24	24	25	25.5

Note: All samples collected at Hoskins Plant.

DAVIDSON, MECKLENBURG COUNTY

OWNERSHIP:

Municipal. Also supplies Cornelius and Davidson College, Cornelius supplies the Smithville Community. Total population supplied, about 4,400 in 1972 (1,400 metered customers, approximately 25 of which are in suburban areas).

SOURCE:

Catawba River impounded in Lake Norman (lake used for hydroelectric power generation by Duke Power Company): The intakes are in Lake Norman at lat 35°35'47", long 80°53'53", about 2-1/2 miles west of Davidson. The drainage area at the dam is 1,790 square miles, approximately.

RAW-WATER STORAGE:

Lake Norman, 356 billion gallons.

ALLOWABLE DRAFT: Not determined. There are no contractual limitations on the amount of water that can be withdrawn from Lake Norman.

TOTAL USE:

Average (1971) 0.44 mgd, metered; maximum daily (7-1-70), 0.71 million gallons.

INDUSTRIAL USE:

0.15 mgd, estimated. Principal users include General Time Corporation and Elox Corporation.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, Anthra-filt filtration, adjustment of pH with lime, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

0.75 mgd.

PUMPING CAPACITY:

Raw water, 1.0 mgd; finished water, 1.1 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 257,000 and 200,000 gallons; one elevated tank, 100,000 gallons.

FUTURE PLANS:

Plan to raise filter plant capacity to 1.5 mgd by modernizing existing plant and to install two additional elevated tanks.

WATER-RESOURCES APPRAISAL:

Surface water: Davidson is on the north boundary of Mecklenburg County and on the east shore of Lake Norman. There is ample water available at the present source to meet the needs of the foreseeable future.

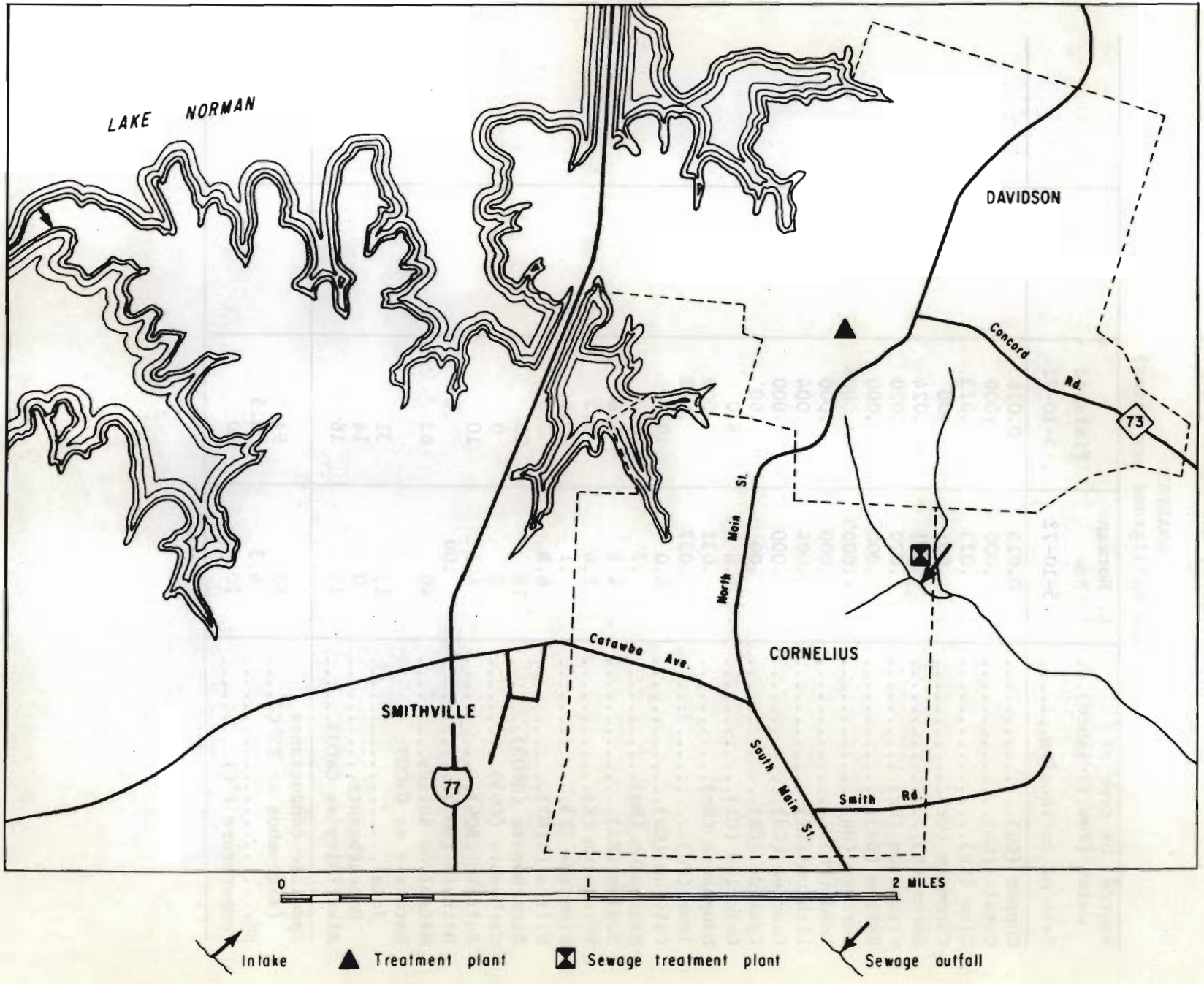
Ground water: Granite and diorite are the predominant rocks underlying

DAVIDSON, MECKLENBURG COUNTY

Davidson. Records of well casing lengths indicate that the overlying thickness of weathered material is as much as 90 feet thick. Reported well depths range from 55 to 160 feet and average about 100 feet. Well yields as high as 70 gpm have been reported. The chemical quality of ground water is good and suitable for most uses without treatment. Locally the water may be moderately hard.

With the abundance of surface water available, it is not likely that ground water will be used for the public supply.

CITY OF DAVIDSON



DAVIDSON, MECKLENBURG COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	L. Norman Raw	Finished		
Date of collection.....	5-10-72	5-10-72		
Copper (Cu).....	0.015	0.016		
Cobalt (Co).....	.000	.000		
Zinc (Zn).....	.023	.023		
Chromium (Cr).....	.00	.00		
Boron (B).....	.021	.024		
Strontium (Sr).....	.020	.020		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.004	.004		
Cadmium (Cd).....	.000	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	5.6	8.0		
Manganese (Mn).....	.031	.009		
Iron (Fe).....	.037	.018		
Calcium (Ca).....	4.0	10		
Magnesium (Mg).....	.7	1.4		
Sodium (Na).....	4.8	5.6		
Potassium (K).....	1.6	1.3		
Fluoride (F).....	.1	.9		
Silica (SiO2).....	6.8	7.0		
Bicarbonate (HCO3).....	18	20		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	4.4	10		
Nitrate (NO3).....	.00	.2		
Dissolved Solids.....	40	63		
Hardness as CaCO3:				
Total.....	13	31		
Noncarbonate.....	0	14		
Alkalinity as CaCO3.....	15	16		
Specific conductance (micromhos at 25° C)....	55	94		
pH.....	6.3	8.5		
Temperature (°C).....	20	20		

HUNTERSVILLE, MECKLENBURG COUNTY

OWNERSHIP:

Municipal. Also supplies the community of Pottstown. Total population supplied, about 2,000 in 1972 (500 metered customers, 25 of which are in suburban areas).

SOURCE:

Catawba River impounded in Lake Norman (lake used for hydroelectric power generation by Duke Power Co.): The intakes are at lat 35°24'32", long 80°54'07", approximately 4-1/2 miles northwest of Huntersville. The drainage area at the dam is 1,790 square miles, approximately.

RAW-WATER STORAGE:

Lake Norman, 356 billion gallons.

ALLOWABLE DRAFT:

Not determined. There are no contractual limitations to the amount of water that can be withdrawn from Lake Norman.

TOTAL USE:

Average (1971) 0.13 mgd estimated; maximum daily (June 1971), 0.18 million gallons.

INDUSTRIAL USE:

None.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, rapid anthracite filtration, adjustment of pH with lime, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.5 mgd.

PUMPING CAPACITY:

Raw water, 1.0 mgd; finished water 1.4 mgd.

FINISHED-WATER STORAGE:

One clear well 250,000 gallons; one elevated tank, 75,000 gallons.

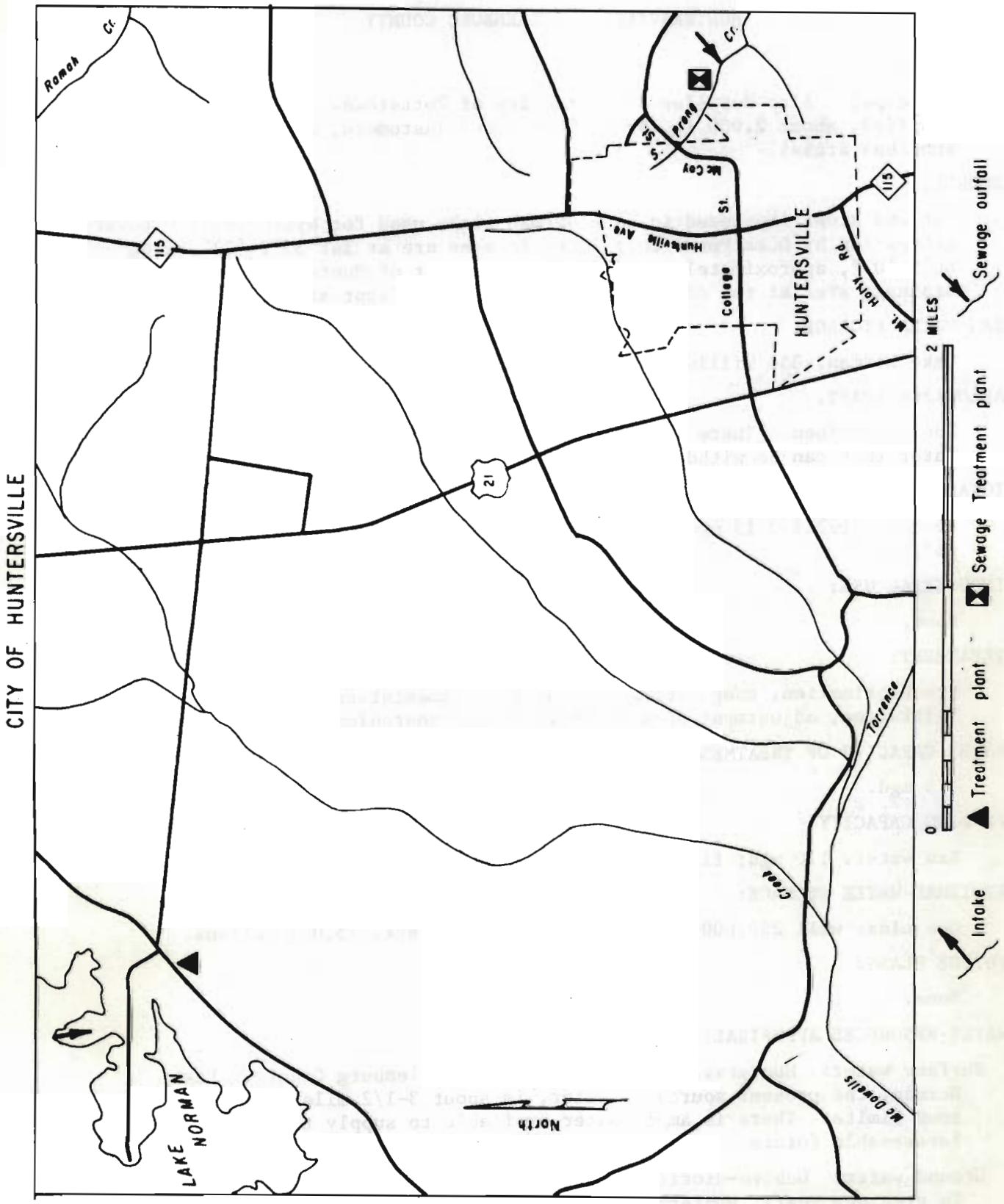
FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

Surface water: Huntersville is in northern Mecklenburg County. Lake Norman, the present source of water, is about 3-1/2 miles west of the town limits. There is ample water available to supply the town for the foreseeable future.

Ground water: Gabbro-diorite and allied basic rocks underlie Huntersville. In previous years, Huntersville obtained its water supply from four deep wells. The wells ranged in depth from 70 to 210 feet, and in yield from 5 to 35 gpm. Static water levels were reported to be 20 to 40 feet below land surface. The water was soft and the chemical quality was good.


CITY OF HUNTERSVILLE
Roman Cr.
Cr.
St.
Prong
Mc Coy
St.
Huntsville Ave.
College
HUNTERSVILLE
Rd.
Hony
Mt.
115
115
21
Torrence
Creek
Mc Dowells
LAKE NORMAN
North
0
1
2 MILES
Sewage outfall
Sewage Treatment plant
Treatment plant
Intake

HUNTERSVILLE, MECKLENBURG COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	L. Norman Raw	Finished		
Date of collection.....	5-10-72	5-10-72		
Copper (Cu).....	0.018	0.033		
Cobalt (Co).....	.000	.000		
Zinc (Zn).....	3.820	.024		
Chromium (Cr).....	.00	.00		
Boron (B).....	.020	.000		
Strontium (Sr).....	.020	.020		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.003	.003		
Cadmium (Cd).....	.002	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	5.4	8.6		
Manganese (Mn).....	.008	.005		
Iron (Fe).....	.116	.000		
Calcium (Ca).....	4.0	8.2		
Magnesium (Mg).....	1.4	.7		
Sodium (Na).....	4.4	4.8		
Potassium (K).....	1.3	1.6		
Fluoride (F).....	.0	.1		
Silica (SiO2).....	5.3	7.4		
Bicarbonate (HCO3).....	22	18		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	2.4	11		
Nitrate (NO3).....	.2	.2		
Dissolved Solids.....	37	49		
Hardness as CaCO3:				
Total.....	16	24		
Noncarbonate.....	0	9		
Alkalinity as CaCO3.....	18	15		
Specific conductance (micromhos at 25° C)....	55	83		
pH.....	6.4	6.6		
Temperature (°C).....	21.5	18.5		

MONTGOMERY COUNTY

WATER-RESOURCES APPRAISAL

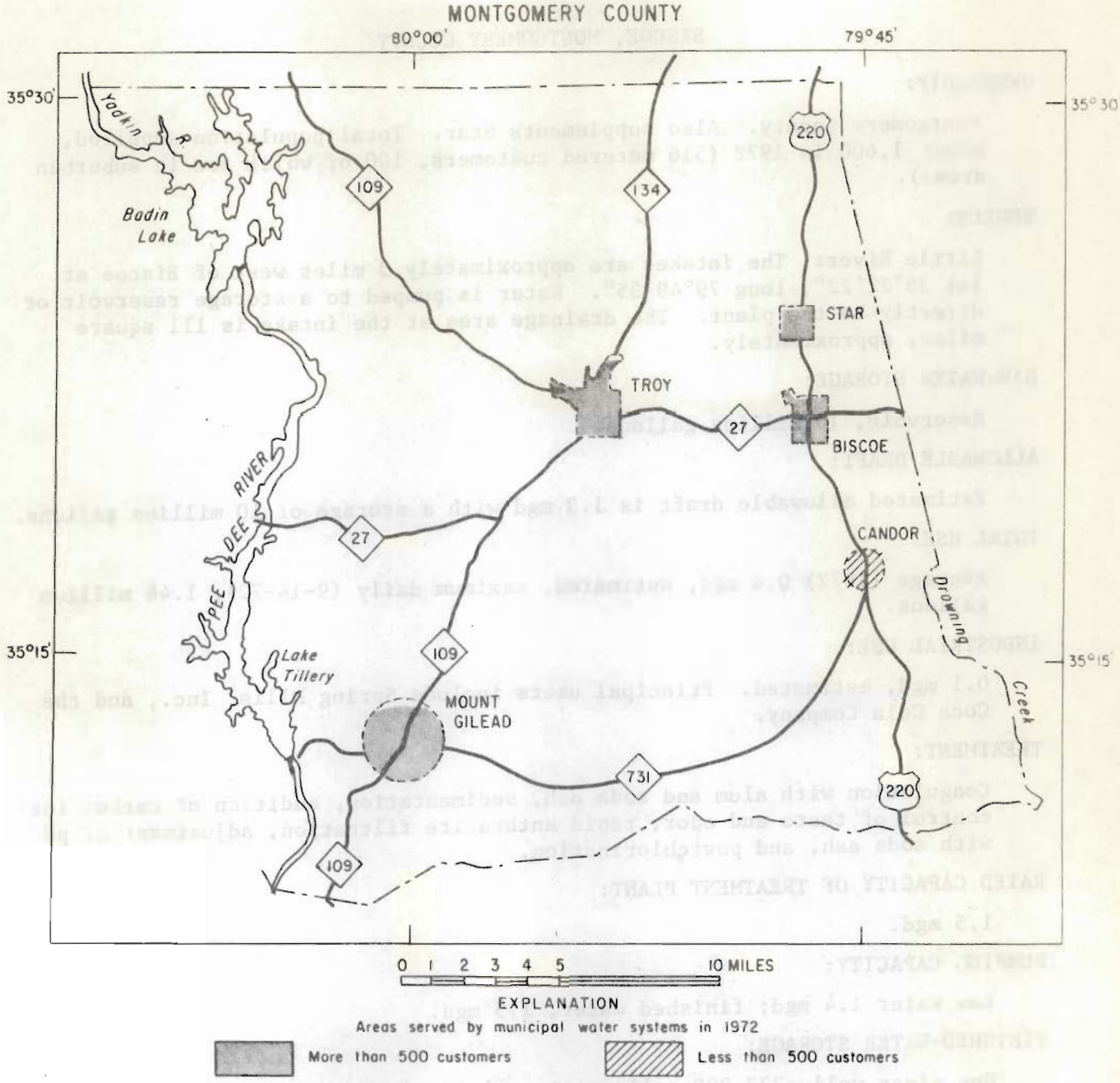
Montgomery County is in the south-eastern part of the Piedmont Province with approximately 10 percent of the county along the southeastern boundary extending into the Sand Hills subprovince of the Coastal Plain Province. In the western part, the topography is characterized by rolling hills and long ridges. The land surface in the Sand Hills is gently undulating. The Pee Dee River is the west boundary of the county and receives the drainage from all but a small area along the northeast boundary which is drained by tributaries of Deep River of the Cape Fear River basin. Hydrologically, streams in the Sand Hills are considerably more productive than those in the remainder of the county. For streams in the Sand Hills, the average discharge is 1.0 mgd per square mile, the 7-day, 2-year low flow is 0.3 mgd per square mile and minimum flows generally exceed 0.1 mgd per square mile. For streams in the remainder of the county, the average discharge ranges from 0.6 to 0.9 mgd per square mile, the 7-day, 2-year low flow averages 0.08 mgd per square mile and minimum flows generally exceed 0.008 mgd per square mile. Streams in the Sand Hills rarely go dry while those with less than thirty square miles drainage area in the remainder of the county can be expected to go dry occasionally.

Troy, Biscoe, Mount Gilead, and Candor obtain their water supplies from surface sources. Montgomery County recently acquired the treatment plants of Mount Gilead, Troy, and Biscoe. In 1972, the county was installing pipe lines to connect these systems. Candor elected to retain its treatment plant but will be tied in by pipeline to the other cities. These municipalities serve approximately 5,500 of the county's population of 19,267 (1970).

Rocks of the Carolina Slate Belt underlie most of the county. Triassic rocks, principally shale, crop out in the southern part. In the Sand Hill section, surficial sands are as much as 75 feet or more thick. There are insufficient well records available to make an accurate appraisal of the water-bearing potential of the various rock units in the county, however, some general observations can be made. Yields as high as 135 gpm have been reported from wells in the Slate Belt and if wells are located in favorable sites such as low-flat areas, sags, or draws, yields as high as 40-50 gpm may reasonably be expected. Wells in the Triassic rocks would probably yield about half as much as those in the Slate Belt. Supplies of 50 to 100 gpm can be developed in the surficial sands, depending largely on the thickness of the sand layer.

In general, ground water from the slate is slightly acidic, soft or only moderately hard, and locally may contain iron in excess of 0.3 mg/l. The range in chemical quality of water from the Triassic rocks is great. The water is usually alkaline and hard to very hard. Water from the surficial sands is acidic and very soft.

Ground water will continue to be an important source of water for domestic and agricultural needs in areas remote from the Montgomery County water system. The potential ground-water supply is also adequate, with proper planning and management, for small industrial and small municipal needs.


MONTGOMERY COUNTY
80°00'
79°45'
35°30'
35°15'
Yadkin R.
Badin Lake
109
134
220
STAR
TROY
27
BISCOE
RIVER
DEE
PEE
CANDOR
Lake Tillery
MOUNT GILEAD
731
Creek
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

BISCOE, MONTGOMERY COUNTY

OWNERSHIP:

Montgomery County. Also supplements Star. Total population supplied, about 1,600 in 1972 (516 metered customers, 100 of which are in suburban areas).

SOURCE:

Little River: The intakes are approximately 3 miles west of Biscoe at lat 35°22'22", long 79°49'35". Water is pumped to a storage reservoir or directly to the plant. The drainage area at the intake is 111 square miles, approximately.

RAW-WATER STORAGE:

Reservoir, 10 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.3 mgd with a storage of 10 million gallons.

TOTAL USE:

Average (1972) 0.4 mgd, estimated, maximum daily (9-14-72), 1.46 million gallons.

INDUSTRIAL USE:

0.1 mgd, estimated. Principal users include Spring Mills, Inc., and the Coca Cola Company.

TREATMENT:

Coagulation with alum and soda ash, sedimentation, addition of carbon for control of taste and odor, rapid anthracite filtration, adjustment of pH with soda ash, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

1.5 mgd.

PUMPING CAPACITY:

Raw water 1.4 mgd; finished water, 1.5 mgd.

FINISHED-WATER STORAGE:

One clear well, 237,000 gallons; two elevated tanks, 500,000 and 75,000 gallons.

FUTURE PLANS:

Montgomery County recently purchased the treatment plant and a major expansion of the county distribution system was underway in 1972. Tentatively, a 10 mgd treatment plant on the Pee Dee River is planned.

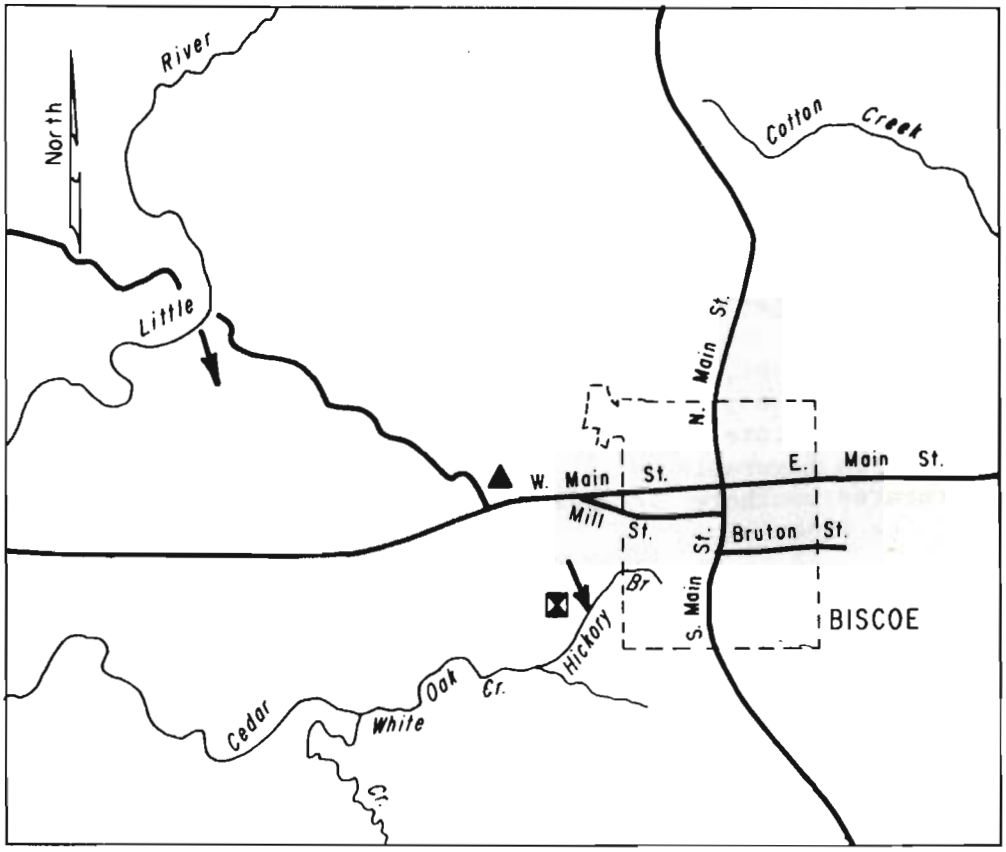
WATER-RESOURCES APPRAISAL:

Surface water: Biscoe is on a relatively flat, north-south trending ridge in eastern Montgomery County. The east side of town is drained by tributaries of Bear Creek of the Cape Fear River basin and the west side is drained by tributaries of Little River of the Pee Dee River basin. The

low flow yield of streams in the immediate vicinity is small, averaging 0.004 mgd per square mile. Streams with less than 10 square miles drainage area occasionally go dry. 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 0.08 mgd per square mile. Flow of the Little River has not been adequate to supply Biscoe in some dry years. With adequate storage, Little River could meet future requirements. The proposed treatment plant on the Pee Dee River would provide ample water for the future.

Ground water: Biscoe is underlain by rocks of the Carolina Slate Belt. Records of well casing lengths indicate that the overlying mantle of weathered rock ranges from a few feet to over 90 feet in places and averages 50 feet. For 18 wells, the depth ranged from 44 to 400 feet and averaged 156 feet, and the yield ranged from 3 to 40 gpm and averaged 14 gpm. The average yield includes several domestic wells that are drilled in sites close to the point of use rather than sites selected for high yield. In favorable sites, such as low flat areas, sags, or draws where saturated weathered rock is thickest, yields of 40 to 50 gpm may reasonably be expected.

CITY OF BISCOE



BISCOE, MONTGOMERY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	3-28-66	3-28-66	10-4-72	10-4-72
Copper (Cu).....	----------	----------	0.010	0.000
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.033	.000
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.001	.003
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	3.5	5.4	6.2	7.8
Manganese (Mn).....	.01	.04	.015	.026
Iron (Fe).....	.08	.06	.137	.000
Calcium (Ca).....	5.3	5.5	----------	----------
Magnesium (Mg).....	1.2	1.3	----------	----------
Sodium (Na).....	4.5	21	----------	----------
Potassium (K).....	.7	.7	----------	----------
Fluoride (F).....	.0	.1	----------	----------
Silica (SiO2).....	18	17	----------	----------
Bicarbonate (HCO3).....	28	47	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	.8	22	----------	----------
Nitrate (NO3).....	.4	.9	----------	----------
Dissolved Solids.....	45	92	----------	----------
Hardness as CaCO3:				
Total.....	18	20	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	23	39	----------	----------
Specific conductance (micromhos at 25° C)....	58	137	----------	----------
pH.....	6.7	7.4	----------	----------
Temperature (°C).....	9.0	----------	20.5	20.5

MOUNT GILEAD, MONTGOMERY COUNTY

OWNERSHIP:

Montgomery County. Total population supplied, about 1,400 in 1972 (525 metered customers, 48 of which are in suburban areas).

SOURCE:

Pee Dee River impounded in Lake Tillery: The intakes are approximately 3-1/2 miles west of Mount Gilead at lat 35°12'36", long 80°01'21". Lake Tillery is used for hydroelectric power by Carolina Power & Light Company. The drainage area at the dam is 4,600 square miles, approximately.

RAW-WATER STORAGE:

Lake Tillery, 54.4 billion gallons.

ALLOWABLE DRAFT:

Not determined. The amount of water that can be withdrawn from Lake Tillery is unlimited provided the withdrawal does not interfere with the hydroelectric operations.

TOTAL USE:

Average (1971), 0.5 mgd, estimated; maximum daily, not available.

INDUSTRIAL USE:

0.2 mgd, estimated. Principal users include Texfi Industries, Mount Gilead Finishing, and Russel-Harwelle Hosiery Mill.

TREATMENT:

Prechlorination, coagulation with alum and soda ash, sedimentation, addition of carbon for control of taste and odor, rapid anthracite filtration, and adjustment of pH with soda ash.

RATED CAPACITY OF TREATMENT PLANT:

0.475 mgd.

PUMPING CAPACITY:

Raw water, 0.5 mgd; finished water, 0.5 mgd.

FINISHED-WATER STORAGE:

One clear well, 250,000 gallons; two elevated tanks, 100,000 and 300,000 gallons.

FUTURE PLANS:

Montgomery County has recently acquired the water treatment plants of Biscoe, Troy and Mount Gilead. A major expansion of the county distribution system was under construction in 1972. Tentatively, a 10 mgd treatment plant on the Pee Dee River is planned.

WATER-RESOURCES APPRAISAL:

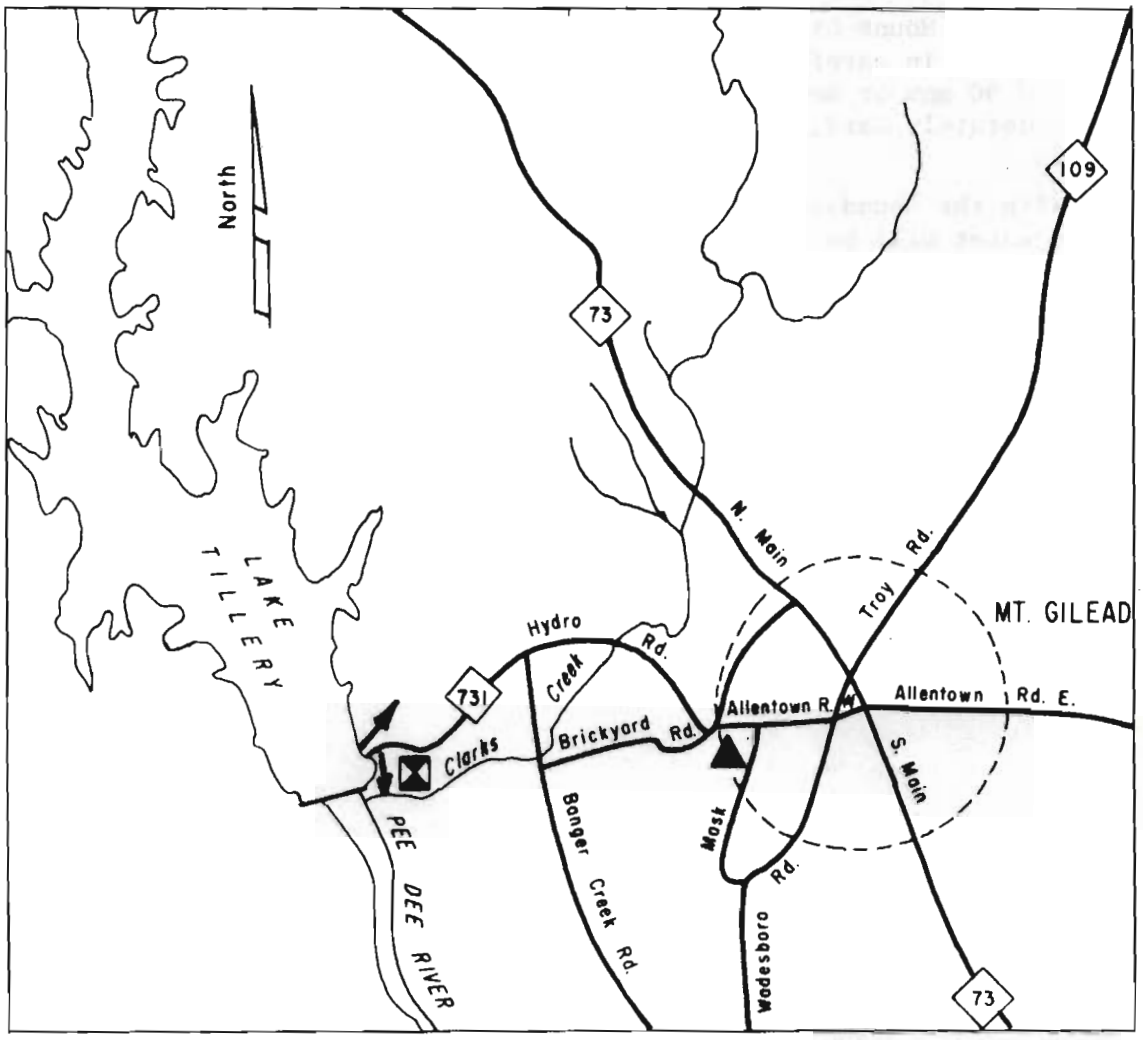
Surface water: The water available at Lake Tillery is ample to supply the future requirements of Mount Gilead. The treatment plant is operating

at or near capacity. The proposed treatment plant on the Pee Dee River would provide ample water for the future.

Ground water: Mount Gilead is underlain by rocks of the Carolina Slate Belt. Wells in carefully selected sites in this rock unit are reported to yield 50 gpm or more. The water is slightly acidic, usually soft or only moderately hard, and locally may contain undesirable concentrations of iron.

With the abundance of surface water available it is unlikely that ground water will be used as a source for the municipal supply.

CITY OF MOUNT GILEAD



MOUNT GILEAD, MONTGOMERY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	3-28-66	3-28-66	10-5-72	10-5-72
Copper (Cu).....	----------	----------	0.014	0.007
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.000
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.005	<.005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.000	.000
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	4.6	7.4	5.8	8.8
Manganese (Mn).....	.00	.02	.045	.004
Iron (Fe).....	.03	.00	.000	.000
Calcium (Ca).....	4.3	5.8	----------	----------
Magnesium (Mg).....	1.6	1.4	----------	----------
Sodium (Na).....	3.9	45	----------	----------
Potassium (K).....	1.6	1.8	----------	----------
Fluoride (F).....	.1	.0	----------	----------
Silica (SiO2).....	9.3	7.9	----------	----------
Bicarbonate (HCO3).....	18	68	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	5.0	53	----------	----------
Nitrate (NO3).....	1.7	1.7	----------	----------
Dissolved Solids.....	42	157	----------	----------
Hardness as CaCO3:				
Total.....	18	20	----------	----------
Noncarbonate.....	3	0	----------	----------
Alkalinity as CaCO3.....	15	56	----------	----------
Specific conductance (micromhos at 25° C)....	58	256	----------	----------
pH.....	6.4	7.3	----------	----------
Temperature (°C).....	10.5	----------	20.5	21

TROY, MONTGOMERY COUNTY

OWNERSHIP:

Montgomery County. Total population supplied, about 3,000 in 1972 (1,200 to 1,300 metered customers, 150 of which are in suburban areas).

SOURCE:

Densons Creek impounded in City Reservoir: The intakes are approximately 1-1/2 miles northeast of Troy at lat 35°23'24", long 79°52'10". The drainage area at the dam is 26 square miles, approximately.

RAW-WATER STORAGE:

City Reservoir, approximately 40 million gallons.

Reservoir at treatment plant, 1.5 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 0.8 mgd with a storage of 40 million gallons.

TOTAL USE:

Average (1972) 0.5 mgd, estimated; maximum daily (7-14-72), 0.76 million gallons.

INDUSTRIAL USE:

0.1 mgd, estimated. Principal users include A. Leon Capel, Collins and Aikman Corporation, Smitherman Industries, Inc., and Troy Drapery Corporation.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

0.75 mgd.

PUMPING CAPACITY:

Raw water, 0.75 mgd; finished water, 2.2 mgd.

FINISHED-WATER STORAGE:

One clear well, 350,000 gallons; one elevated tank, 500,000 gallons.

FUTURE PLANS:

Montgomery County has recently acquired the treatment plants of Troy, Biscoe, and Mount Gilead. A major expansion of the county distribution system was underway in 1972. Tentatively, a 10 mgd treatment plant on the Pee Dee River is planned.

WATER-RESOURCES APPRAISAL:

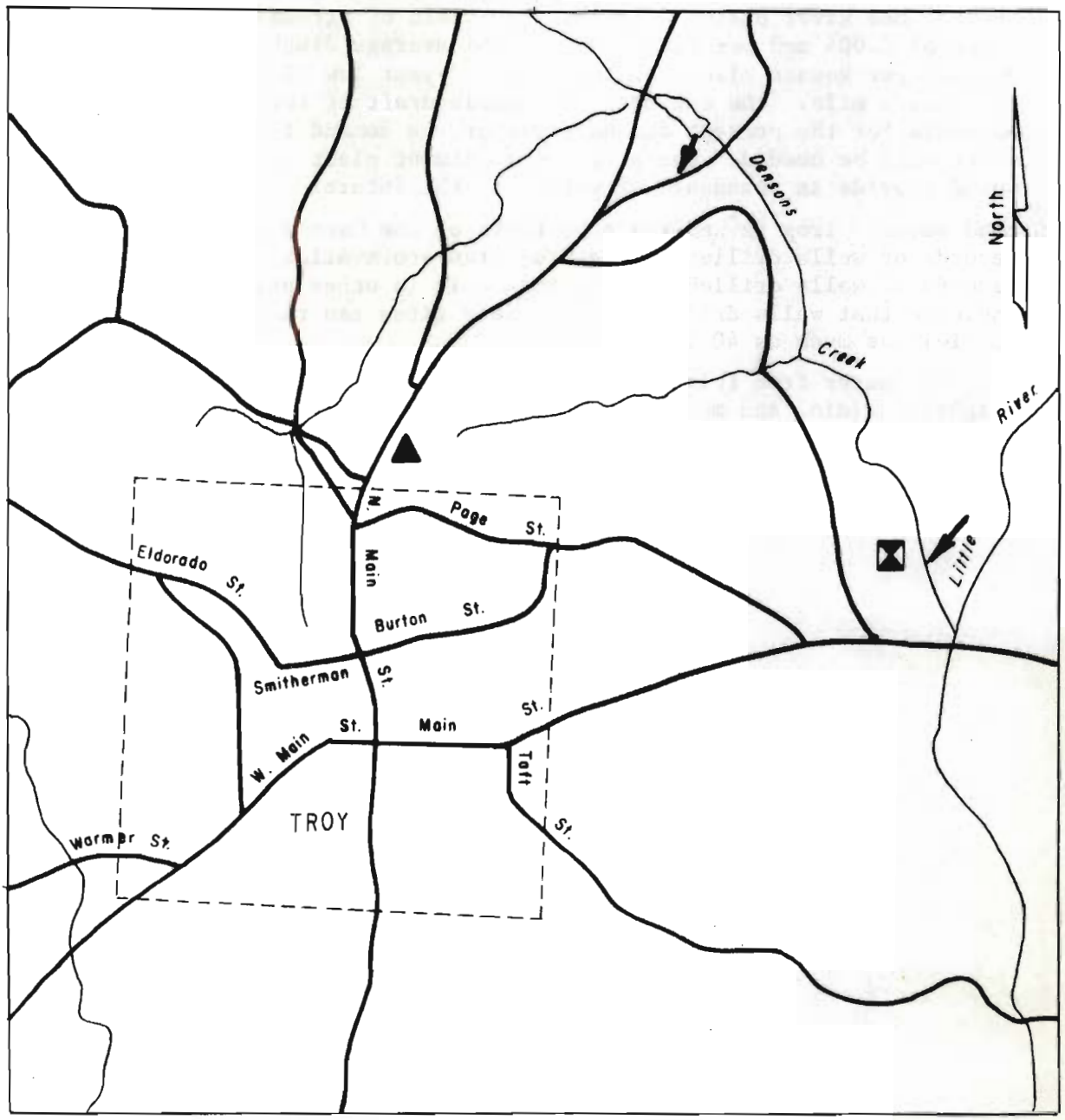
Surface water: Troy is in the center of Montgomery County where the topography is characterized by rolling hills with moderate land and stream slopes. The immediate area is drained by tributaries of Little River of

the Pee Dee River basin. The low flow yield of streams is small, on the order of 0.004 mgd per square mile. The average discharge of streams is 0.8 mgd per square mile, and the 7-day, 2-year low flow averages 0.03 mgd per square mile. The estimated allowable draft of the present source is adequate for the present demand; however, as demand increases additional water will be needed. The proposed treatment plant on the Pee Dee River would provide an abundance of water for the future.

Ground water: Troy is underlain by rocks of the Carolina Slate Belt. No records of wells drilled in the Troy area are available. However, records of wells drilled in this rock unit in other parts of the county indicate that wells drilled in favorable sites can reasonably be expected to yield as much as 40 gpm or more.

The water from this rock unit is usually soft to moderately hard, slightly acidic, and may contain iron in excess of 0.3 mg/1.

CITY OF TROY


Dawsons
Creek
North
Little
River
N. Main
Page St.
Eldorado St.
Burton St.
Smitherman St.
W. Main St.
Main St.
Main St.
Taft St.
Warmer St.
TROY
0
1
2 MILES
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

TROY, MONTGOMERY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	3-28-66	3-28-66	10-4-72	10-4-72
Copper (Cu).....	----------	----------	0.000	0.000
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.000
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.040	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.000	.001
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	3.7	6.2	2.8	7.8
Manganese (Mn).....	.02	.02	.256	.002
Iron (Fe).....	.04	.01	.539	.000
Calcium (Ca).....	3.4	4.0	----------	----------
Magnesium (Mg).....	.6	.6	----------	----------
Sodium (Na).....	4.4	11	----------	----------
Potassium (K).....	.8	.8	----------	----------
Fluoride (F).....	0	.1	----------	----------
Silica (SiO2).....	19	18	----------	----------
Bicarbonate (HCO3).....	20	21	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	2.6	13	----------	----------
Nitrate (NO3).....	.4	.2	----------	----------
Dissolved Solids.....	54	64	----------	----------
Hardness as CaCO3:				
Total.....	12	12	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	16	17	----------	----------
Specific conductance (micromhos at 25° C)....	44	79	----------	----------
pH.....	6.6	6.8	----------	----------
Temperature (°C).....	10	----------	20.5	20.0

MOORE COUNTY

WATER-RESOURCES APPRAISAL

Moore County is in the south-central part of North Carolina. The northern half of the county is in the Piedmont Province and the remainder is in the Sand Hills section of the Coastal Plain Province. The topography ranges from level to low, rolling hills, with the smoother surface features being in the southern half. Tributaries of the Cape Fear River, principally the Deep River, Bear Creek, and Little River drain all but the southwest quarter of the county, which is drained by Drowning Creek and other small tributaries of the Pee Dee River basin. Streamflow varies widely with the higher yielding streams being in the Sand Hills section. For all streams in this section, the average discharge is 0.85 mgd per square mile, the 7-day, 2-year low flow averages 0.3 mgd per square mile, and the low-flow yield generally exceeds 0.1 mgd per square mile. This contrasts sharply with streams in other sections. For these streams, the average discharge is 0.70 mgd per square mile, the 7-day, 2-year low flow averages 0.03 mgd per square mile, and the low flow yield ranges from 0 to 0.005 mgd per square mile. Streams in this section with as much as 100 square miles drainage area have gone dry.

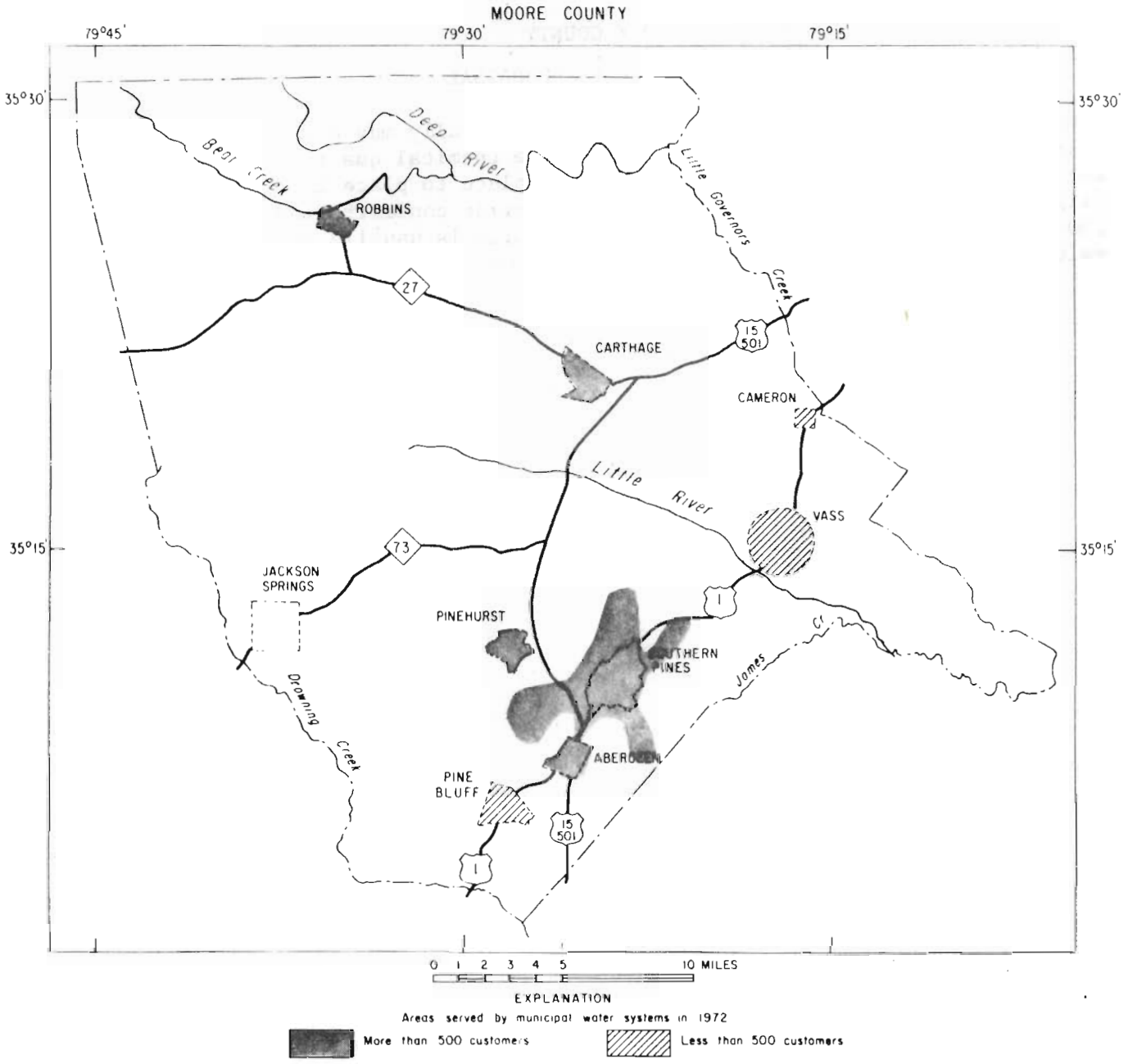
Southern Pines, Vass, and Robbins obtain their water supply from surface sources. Aberdeen, Pine Bluff, and Cameron use ground water. Pinehurst is using a combination of surface and ground water and plans to phase-out its surface-water source in the near future. Carthage obtains its water from springs and Nicks Creek. The county population in 1970 was 39,048.

Three principal rock types crop out in Moore County. The northwestern third is underlain by rocks of the volcanic slate series, consisting of slate, schist, and related rocks. A broad belt of Triassic rocks (claystone, sandstone, siltstone and conglomerate), trends northeasterly through the center of the county. Coastal Plain strata cover the southeastern third. Surficial sands overlie most of the county and are as much as 150 feet thick beneath the higher hills in the vicinity of Southern Pines. Generally, the higher yielding wells in volcanic slate are those drilled in sags, draws, and low flat areas where the mantle of saturated weathered rock is thickest. The Triassic rocks are the poorest source of ground water and well yields are usually low. The Coastal Plain strata and surficial sand are the best aquifer. The yield of wells depends to a large extent on the thickness and extent of the sand layers penetrated. The following table shows typical reported well depths and yields in the various rock units.

Rock unit	Yield (gpm)		Average depth (feet)
	Range	Average	
Volcanic slate	1-120	16	160
Triassic	1-50	11	144
Coastal Plain	8-225	114	138

The chemical quality of ground water is generally good and suitable for most uses with little or no treatment. Water from the slate is usually

somewhat acidic, soft to moderately hard, and locally may contain iron concentrations that are higher than desirable. The chemical quality of water from the Triassic rocks varies considerably from place to place and is usually slightly alkaline, hard, and may contain chloride concentrations in excess of 250 mg/l. Water from the Coastal Plain deposits is usually acidic, with pH values less than 6.0 being common, and very soft.


MOORE COUNTY
79°45'
79°30'
79°15'
35°30'
35°15'
Deep River
Bear Creek
Little Governors Creek
ROBBINS
27
CARTHAGE
15
501
CAMERON
Little River
VASS
73
JACKSON SPRINGS
PINEHURST
SOUTHERN PINES
ABERDEEN
PINE BLUFF
Drowning Creek
James Cr.
1
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

ABERDEEN, MOORE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,300 in 1972 (783 metered customers, 150 of which are in suburban areas).

SOURCE:

Seven wells (Nos. 1-7).

Well No. 1, Mo-76, located at lat 35°07'49", long 79°24'54". Driller: Heater Well Company. Date drilled: 1954. Total depth: 210 ft. Diam.: 10 in. Cased to: 72 ft. Type of finish: screened. Topography: hillside. Aquifer: sand. Static water level: 51 ft below land surface. Yield: 150 gpm. Type pump: turbine.

Well No. 2, Mo-82, located at lat 35°07'52", long 79°24'54". Driller: Carolina Well and Pump Company. Date drilled: 1967. Total depth: 176 ft. Diameter: 18 to 8 in. Cased to: 99 ft. Type of finish: screened. Topography: flat. Aquifer: sand. Static water level: 75.2 ft below land surface. Yield: 200 gpm. Type pump: turbine.

Well No. 3, Mo-83, located at lat 35°08'02", long 79°24'09". Driller: Carolina Well and Pump Co. Date drilled: June 1967. Total depth: 154 ft. Diam.: 8 in. Cased to: 96 ft. Type of finish: screened. Topography: hilltop. Aquifer: sand. Static water level: 75 ft below land surface. Yield: 215 gpm. Type of pump: turbine.

Well No. 4, Mo-84, located at 35°07'36", long 79°24'37". Driller: Carolina Well and Pump Co. Date drilled: _____. Total depth: 157 ft. Diam.: 8 in. Cased to: 69 ft. Type of finish: screened. Topography: hilltop. Aquifer: sand. Static water level: _____. Yield: 200 gpm. Type pump: turbine.

Well No. 5, Mo-85, located at lat 35°07'09", long 79°25'16". Driller: Carolina Well and Pump Co. Date drilled: 1968. Total depth: 171 ft. Diam: 8 in. Cased to: 70 ft. Type of finish: screened. Topography: hillside. Aquifer: sand. Static water level: 88 ft below land surface. Yield: 225 gpm. Type pump: turbine.

Well No. 6, Mo-86, located at lat 35°08'15", long 79°24'02". Driller: Carolina Well and Pump Co. Date drilled: July 1971. Total depth: 131 ft? Diam: 10 in. Cased to: 75 ft. Type of finish: screened. Topography: hilltop. Aquifer: sand. Static water level: 49 ft below land surface. Yield: 200 gpm. Type of pump: turbine.

Well No. 7, Mo-87, located at lat 35°08'26", long 79°24'00". Driller: Carolina Well and Pump Co. Date drilled: August 1971. Total depth: 200 ft? Diam: 10 in. Cased to: 96 ft? Type of finish: screened. Topography: hillside. Aquifer: sand. Static water level: 110 ft below land surface. Yield 150 gpm. Type of pump: turbine.

TOTAL USE:

Average (1972) 0.3 mgd, estimated; maximum daily, not available.

ABERDEEN, MOORE COUNTY

INDUSTRIAL USE:

0.06 mgd, estimated. Principal users include J. P. Stevens Co. and Aberdeen Coca Cola Co.

TREATMENT:

Chlorination and fluoridation at each well.

RATED CAPACITY OF TREATMENT PLANT:

None.

PUMPING CAPACITY:

1.9 mgd, approximately equal to combined yield of the wells.

RAW-WATER STORAGE:

None.

FINISHED-WATER STORAGE:

Two elevated tanks, 300,000 and 200,000 gallons.

FUTURE PLANS:

None.

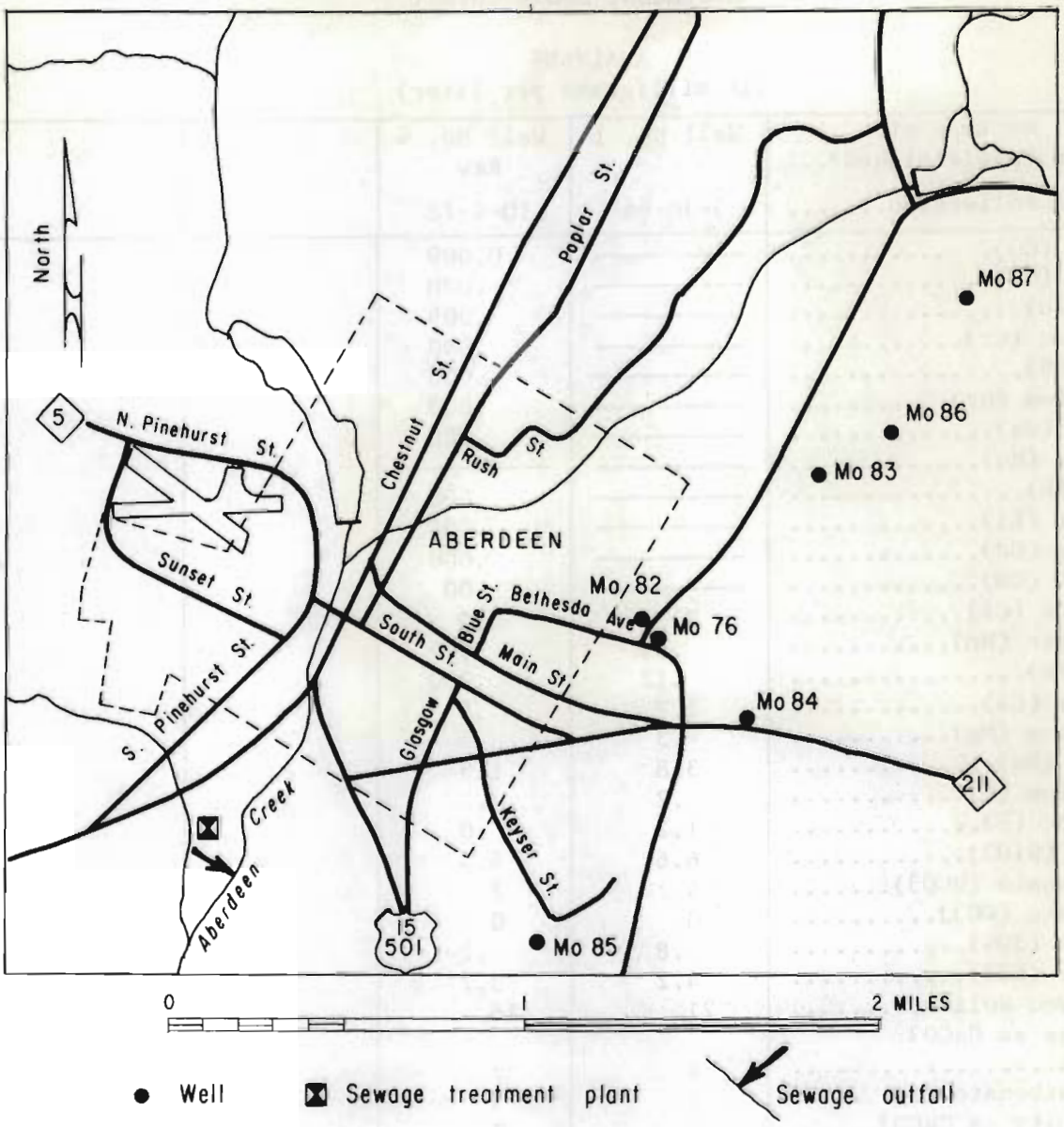
WATER-RESOURCES APPRAISAL:

Surface water: Aberdeen is in the Sand Hills section in southern Moore County. The immediate area is drained by Aberdeen Creek and its tributaries. The low-flow yield of streams is relatively high, generally exceeding 0.16 mgd per square mile. The average discharge of streams is 0.80 mgd per square mile, and the 7-day, 2-year low flow averages 0.35 mgd per square mile. Aberdeen Creek, which flows through the city, or Drowning Creek, about 6 miles to the south appears to be the best surface-water source available. A storage reservoir would be necessary on Aberdeen Creek.

Ground water: Aberdeen is near the western edge of the Coastal Plain Province where the deposits average about 220 feet thick. The deposits are complexly interlayered sand and clays of the Tuscaloosa Formation. Rocks of the volcanic slate series underlie the Tuscaloosa Formation, and surficial sands, several feet thick in most places, overlie the Tuscaloosa. The yield of wells in the area depends primarily on the thickness and extent of the sand layers penetrated by the well. The percentage of sand in the Coastal Plain deposits is on the order of 15 to 25 percent.

The seven wells currently in use are all gravel-packed wells screened in the sand layers. These wells are reported to yield from 150 to 225 gpm and average 191 gpm. The total depth of wells ranges from 131 to 210 feet and averages 171 feet. The combined yield of existing wells is more than adequate to meet the current demand. It is not known whether there is pumping interference between existing wells, but it is probable that no significant interference occurs between wells spaced at least 2,000 feet apart. The chemical quality of the water is generally good. The water is soft and slightly corrosive.

CITY OF ABERDEEN



ABERDEEN, MOORE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 1	Well No. 4 Raw		
Date of collection.....	3-30-66	10-4-72		
Copper (Cu).....	----------	0.009		
Cobalt (Co).....	----------	.000		
Zinc (Zn).....	----------	.009		
Chromium (Cr).....	----------	.000		
Boron (B).....	----------	.000		
Strontium (Sr).....	----------	.000		
Barium (Ba).....	----------	.000		
Mercury (Hq).....	----------	----------		
Lead (Pb).....	----------	.000		
Lithium (Li).....	----------	.000		
Cadmium (Cd).....	----------	.000		
Cyanide (CN).....	----------	.00		
Chloride (Cl).....	3.5	3.0		
Manganese (Mn).....	.01	.003		
Iron (Fe).....	.12	.000		
Calcium (Ca).....	1.7	.5		
Magnesium (Mg).....	.3	.3		
Sodium (Na).....	3.8	1.9		
Potassium (K).....	.2	.2		
Fluoride (F).....	1.2	.0		
Silica (SiO2).....	6.6	5.3		
Bicarbonate (HCO3).....	4	2		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	.8	.2		
Nitrate (NO3).....	4.2	3.7		
Dissolved Solids.....	21	16		
Hardness as CaCO3:				
Total.....	6	2		
Noncarbonate.....	2	1		
Alkalinity as CaCO3.....	3	1		
Specific conductance (micromhos at 25° C)....	34	18		
pH.....	5.7	5.5		
Temperature (°C).....	13.0	----------		

CARTHAGE, MOORE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,200 in 1972 (600 metered customers, 200 of which are in suburban areas).

SOURCE:

Springs; overflow from springs impounded in Town Pond No. 1. Nicks Creek (supplementary source): The intakes are approximately 300 feet upstream from bridge on N. C. 22, 6 miles south of Carthage at lat 35°15', long 79°25'. The drainage area of Nicks Creek at the intake is 26.6 square miles, approximately. Water can be pumped to the treatment plant or to Town Pond No. 1.

RAW-WATER STORAGE:

Town Pond No. 1, 22 million gallons.

ESTIMATED ALLOWABLE DRAFT:

Estimated allowable draft is 1.8 mgd with a storage of 22 million gallons.

TOTAL USE:

Average (1971) 0.15 mgd, estimated; maximum daily, 0.18 million gallons estimated.

INDUSTRIAL USE:

0.03 mgd, estimated. Principal users include Carthage Fabrics, Inc., and Quality Mills.

TREATMENT:

Springs: Lime and chlorination. Town Pond: Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid Anthra-filt filtration, adjustment of pH with lime, and postchlorination.

RATED CAPACITY OF TREATMENT PLANT:

0.35 mgd.

PUMPING CAPACITY:

Raw water, 1.0 mgd at Nicks Creek, 1.0 mgd at Town Pond No. 1; finished water, 1.4 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 100,000 and 1,000,000 gallons; one elevated tank, 75,000 gallons; one standpipe, 220,000 gallons.

FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

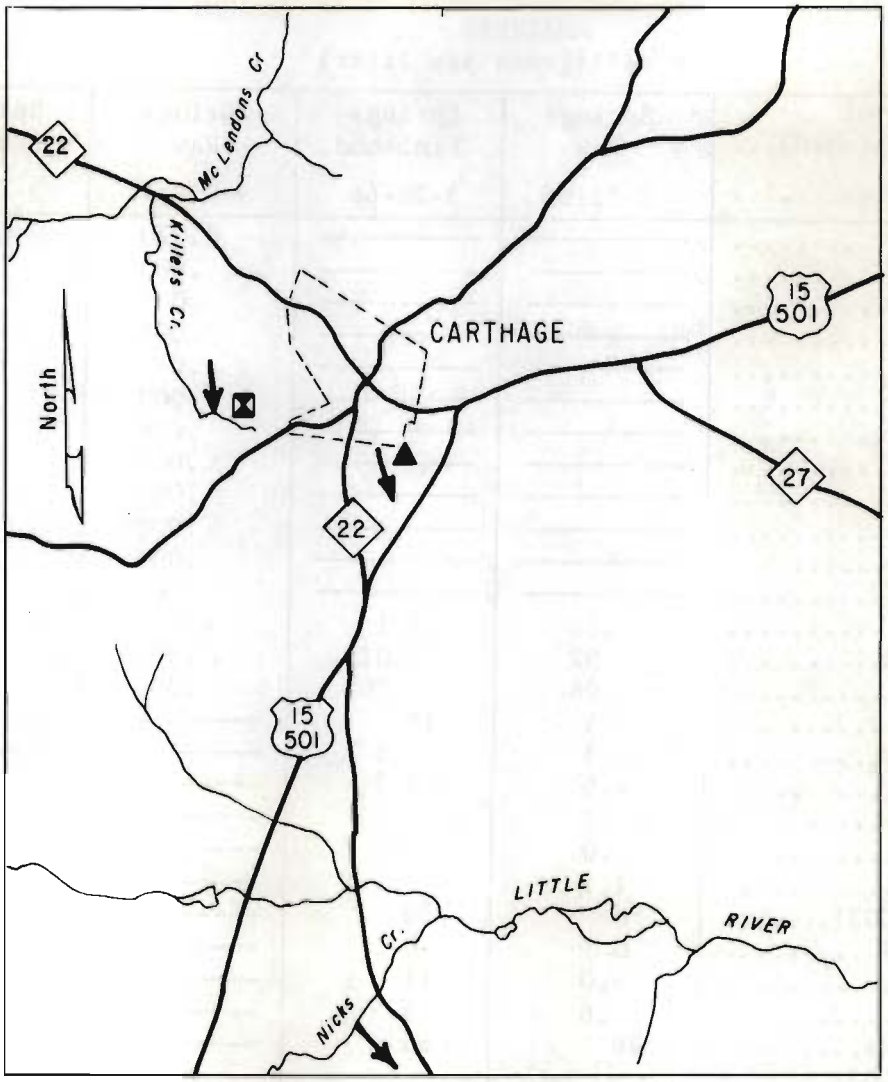
Surface water: Carthage is in an upland area in east-central Moore County very near the western boundary of the Coastal Plain Province. The area

is drained by many small tributaries of the Cape Fear River basin. The low flow yield of streams in the immediate vicinity is small, ranging from 0 to 0.005 mgd per square mile. Most small streams occasionally go dry. For all streams, the average discharge is 0.7 mgd per square mile, and the 7-day, 2-year low flow averages 0.01 mgd per square mile. The present sources of water are adequate to meet the needs of the immediate future. Additional draft could be safely developed by providing storage at the Nicks Creek intake.

Ground water: Carthage is underlain by Triassic rocks mantled by surficial sands. Available records of well casing lengths indicate that the surficial sand layer is relatively thin in the area, probably less than 30 feet in most places. The sand layer is highly permeable and adsorbs precipitation readily. The springs currently in use are formed at the contact of the surficial sand with less permeable material. The Triassic rocks are dense and are not conducive to high yielding wells. The maximum reported yield from the Triassic rocks is 15 gpm.

The chemical quality of water from the surficial sands is generally good. The water is generally acidic and slightly corrosive. The chemical quality of water from the Triassic rocks varies considerably from place to place but is generally alkaline and moderately hard to hard.

CITY OF CARTHAGE



CARTHAGE, MOORE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Springs Raw	Springs Finished	Springs Raw	Springs Finished
Date of collection.....	3-28-66	3-28-66	9-25-72	9-25-72
Copper (Cu).....	----------	----------	0.020	0.004
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.000
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.055	.000
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).....	3.5	7.1	6.4	12
Manganese (Mn).....	.02	.01	.004	.002
Iron (Fe).....	.06	.00	.000	.000
Calcium (Ca).....	3.4	15	----------	----------
Magnesium (Mg).....	.3	.5	----------	----------
Sodium (Na).....	1.5	2.3	----------	----------
Potassium (K).....	.5	.8	----------	----------
Fluoride (F).....	.0	.0	----------	----------
Silica (SiO2).....	1.1	3.5	----------	----------
Bicarbonate (HCO3).....	6	30	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	6.0	11	----------	----------
Nitrate (NO3).....	.6	4.5	----------	----------
Dissolved Solids.....	26	65	----------	----------
Hardness as CaCO3:				
Total.....	10	41	----------	----------
Noncarbonate.....	4	16	----------	----------
Alkalinity as CaCO3.....	5	25	----------	----------
Specific conductance (micromhos at 25° C)....	33	100	----------	----------
pH.....	6.0	7.6	----------	----------
Temperature (°C).....	----------	----------	----------	----------

PINEHURST, MOORE COUNTY

OWNERSHIP:

Pinehurst, Incorporated. Total population supplied, about 1,200 in 1972 (595 metered customers, 5 of which are in suburban areas).

SOURCE:

Rattlesnake Creek: water is withdrawn from the creek at two points. The upstream site is 1.4 miles north of Pinehurst at lat 35°12'48", long 79°27'44". The downstream site is 1.6 miles north of Pinehurst at lat 35°13'06", long 79°27'48".

Two wells, Nos. 1 and 2.

Well No. 1 (Claxton Well), Mo-80, located at: lat 35°11'33", long 79°28'46". Driller: Carolina Pump and Well Company. Date drilled: May 1969. Total depth: 172 feet. Diameter: 8 inch. Cased to: 71 feet. Type of finish: screened. Topography: flat. Aquifer: sand. Static water level: 69 feet below land surface. Yield: 115 gpm. Pumping level: 117 feet. Pump setting: 147 feet. Type pump: submersible.

Well No. 2 (Race Track Well), Mo-81, located at lat 35°10'56", long 79°27'57". Driller: Carolina Pump and Well Company. Date drilled: 1969. Total depth: 151 feet. Diam: 8 inch. Cased to: 74 feet. Type finish: screened. Topography: flat. Aquifer: sand. Static water level: 45 feet below land surface. Yield: 225 gpm. Pumping level: 75 feet. Pump setting 110 feet. Type pump: turbine.

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft of Rattlesnake Creek is 0.5 mgd with no storage.

TOTAL USE:

Average (1971) 0.36 mgd, estimated. Estimated use furnished by Moore-Gardner and Associates and is based on a detailed study of billing records.

INDUSTRIAL USE:

None.

TREATMENT:

Surface water: Slow sand filtration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, and postchlorination.

Ground water: Addition of phosphate compounds for corrosion control, and chlorination. Water is treated at the well.

RATED CAPACITY OF TREATMENT PLANT:

Unknown.

PINEHURST, MOORE COUNTY

PUMPING CAPACITY:

Surface water: Raw water, gravity; finished water, not metered.

Ground water: 0.4 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 100,000 and 20,000 gallons. Two elevated tanks, 200,000 and 100,000 gallons, one ground storage tank 500,000 gallons.

FUTURE PLANS:

Additional wells will be drilled and the surface water system abandoned--probably by summer of 1973. Plan to add 2.5 million gallons finished-water storage.

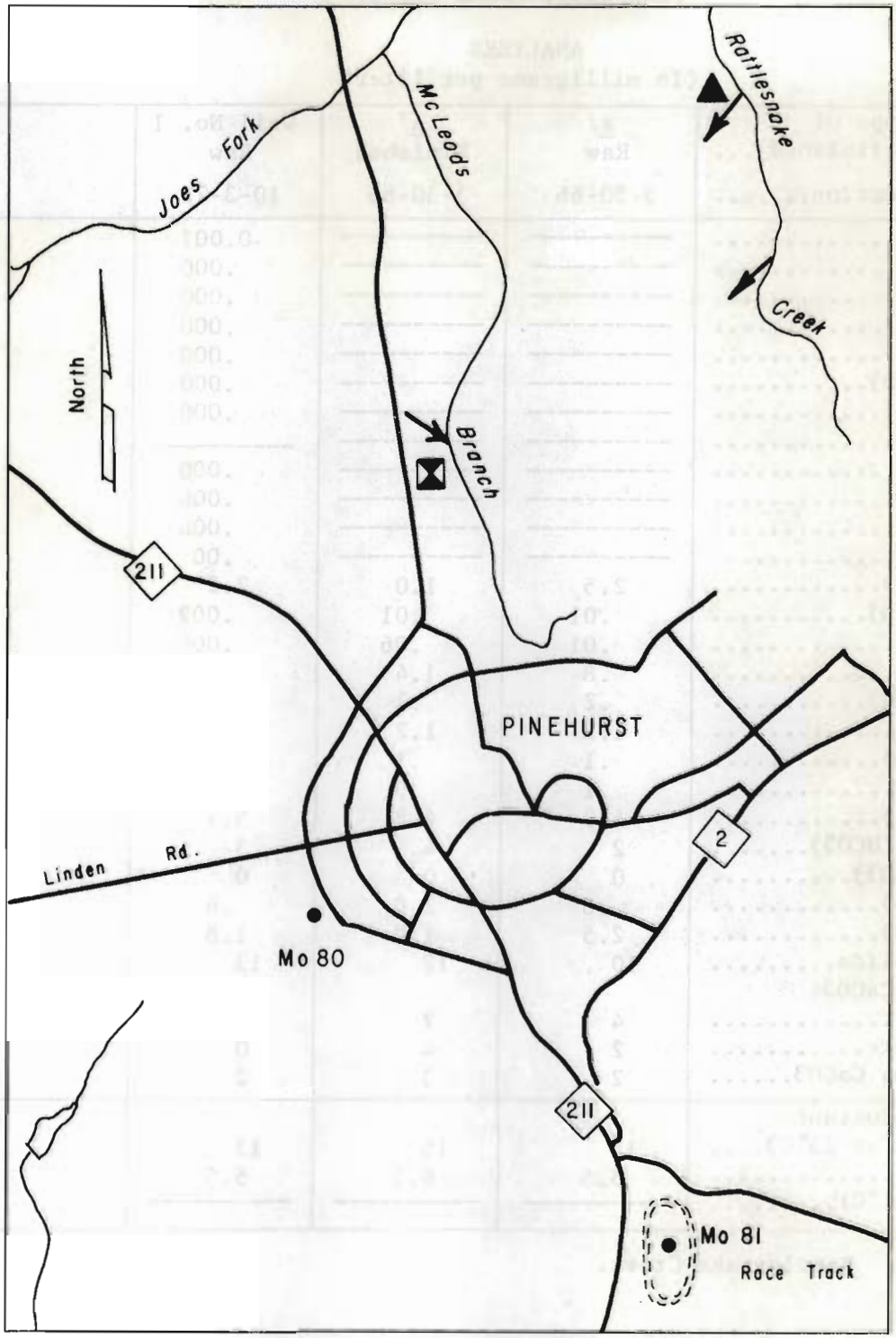
WATER-RESOURCES APPRAISAL:

Surface water: Pinehurst is in the Sand Hills section in Southern Moore County. The basin divide of the Cape Fear and Pee Dee Rivers is on the south edge of the city. The immediate vicinity is drained by small tributaries of Joes Fork, Horse Creek, and Aberdeen Creek. The low flow yield of streams is relatively high, generally exceeding 0.1 mgd per square mile. For all streams, the average discharge is 0.9 mgd per square mile and the 7-day, 2-year low flow is about 0.3 mgd per square mile. Pinehurst is not ideally situated for a surface water supply due to the absence of large nearby streams. The largest nearby stream is Drowning Creek, about 8 miles southwest of the city. The flow of Rattlesnake Creek, which has served as a source of supply for many years, is composed almost entirely of ground water seeping from the highly permeable layer of surficial sand.

Ground water: Cretaceous sand and clay of the Tuscaloosa Formation underlie Pinehurst. Underlying these deposits at a depth of about 240 feet are rocks of the volcanic slate series. Surficial sands mantle the Tuscaloosa Formation. The existing municipal wells are screened in the sand beds of the Tuscaloosa Formation. These wells are 172 feet and 151 feet deep and yield 115 gpm and 225 gpm, respectively. Static water levels reportedly are 45 to 70 feet below land surface. The potential for future development of the ground water supply appears to be excellent. Most of the precipitation that falls passes through the highly permeable surficial sands to the ground-water reservoir.

The chemical quality of ground water is generally good. The total amount of dissolved solids is low, usually less than 50 mg/l. The water is both acidic and corrosive with pH values below 6.0 being common.

CITY OF PINEHURST



PINEHURST, MOORE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	a/ Raw	a/ Finished	Well No. 1 Raw	
Date of collection.....	3-30-66	3-30-66	10-3-72	
Copper (Cu).....	----------	----------	0.007	
Cobalt (Co).....	----------	----------	.000	
Zinc (Zn).....	----------	----------	.000	
Chromium (Cr).....	----------	----------	.000	
Boron (B).....	----------	----------	.000	
Strontium (Sr).....	----------	----------	.000	
Barium (Ba).....	----------	----------	.000	
Mercury (Hq).....	----------	----------	----------	
Lead (Pb).....	----------	----------	.000	
Lithium (Li).....	----------	----------	.000	
Cadmium (Cd).....	----------	----------	.000	
Cyanide (CN).....	----------	----------	.00	
Chloride (Cl).....	2.5	1.0	2.2	
Manganese (Mn).....	.01	.01	.002	
Iron (Fe).....	.01	.06	.000	
Calcium (Ca).....	.8	1.4	.4	
Magnesium (Mg).....	.2	.7	.4	
Sodium (Na).....	1.2	1.2	1.2	
Potassium (K).....	.1	.1	.2	
Fluoride (F).....	.1	.0	.0	
Silica (SiO2).....	4.2	4.2	5.3	
Bicarbonate (HCO3).....	2	4	3	
Carbonate (CO3).....	0	0	0	
Sulfate (SO4).....	.8	2.0	.6	
Nitrate (NO3).....	2.5	1.0	1.8	
Dissolved Solids.....	10	12	13	
Hardness as CaCO3:				
Total.....	4	7	3	
Noncarbonate.....	2	4	0	
Alkalinity as CaCO3.....	2	3	2	
Specific conductance (micromhos at 25° C)....	12	15	17	
pH.....	5.5	6.5	5.5	
Temperature (°C).....	----------	----------	----------	

a/ Source: Rattlesnake Creek.

ROBBINS, MOORE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,100 in 1972 (560 metered customers, 12 of which are in suburban areas).

SOURCE:

Bear Creek impounded by a low dam. The intakes are at lat 35°26'00", long 79°35'00", on the south bank of the creek 1/4 mile west of Robbins. The drainage area of Bear Creek at the intake is 134 square miles, approximately.

RAW-WATER STORAGE:

Approximately 20 million gallons at the low dam.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.7 mgd with a storage of 20 million gallons.

TOTAL USE:

Average (1971) 0.49 mgd, metered; maximum daily (8-28-72), 1.01 million gallons.

INDUSTRIAL USE:

0.20 mgd, estimated. Principal users include Wilson Laurel Farms, Inc., and Deering Milliken Textiles.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd.

PUMPING CAPACITY:

Raw water, 2.0 mgd; finished water, 3.2 mgd.

FINISHED-WATER STORAGE:

One clear well, 340,000 gallons; two elevated tanks, 300,000 and 100,000 gallons.

FUTURE PLANS:

Renovation of the filters is under consideration.

WATER-RESOURCES APPRAISAL:

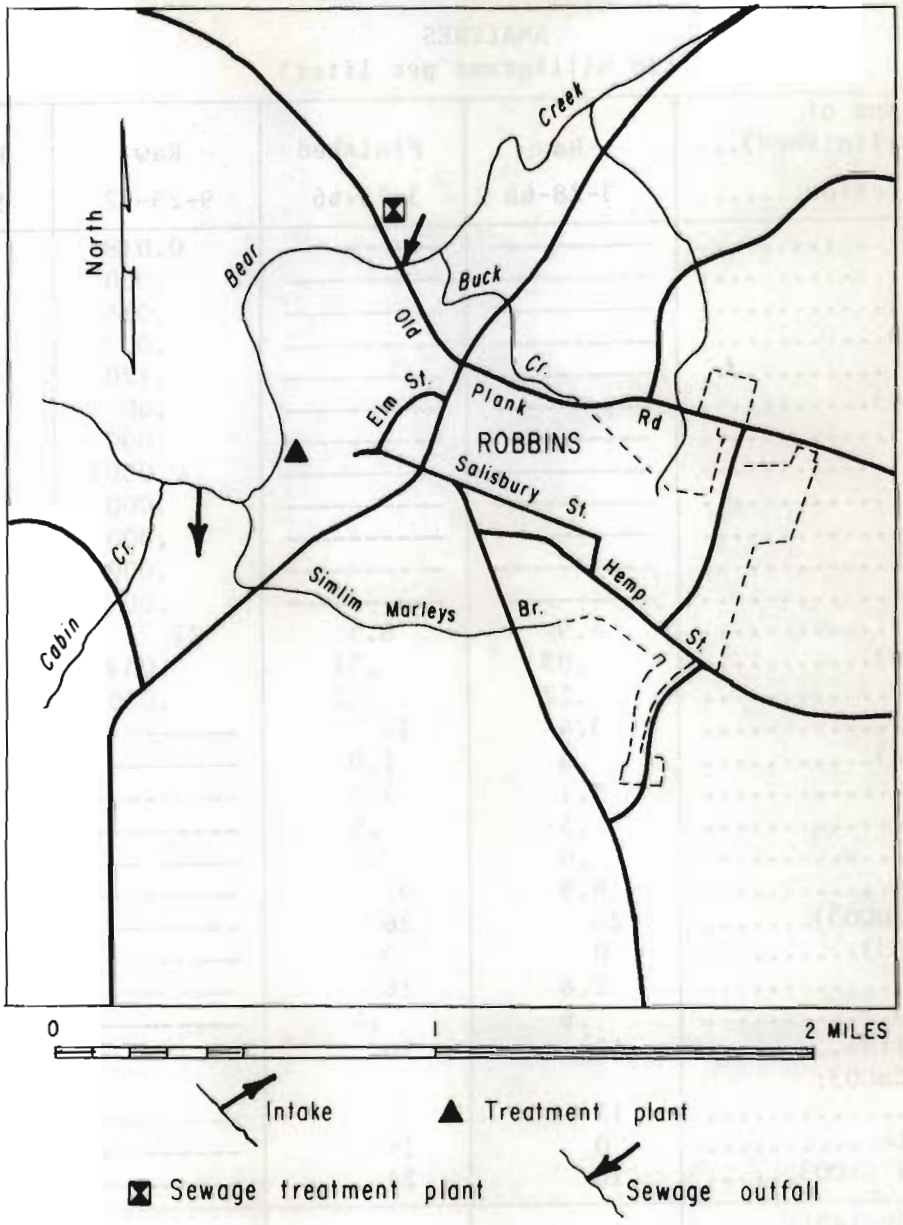
Surface water: Robbins is in north-central Moore County where the topography is characterized by rolling hills with moderate land and stream slopes. The area is drained by Bear Creek and its tributaries. The low-flow yield of streams in the immediate vicinity is small, ranging from 0 to 0.005 mgd per square mile. Streams with as much as 75 square miles drainage area occasionally go dry. The average discharge of all streams is 0.65 mgd per square mile and the 7-day, 2-year low flow averages 0.03

mgd per square mile.

Robbins occasionally experienced water shortages prior to construction of the dam on Bear Creek. The estimated allowable draft of the present facility is adequate to meet the needs of the immediate future. If the demand for water increases significantly, it could be met by enlarging the dam on Bear Creek.

Ground water: Rocks of the volcanic slate series, consisting of slate, schist, and related rocks underlie Robbins. Water in the slate moves along bedding and clevage planes, and through fractures, and is stored in the overlying mantle of weathered rock. The slate weathers to a clayey soil that is as much as 50 feet thick in the area. Reported well depths range from 70 to 200 feet with most wells being from 80 to 120 feet deep. Reported well yields are as high as 50 gpm. The water is slightly corrosive and locally may contain undesirable concentrations of iron.

CITY OF ROBBINS



ROBBINS, MOORE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	3-28-66	3-28-66	9-25-72	9-25-72
Copper (Cu).....	----------	----------	0.018	0.004
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.018	.000
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.120	.000
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).....	4.9	8.5	22	28
Manganese (Mn).....	.03	.01	.039	.000
Iron (Fe).....	.12	.02	.000	.000
Calcium (Ca).....	3.4	12	----------	----------
Magnesium (Mg).....	.6	1.0	----------	----------
Sodium (Na).....	5.1	4.9	----------	----------
Potassium (K).....	.5	.5	----------	----------
Fluoride (F).....	.0	.0	----------	----------
Silica (SiO2).....	8.9	97	----------	----------
Bicarbonate (HCO3).....	20	26	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	2.8	16	----------	----------
Nitrate (NO3).....	.6	.4	----------	----------
Dissolved Solids.....	42	70	----------	----------
Hardness as CaCO3:				
Total.....	12	35	----------	----------
Noncarbonate.....	0	14	----------	----------
Alkalinity as CaCO3.....	16	21	----------	----------
Specific conductance (micromhos at 25°C)....	49	98	----------	----------
pH.....	6.5	7.4	----------	----------
Temperature (°C).....	11	----------	----------	----------

ROBBINS, MOORE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 1,100 in 1972 (560 metered customers, 12 of which are in suburban areas).

SOURCE:

Bear Creek impounded by a low dam. The intakes are at lat 35°26'00", long 79°35'00", on the south bank of the creek 1/4 mile west of Robbins. The drainage area of Bear Creek at the intake is 134 square miles, approximately.

RAW-WATER STORAGE:

Approximately 20 million gallons at the low dam.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.7 mgd with a storage of 20 million gallons.

TOTAL USE:

Average (1971) 0.49 mgd, metered; maximum daily (8-28-72), 1.01 million gallons.

INDUSTRIAL USE:

0.20 mgd, estimated. Principal users include Wilson Laurel Farms, Inc., and Deering Milliken Textiles.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd.

PUMPING CAPACITY:

Raw water, 2.0 mgd; finished water, 3.2 mgd.

FINISHED-WATER STORAGE:

One clear well, 340,000 gallons; two elevated tanks, 300,000 and 100,000 gallons.

FUTURE PLANS:

Renovation of the filters is under consideration.

WATER-RESOURCES APPRAISAL:

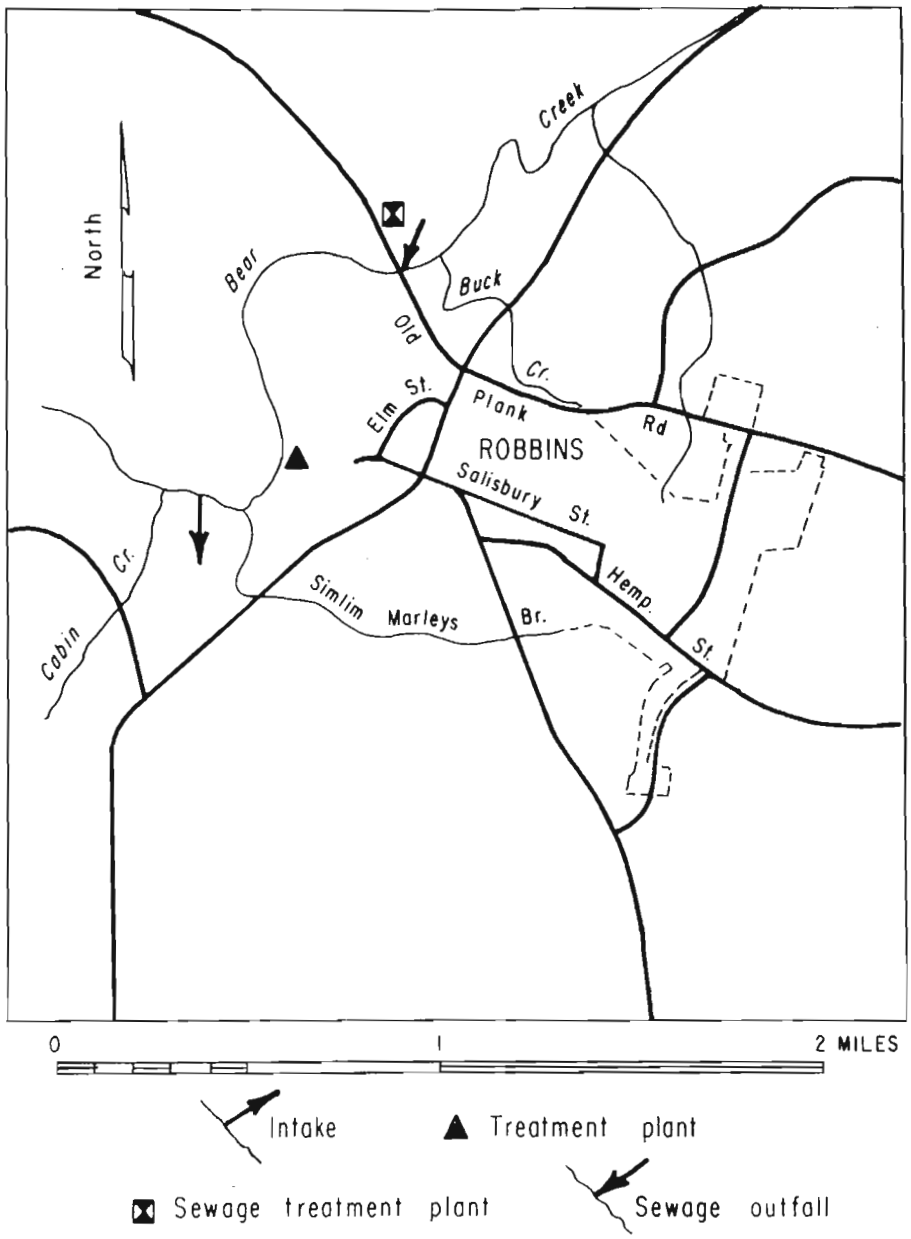
Surface water: Robbins is in north-central Moore County where the topography is characterized by rolling hills with moderate land and stream slopes. The area is drained by Bear Creek and its tributaries. The low-flow yield of streams in the immediate vicinity is small, ranging from 0 to 0.005 mgd per square mile. Streams with as much as 75 square miles drainage area occasionally go dry. The average discharge of all streams is 0.65 mgd per square mile and the 7-day, 2-year low flow averages 0.03

mgd per square mile.

Robbins occasionally experienced water shortages prior to construction of the dam on Bear Creek. The estimated allowable draft of the present facility is adequate to meet the needs of the immediate future. If the demand for water increases significantly, it could be met by enlarging the dam on Bear Creek.

Ground water: Rocks of the volcanic slate series, consisting of slate, schist, and related rocks underlie Robbins. Water in the slate moves along bedding and clevage planes, and through fractures, and is stored in the overlying mantle of weathered rock. The slate weathers to a clayey soil that is as much as 50 feet thick in the area. Reported well depths range from 70 to 200 feet with most wells being from 80 to 120 feet deep. Reported well yields are as high as 50 gpm. The water is slightly corrosive and locally may contain undesirable concentrations of iron.

CITY OF ROBBINS



SOUTHERN PINES, MOORE COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 9,000 in 1972 (4,000 metered customers, 600 of which are in suburban areas).

SOURCE:

Mill Creek impounded in Southern Pines Lake: The intake is at lat 35°12'54", long 72°24'06", in Southern Pines Lake about 1 mile north of Southern Pines. The drainage area of the lake is 1.9 square miles.

RAW-WATER STORAGE:

Southern Pines Lake, 175 million gallons.

ALLOWABLE DRAFT:

Not determined. Carryover storage analysis required.

TOTAL USE:

Average (1971) 1.06 mgd, metered; maximum daily (6-19-70), 1.98 million gallons.

INDUSTRIAL USE:

0.15 mgd, estimated.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid-sand or anthracite filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, postchlorination when required, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

2.0 mgd.

PUMPING CAPACITY:

Raw water, 2.0 mgd; finished water, 2.0 mgd. Raw water normally flows by gravity to the plant but is pumped when lake level is low.

FINISHED-WATER STORAGE:

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

FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

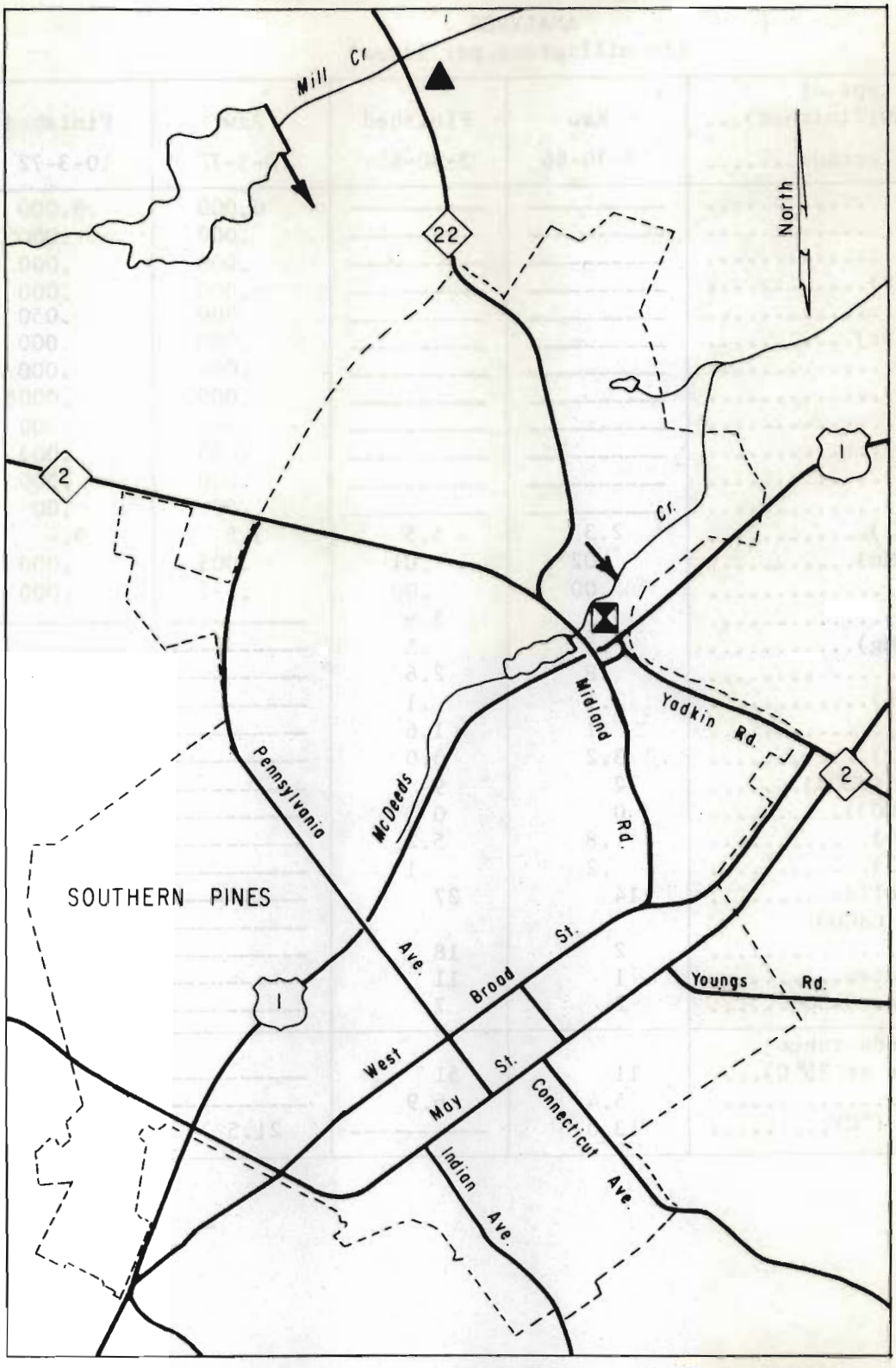
Surface water: Southern Pines is in the Sand Hills section in southern Moore County. The immediate area is drained by small tributaries of Little River of the Cape Fear River basin and tributaries of Drowning Creek of the Pee Dee River basin. The low-flow yield of streams is relatively high, generally exceeding 0.1 mgd per square mile. For all streams, the average discharge is 0.9 mgd per square mile, and the 7-

day, 2-year low-flow averages about 0.3 mgd per square mile. The reservoir currently in use has a capacity large enough to meet the needs of the immediate future. The lake level reportedly fell only 4 feet in 1968, an exceptionally dry year. If demands increase significantly, additional raw water would be needed. A regional water system using Drowning Creek as a source, might be considered.

Ground water: Highly permeable, surficial sands overlie the Tuscaloosa Formation in the vicinity of Southern Pines. Because of the highly permeable nature of the sands, most precipitation that falls is absorbed and goes into underground storage. Only during intense storms is there significant overland runoff. This water in underground storage is available for development for water supply, and, in fact, is the principal source of water to Southern Pines Lake. It is estimated that properly constructed wells, drilled in upland areas where the sand layer is thickest, and spaced to prevent pumping interference, would yield up to 0.25 mgd.

The chemical quality of ground water is generally good. The water is usually acidic with pH values below 6.0 being common. The total amount of dissolved solids in the water is low, usually less than 50 mg/l.

CITY OF SOUTHERN PINES



SOUTHERN PINES, MOORE COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	3-30-66	3-30-66	10-3-72	10-3-72
Copper (Cu).....	----------	----------	0.000	0.000
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.000
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.050
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.003	.003
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	2.3	5.5	3.8	9.4
Manganese (Mn).....	.02	.01	.005	.000
Iron (Fe).....	.00	.00	.137	.000
Calcium (Ca).....	.5	5.9	----------	----------
Magnesium (Mg).....	.3	.5	----------	----------
Sodium (Na).....	.8	2.6	----------	----------
Potassium (K).....	.1	.1	----------	----------
Fluoride (F).....	.1	1.6	----------	----------
Silica (SiO2).....	3.2	3.0	----------	----------
Bicarbonate (HCO3).....	2	9	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	.8	5.2	----------	----------
Nitrate (NO3).....	.2	.1	----------	----------
Dissolved Solids.....	14	27	----------	----------
Hardness as CaCO3:			----------	----------
Total.....	2	18	----------	----------
Noncarbonate.....	1	11	----------	----------
Alkalinity as CaCO3.....	2	7	----------	----------
Specific conductance (micromhos at 25° C)....	11	51	----------	----------
pH.....	5.4	6.9	----------	----------
Temperature (°C).....	13.0	----------	21.5	22.0

RICHMOND COUNTY

WATER-RESOURCES APPRAISAL

Richmond County is on the North Carolina-South Carolina State line in south-central North Carolina. The topography of the county varies from rolling to hilly in the northwest to the smoother undulating hills in the southeast. Approximately the southeastern two-thirds of the county is in the Sand Hills section of the Coastal Plain Province. The Pee Dee River is the west boundary and receives the drainage of the entire county. The low-flow yield of streams varies considerably. Streams originating in and draining the Sand Hills region have the higher low-flow yield, generally exceeding 0.15 mgd per square mile, while the low flow yield of the remaining streams ranges from 0 to 0.05 mgd per square mile. Similarly, the 7-day, 2-year low flow of Sand Hills streams averages 0.3 mgd per square mile, and the other streams average 0.10 mgd per square mile. For all streams, the average discharge ranges from 0.7 to 0.9 mgd per square mile. The Pee Dee River is one of the major rivers of the State. The 49 year average discharge of the Pee Dee River at the U.S. Highway 74 crossing is 4.98 billion gallons per day.

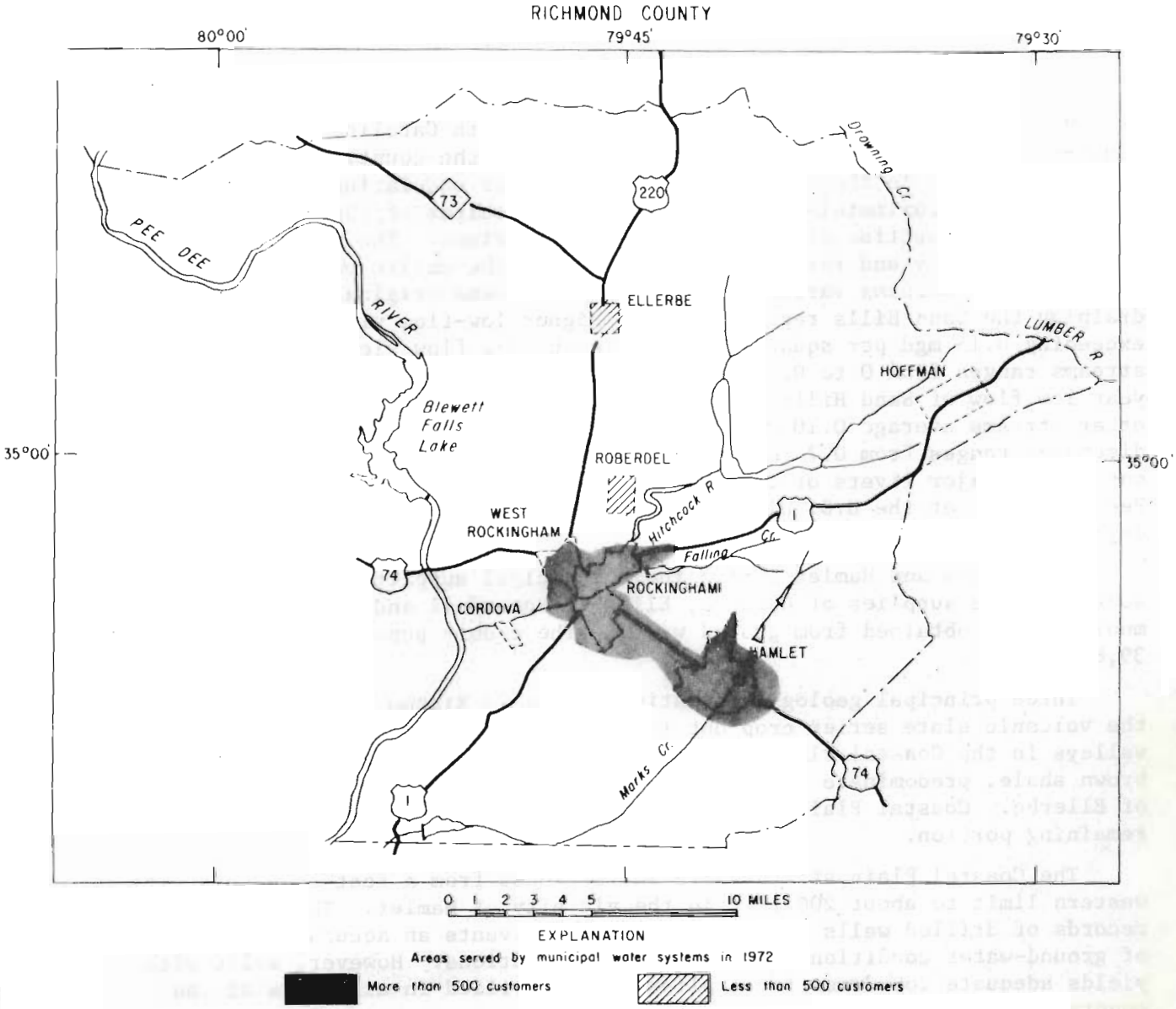
Rockingham and Hamlet obtain their municipal supplies from surface sources. The supplies of Cordova, Ellerbe, Roberdell and other small communities are obtained from ground water. The county population in 1970 was 39,889.

Three principal geologic formations occur in Richmond County. Rocks of the volcanic slate series crop out in the western part and along stream valleys in the Coastal Plain section. Triassic rocks, principally reddish-brown shale, predominate in the northern part and in a small area southwest of Ellerbe. Coastal Plain strata overlain by surficial sands underlie the remaining portion.

The Coastal Plain strata range in thickness from a feather edge at its western limit to about 200 feet in the vicinity of Hamlet. The scarcity of records of drilled wells of tested capacity prevents an accurate appraisal of ground-water conditions in the various formations. However, wells with yields adequate for domestic supplies can be drilled in all parts of the county.

The higher yielding wells are in the Coastal Plain section where several well yields in the 60 to 70 gpm range are reported. In other parts of the county, if wells are drilled in favorable sites, such as low flat areas, sags, or draws, yields of 35 gpm or more might reasonably be expected.

The chemical quality of ground water is usually good and suitable for most uses with little or no treatment. Generally, water from the slate is soft and slightly acidic, water from the Triassic rocks is alkaline and moderately hard, and water from the Coastal Plain deposits is very soft and acidic.


RICHMOND COUNTY
80°00'
79°45'
79°30'
35°00'
35°00'
PEE DEE
RIVER
73
220
Drowning Cr.
ELLERBE
LUMBER R.
HOFFMAN
Blewett
Falls
Lake
ROBERDEL
WEST
ROCKINGHAM
Hitchcock R.
Falling Cr.
74
ROCKINGHAM
CORDOVA
HAMLET
Marks Cr.
1
74
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

HAMLET, RICHMOND COUNTY

OWNERSHIP:

Municipal. Also supplies East Rockingham. Total population supplied, about 10,000 in 1972 (3,810 metered customers, 1,270 of which are in suburban areas).

SOURCE:

Marks Creek impounded in two lakes. The intake is in the downstream lake, 1.1 miles northeast of Hamlet at lat 34°53'59", long 79°40'16". The upstream lake is basically an emergency reserve. The drainage area at the intake is 2.1 square miles.

RAW-WATER STORAGE:

Combined storage of the lakes is 141 million gallons.

ALLOWABLE DRAFT:

Not determined. Carryover storage analysis required.

TOTAL USE:

Average (1971) 1.8 mgd, metered; maximum daily (7-10-72) 2.56 million gallons.

INDUSTRIAL USE:

0.6 mgd, estimated. Principal users include Sandhurst Mills, Aleo Manufacturing Company, J. P. Stevens and Company, Inc., and Beaunit Textiles.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd.

PUMPING CAPACITY:

Raw water, 3.5 mgd; finished water, 3.5 mgd. There is a raw-water gravity line from the lake to the treatment plant with a capacity of about 2.5 mgd.

FINISHED-WATER STORAGE:

One clear well, 200,000 gallons; three elevated tanks, 300,000, 150,000 and 100,000 gallons.

FUTURE PLANS:

A major renovation and expansion of the treatment plant was completed in 1972. No other work planned at present.

WATER-RESOURCES APPRAISAL:

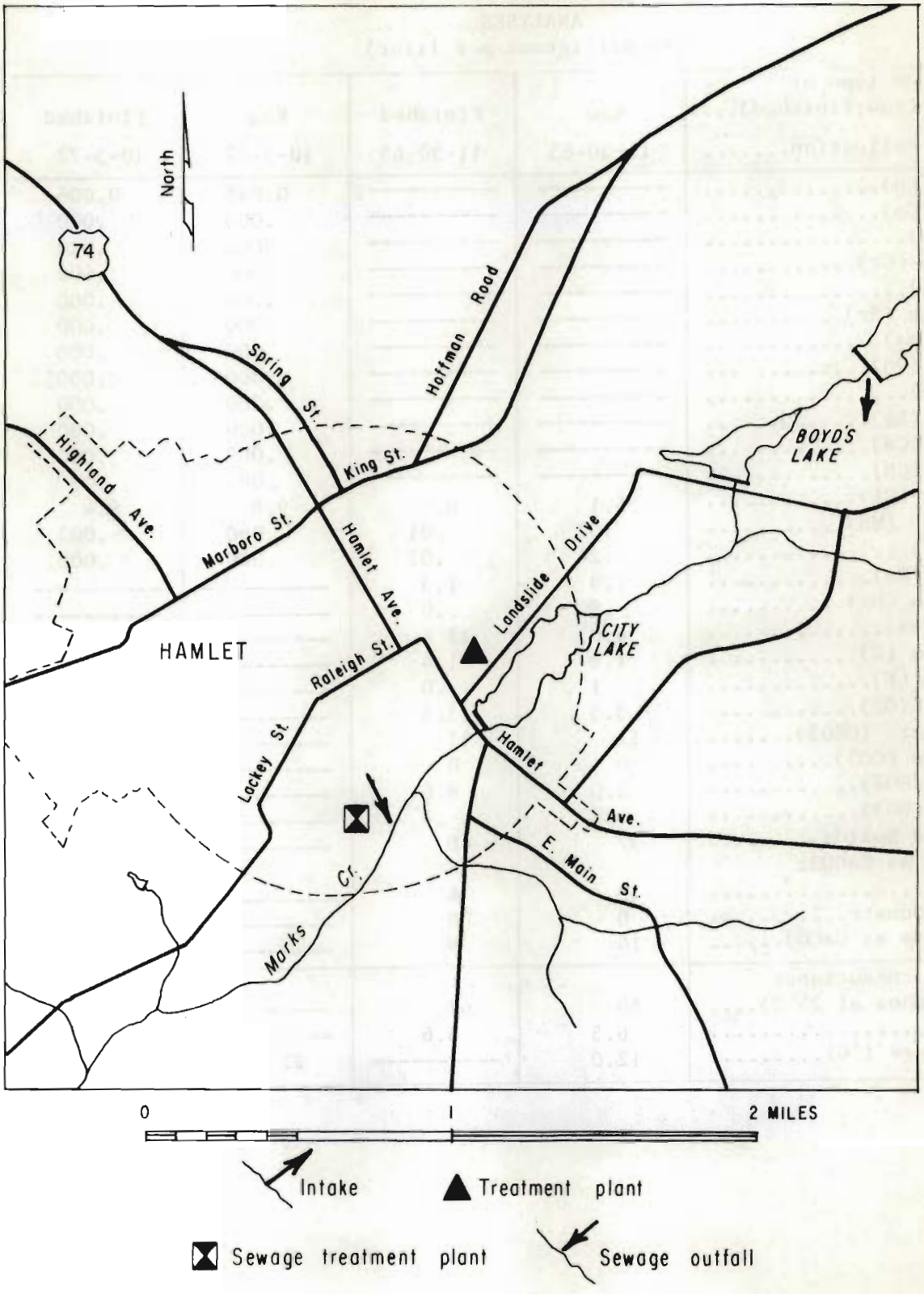
Surface water: Hamlet is in the Sand Hills section in southeastern Richmond County. The area is drained by Marks Creek, South Prong Falling

Creek, and their tributaries. The low-flow yield of streams draining the immediate area ranges from 0.10 to 0.15 mgd per square mile. The average discharge of all streams is 0.95 mgd per square mile and the 7-day, 2-year low flow averages 0.25 mgd per square mile. The allowable draft of the reservoir currently in use was not estimated and the adequacy of the present source is not evaluated. However, it was reported that in 1968, a very dry year, there was no shortage of water.

Ground water: Coastal Plain strata consisting of complexly interlayered beds of sand and clay of the Tuscaloosa Formation underlie Hamlet. A layer of sand mantles the Tuscaloosa. Available well records indicate that the relatively impermeable clay layers predominate in the immediate area and reported well yields are relatively low. The maximum yield reported in available records is 38 gpm and the average yield is 35 gpm.

The chemical quality of ground water is generally good. The water is usually acidic and very soft.

CITY OF HAMLET



HAMLET, RICHMOND COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)...	Raw	Finished	Raw	Finished
Date of collection.....	11-30-65	11-30-65	10-5-72	10-5-72
Copper (Cu).....	----------	----------	0.045	0.006
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.000	.013
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.000
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).....	5.1	8.0	9.8	9.4
Manganese (Mn).....	.02	.01	.060	.003
Iron (Fe).....	.24	.07	.000	.000
Calcium (Ca).....	1.9	1.3	----------	----------
Magnesium (Mg).....	.8	.0	----------	----------
Sodium (Na).....	6.3	11	----------	----------
Potassium (K).....	1.6	1.4	----------	----------
Fluoride (F).....	.1	.0	----------	----------
Silica (SiO_2).....	3.5	3.5	----------	----------
Bicarbonate (HCO_3).....	17	11	----------	----------
Carbonate (CO_3).....	0	0	----------	----------
Sulfate (SO_4).....	5.0	8.6	----------	----------
Nitrate (NO_3).....	.3	.4	----------	----------
Dissolved Solids.....	37	48	----------	----------
Hardness as $CaCO_3$:				
Total.....	10	6	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as $CaCO_3$.....	14	9	----------	----------
Specific conductance (micromhos at 25° C)....	50	67	----------	----------
pH.....	6.5	6.6	----------	----------
Temperature (°C).....	12.0	----------	22.5	22.5

ROCKINGHAM, RICHMOND COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 7,200 in 1972 (2,800 metered customers, 900 of which are in suburban areas).

SOURCE:

Falling Creek impounded in City Lake: The intake is approximately one-half mile east of Rockingham at lat 34°56'16", long 79°44'22". The drainage area of Falling Creek at the dam is approximately 11 square miles. Hitchcock Creek impounded in Roberdell Lake: The intake is at lat 34°58'13", long 79°44'18", approximately 1 mile northeast of Rockingham. The drainage area of Hitchcock Creek at the dam is 91 square miles.

RAW-WATER STORAGE:

City Lake, 5 million gallons. Roberdell Lake, not determined.

ALLOWABLE DRAFT:

Not determined; raw water storage data not available.

TOTAL USE:

Average (1971) 1.26 mgd, metered; maximum daily (1-13-70) 2.092 million gallons. Does not include approximately 0.7 mgd of untreated water furnished to industry.

INDUSTRIAL USE:

0.6 mgd, estimated. Also supplies approximately 0.7 mgd of untreated water for industrial use.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

2.5 mgd.

PUMPING CAPACITY:

Raw water, 3.5 mgd; finished water, 5.6 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 500,000 and 300,000 gallons; two elevated tanks, 300,000 and 75,000 gallons.

FUTURE PLANS:

None.

WATER-RESOURCES APPRAISAL:

Surface water: Rockingham is in southwestern Richmond County near the western edge of the Coastal Plain Province. Falling Creek, Hitchcock Creek, and their tributaries drain the immediate vicinity. The low-flow

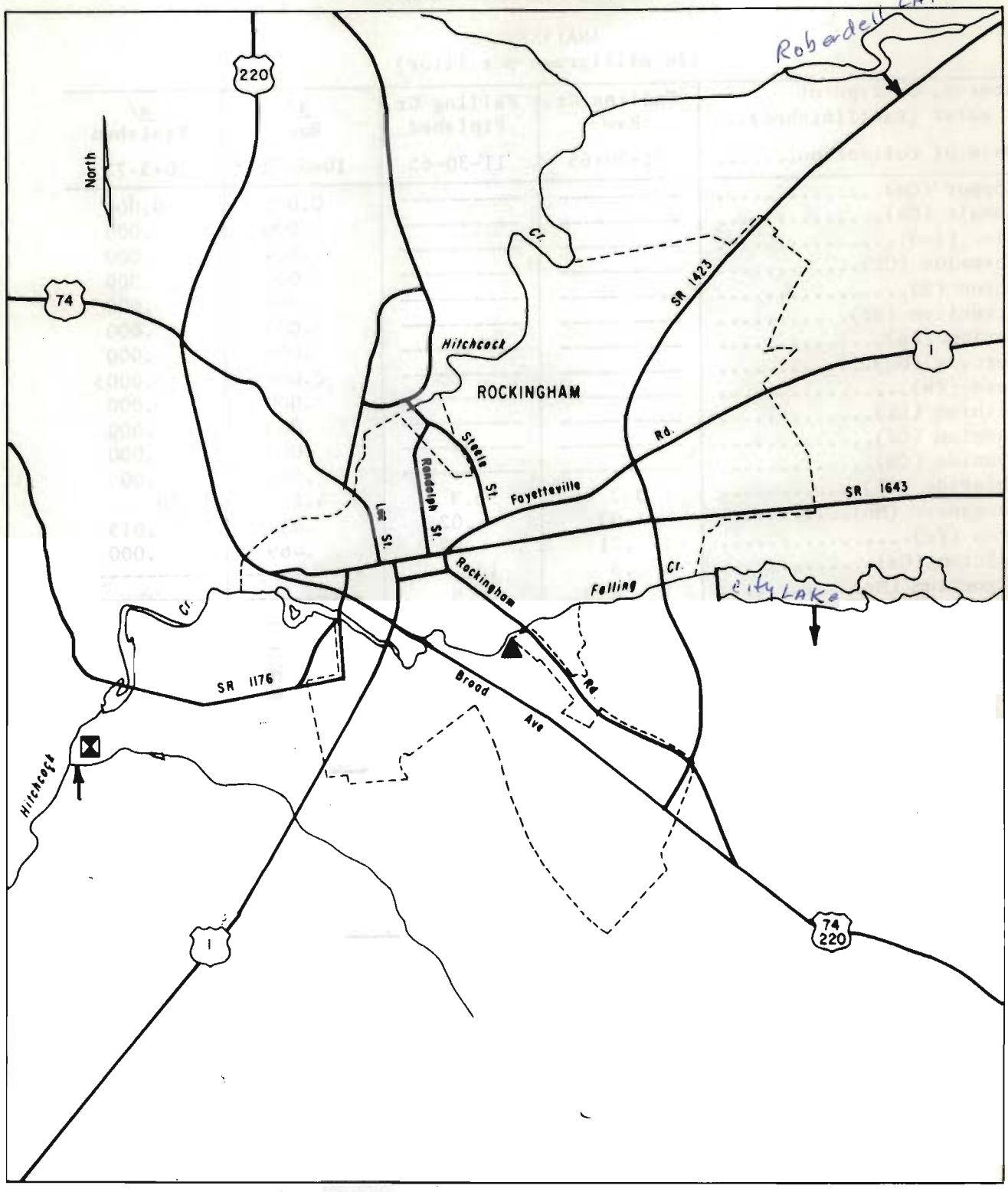
ROCKINGHAM, RICHMOND COUNTY

yield of streams is relatively high, averaging about 0.15 mgd per square mile. For all streams draining the area, the average discharge is 0.75 mgd per square mile, and the 7-day, 2-year low flow averages 0.25 mgd per square mile. The adequacy of the present source could not be evaluated due to the lack of raw water storage data.

Ground water: Rocks of the volcanic slate series, including shales, slates, and related rocks, underlie Rockingham. Weathered depths of the rocks is at least 50 feet in some places. A relatively thin layer of permeable surficial sand covers most of the area. The Coastal Plain deposits are too thin for development of wells, and wells in the area are finished in the hard rock. Average yield of wells in the area is about 10 gpm, and average well depth is about 120 feet. According to available data some wells in the vicinity of Rockingham are reported to yield 50 gpm. If wells are located in areas where ground-water conditions are favorable, such as draws, valleys, sags, or other low places, and spaced to prevent pumping interference, yield of 35 gpm might reasonably be expected.

Ground water from the slate is usually acidic, moderately hard, and locally may contain iron concentrations in excess of 0.3 mg/1.

CITY OF ROCKINGHAM



ROCKINGHAM, RICHMOND COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Falling Cr. Raw	Falling Cr. Finished	a/ Raw	a/ Finished
Date of collection.....	11-30-65	11-30-65	10-5-72	10-5-72
Copper (Cu).....	----------	----------	0.000	0.000
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.004	.000
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.000
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).....	3.3	6.3	4.8	10
Manganese (Mn).....	.03	.02	.015	.015
Iron (Fe).....	.21	.03	.469	.000
Calcium (Ca).....	.3	13	----------	----------
Magnesium (Mg).....	.6	.9	----------	----------
Sodium (Na).....	1.2	3.4	----------	----------
Potassium (K).....	.3	.5	----------	----------
Fluoride (F).....	.1	1.2	----------	----------
Silica (SiO_2).....	4.4	4.5	----------	----------
Bicarbonate (HCO_3).....	3	10	----------	----------
Carbonate (CO_3).....	0	0	----------	----------
Sulfate (SO_4).....	.8	23	----------	----------
Nitrate (NO_3).....	.9	.0	----------	----------
Dissolved Solids.....	26	63	----------	----------
Hardness as $CaCO_3$:				
Total.....	4	38	----------	----------
Noncarbonate.....	1	30	----------	----------
Alkalinity as $CaCO_3$.....	2	8	----------	----------
Specific conductance (micromhos at 25°C)....	17	102	----------	----------
pH.....	5.4	6.6	----------	----------
Temperature (°C).....	13.0	----------	22.0	22.0

a/ Combined sample from Falling Creek and Hitchcock Creek.

ROWAN COUNTY

WATER-RESOURCES APPRAISAL

Rowan County is in the central part of the Piedmont Province. The topography is characterized by rolling hills with moderate land slopes. Tributaries of the Yadkin and South Yadkin Rivers, which are the north and east boundaries of the county, drain all but a small area in the southern part. The average discharge of all streams is 0.65 mgd per square mile. Minimum flows are quite variable ranging from 0.03 to 0.13 mgd per square mile, and averaging 0.10 mgd per square mile. The 7-day, 2-year low-flow averages 0.22 mgd per square mile. Minimum natural flows of the Yadkin River are augmented by release of water from W. Kerr Scott Reservoir in Wilkes County.

The water supplies of Salisbury, Landis, Kannapolis, and a portion of Spencer's are obtained from surface water sources. China Grove, Rockwell, and other small municipal supplies are obtained from ground-water sources. The county population was 90,035 in 1970.

Two large geologic units are represented in the county. They are the volcanic and allied rocks of the Carolina Slate belt in the eastern corner, and the plutonic rocks, chiefly granite and diorite in the remainder. A large part of western Rowan County is underlain by diorite and gabbro-diorite. Granite occurs interlayered with other rocks and in several separate bodies. A large body of granite forms a southwestward trending ridge through Granite Quarry and Faith to the Cabarrus County line.

The areas in which it is most difficult to obtain ground water appears to be those underlain by granite in the Granite Quarry-Faith area and that underlain by rocks of the Carolina Slate belt. The thinness of the weathered zone and sparseness of fractures in these rocks are not conducive to large-yielding wells. Only a few drilled wells in these areas yield as much as 20 gpm. In the remainder of the county, the rocks are more fractured and have a thicker layer of overlying weathered material so most wells are fairly productive. It is not unreasonable to expect wells drilled in favorable sites in these areas to yield 35 gpm.

There are insufficient records of wells of tested capacity to make an appraisal of the water-bearing characteristics of all rock units in the county. However, from records of 68 wells, the following table showing the average depth, and maximum and average yield of wells in granite and diorite was compiled.

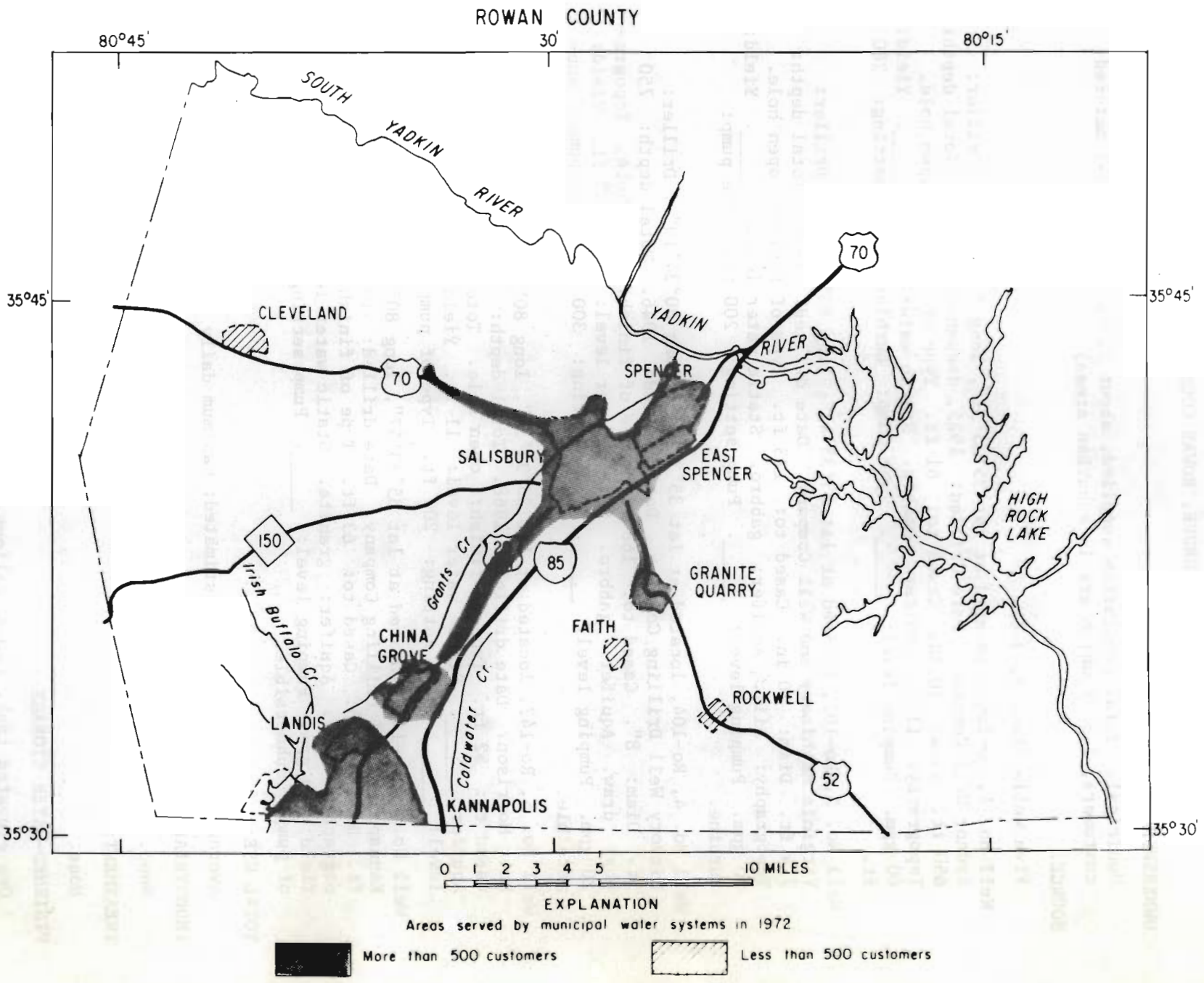
Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Diorite	50	17	185
Granite	60	13	172

The yield figures in the above table are influenced by domestic wells which are usually drilled near the point of use rather than in sites selected for maximum yield.

ROWAN COUNTY

WATER-RESOURCES APPRAISAL

The chemical quality of ground-water varies considerably in the various rock units. In general, water from the granite is low in mineral matter and soft, and water from the diorite and gabbro is moderately hard to hard. Water from the diorite may contain iron concentrations greater than 0.3 mg/l.


ROWAN COUNTY
80°45'
30'
80°15'
35°45'
35°30'
SOUTH YADKIN RIVER
YADKIN RIVER
CLEVELAND
SPENCER
SALISBURY
EAST SPENCER
HIGH ROCK LAKE
GRANITE QUARRY
FAITH
CHINA GROVE
ROCKWELL
LANDIS
KANNAPOLIS
Irish Buffalo Cr.
Grants Cr.
Coldwater Cr.
70
85
150
52
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

CHINA GROVE, ROWAN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,500 in 1972 (841 metered customers, 125 of which are in suburban areas).

SOURCE:

Five wells (Nos. 1, 3-6).

Well No. 1, Ro-100a, located at lat 35°33'51", long 80°33'53". Driller: Sydnor Well Company. Date drilled: 1925, deepened in 1952. Total depth: 650 ft. Diam: 10 in. Cased to: 61 ft. Type of finish: open hole. Topography: flat. Aquifer: gabbro. Static water level: _____. Yield: 60 gpm. Pumping level: _____. Type pump: turbine. Pump setting: 200 ft.

Well No. 3, Ro-107, located at lat 35°33'47", long 80°35'14". Driller: Virginia Machinery and Well Company. Date drilled: 1931. Total depth: 714 ft. Diam: 10 in. Cased to: 123 ft. Type of finish: open hole. Topography: hill. Aquifer: gabbro. Static water level: _____. Yield: 50 gpm. Pumping level: _____. Pump setting: 200 ft. Type pump: turbine.

Well No. 4, Ro-104, located at lat 35°33'56", long 80°34'10". Driller: Hickory Well Drilling Company. Date drilled: 1946. Total depth: 750 ft. Diam: 8". Cased to: 168 ft. Type of finish: open hole. Topography: draw. Aquifer: gabbro. Static water level: about 50 ft. Yield: 20 gpm. Pumping level: _____. Pump setting: 300 ft. Type pump: submersible.

Well No. 5, Ro-147, located at lat 35°34'33", long 80°34'32". Driller: Mott Morrison. Date drilled: 1968. Total depth: 708 ft. Diam: 8 in. Cased to: 52 ft. Type of finish: open hole. Totography: draw. Aquifer: _____. Static water level: 11 ft. Yield: 30 gpm. Pumping level: _____. Pump setting: 200 ft. Type of pump: turbine.

Well No. 6, Ro-148, located at lat 35°33'47", long 80°35'03". Driller: Kannapolis Well Drilling Company. Date drilled: 1971. Total depth: 705 ft. Diam: 8 in. Cased to: 63 ft. Type of finish: open hole. Topography: draw. Aquifer: granite. Static water level: about 80 ft. Yield: 50 gpm. Pumping level: _____. Pump setting: 500 feet. Type of pump: submersible.

TOTAL USE:

Average (1971) 0.13 mgd, estimated; maximum daily not recorded.

INDUSTRIAL USE:

None.

TREATMENT:

None.

FINISHED-WATER STORAGE:

One elevated tank, 75,000 gallons.

CHINA GROVE, ROWAN COUNTY

FUTURE PLANS:

Plan to drill another well in near future, probably by summer of 1972.

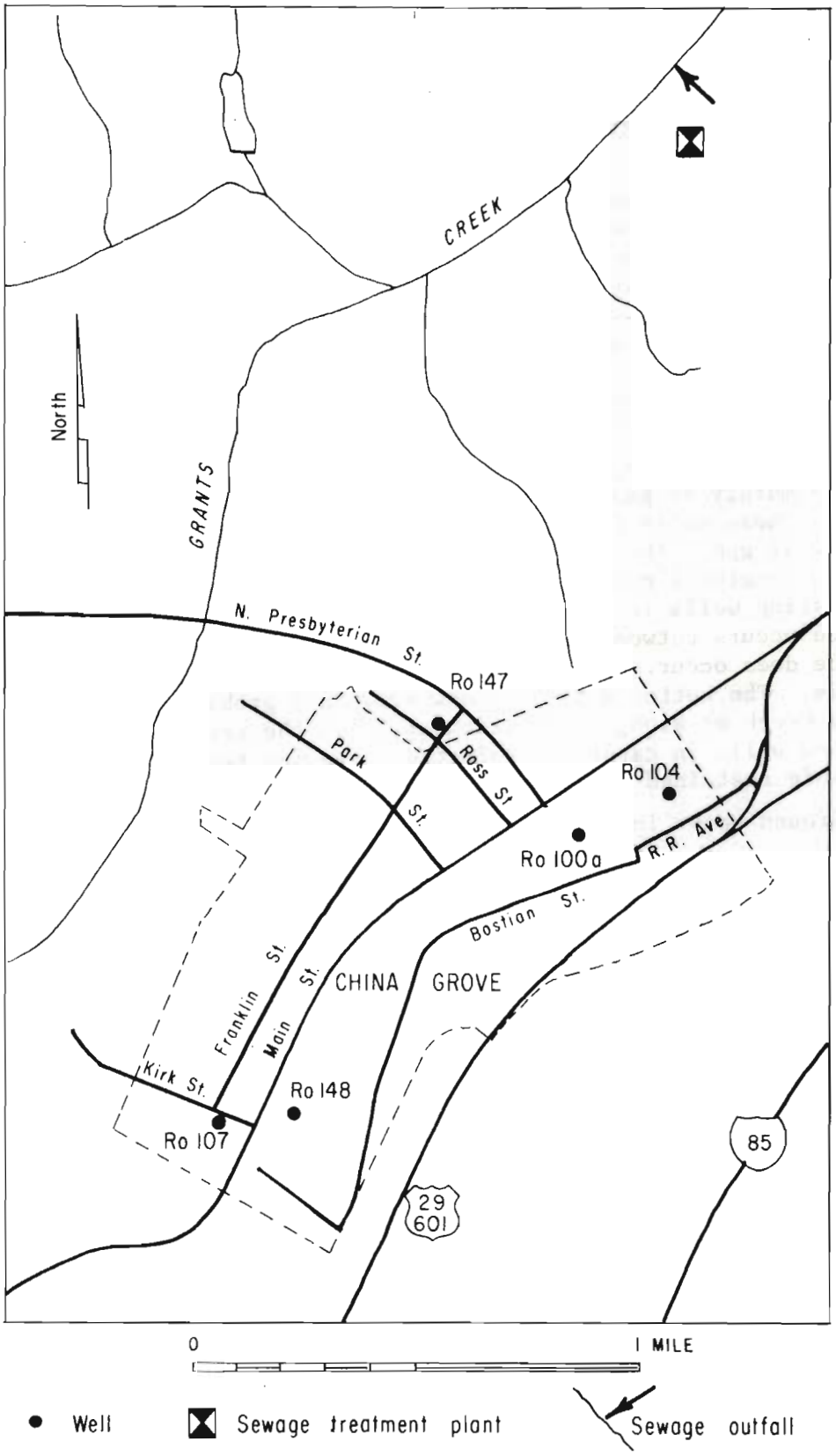
WATER-RESOURCES APPRAISAL:

Surface water: China Grove is located in an upland area in south-central Rowan County. The west half of town is drained by tributaries of Grants Creek and the east half by tributaries of Cold Water Creek. For streams draining the immediate area, the low-flow yield is 0.06 mgd per square mile, the average discharge is 0.65 mgd per square mile, and the 7-day, 2-year low flow is 0.16 mgd per square mile. The larger nearby streams are used for water supply by other cities, or in the case of Grants Creek, for sewage disposal. Thus potential surface water sources are limited. If future demands exceed the capabilities of the present system, the city might consider obtaining supplemental water from Salisbury or Kannapolis.

Ground-water: Underlying the town of China Grove are igneous rocks consisting mainly of gabbro. The municipal water system is supplied by five wells. These wells reportedly have yields ranging from 20 to 60 gpm and average 42 gpm. The total depths of wells range from 650 to 750 feet, and the length of casing ranges from 52 to 168 feet. The minimum spacing of existing wells is about 900 feet. It is not known if pumping interference occurs between the wells, but it is probable that some interference does occur. Additional wells will be needed to meet increasing demands. The better sites for new wells are probably west of town along Grants Creek or along small tributaries of the creek. Properly constructed wells in carefully selected sites may reasonably be expected to have safe sustained yields of 35 to 50 gpm.

Ground water in the area is alkaline and is unusually hard.

CITY OF CHINA GROVE



CHINA GROVE, ROWAN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 3 Raw	Well No. 4 Finished	Well No. 1 Raw
Date of collection.....	7-26-66	7-26-66	5-9-72
Copper (Cu).....	----------	----------	0.016
Cobalt (Co).....	----------	----------	.000
Zinc (Zn).....	----------	----------	.032
Chromium (Cr).....	----------	----------	.00
Boron (B).....	----------	----------	.020
Strontium (Sr).....	----------	----------	.320
Barium (Ba).....	----------	----------	.000
Mercury (Hq).....	----------	----------	<.0005
Lead (Pb).....	----------	----------	.000
Lithium (Li).....	----------	----------	.001
Cadmium (Cd).....	----------	----------	.000
Cyanide (CN).....	----------	----------	.00
Chloride (Cl).....	5.1	5.0	7.0
Manganese (Mn).....	.04	.04	.007
Iron (Fe).....	.15	.06	.000
Calcium (Ca).....	48	56	73
Magnesium (Mg).....	4.7	6.5	6.2
Sodium (Na).....	8.7	12	9.8
Potassium (K).....	3.4	3.5	3.0
Fluoride (F).....	.1	.2	.1
Silica (SiO2).....	29	31	36
Bicarbonate (HCO3).....	124	125	131
Carbonate (CO3).....	----------	----------	0
Sulfate (SO4).....	48	78	109
Nitrate (NO3).....	.1	.1	.6
Dissolved Solids.....	216	255	311
Hardness as CaCO3:			
Total.....	141	168	207
Noncarbonate.....	40	65	100
Alkalinity as CaCO3.....	102	102	107
Specific conductance (micromhos at 25° C)....	314	367	410
pH.....	7.3	8.2	7.8
Temperature (°C).....	18.5	18.5	12

KANNAPOLIS, ROWAN COUNTY

OWNERSHIP:

Cannon Mills. Total population supplied, about 28,400 in 1972 (7,293 metered customers, including 5,527 metered customers of the Kannapolis Sanitary District).

SOURCE:

Irish Buffalo Creek impounded in Lake Kannapolis: The intakes are at the dam at lat 35°30'45", long 80°38'48". The drainage area at the dam is 10 square miles, approximately. For supplementary supply, water is pumped from Coddle Creek and Second Creek to Kannapolis Lake. The Coddle Creek intake is located about 4 miles west of Lake Kannapolis at lat 35°28'57", long 80°43'00". The drainage area at the intake is 26 square miles, approximately. The Second Creek intakes are located about 10 miles north of Kannapolis at lat 35°41'04", long 80°37'31". The drainage area at the intakes is 59 square miles, approximately. Normally Lake Kannapolis is supplemented only by water pumped from Coddle Creek.

RAW-WATER STORAGE:

Lake Kannapolis, 1,350 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft of Second Creek is 4.7 mgd with no storage. Estimated allowable draft of Coddle Creek is 1.6 mgd with no storage. Estimated allowable draft of Kannapolis Lake not determined; carryover storage analysis required.

TOTAL USE:

Average (1971), 12.37 mgd, metered; maximum daily (7-14-71), 17.65 million gallons.

INDUSTRIAL USE:

8.1 mgd, estimated.

TREATMENT:

Prechlorination, coagulation with alum, addition of carbon for control of taste and odor, micro-floc filtration, addition of phosphate compounds for corrosion control, adjustment of pH with soda ash, and post chlorination.

RATED CAPACITY OF TREATMENT PLANT:

15.0 mgd.

PUMPING CAPACITY:

Raw water; from Coddle Creek, 3.0 mgd, from Second Creek, 7.2 mgd. Raw water from Lake Kannapolis flows by gravity to the treatment plant. Finished water, 23.1 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 2 million gallons each; two elevated tanks, 250,000 gallons each. The Kannapolis Sanitary district has two elevated tanks,

KANNAPOLIS, ROWAN COUNTY

500,000 gallons each. For industrial use only there is a 10,000,000 gallon reservoir and two stand pipes, 100,000 gallons each.

FUTURE PLANS:

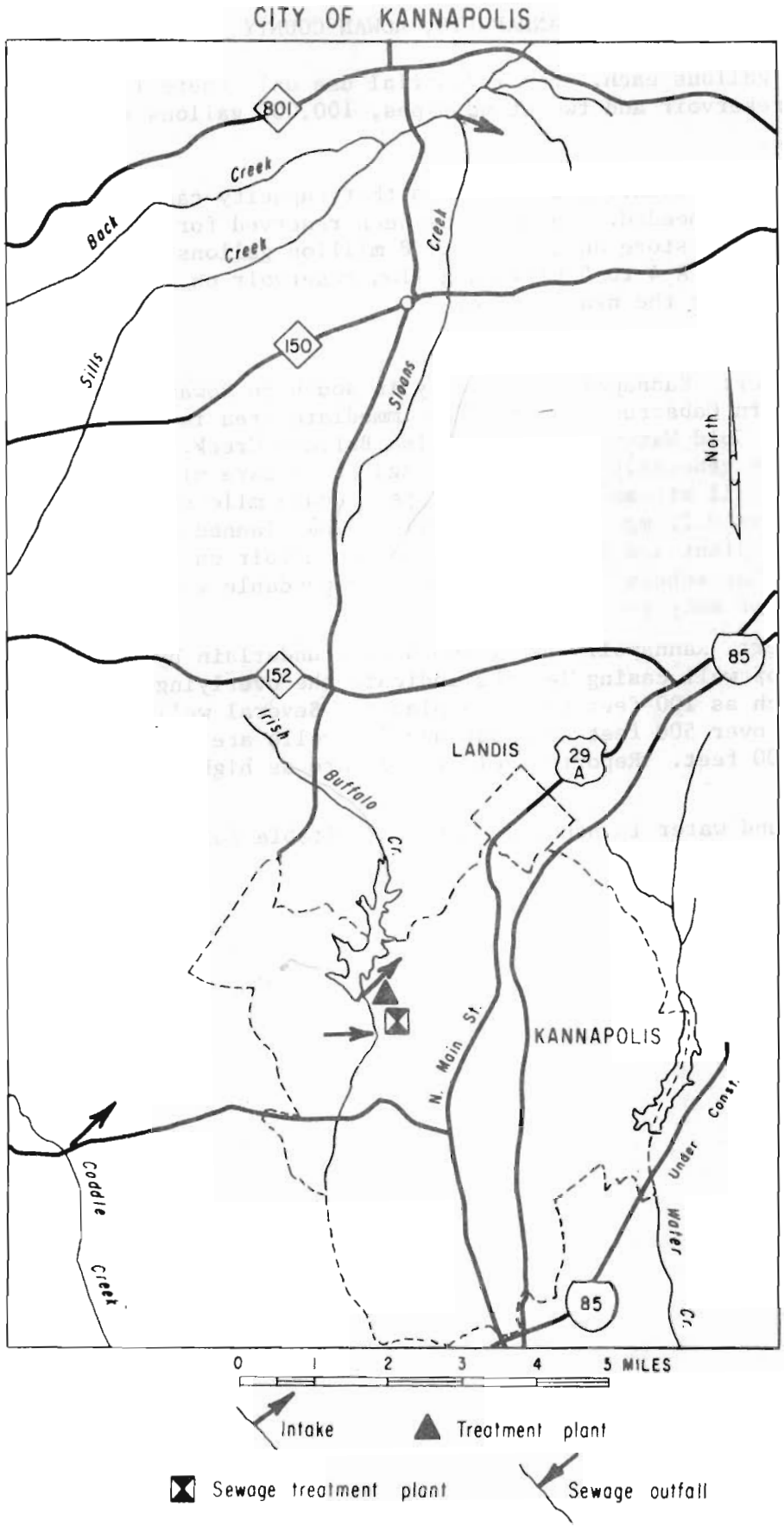
The treatment plant is designed so that capacity can be readily increased to 30 mgd as needed. An area has been reserved for construction of facilities to store an additional 8 million gallons of finished water when needed. A 4 to 5 billion gallon reservoir on Second Creek is to be constructed in the near future.

WATER-RESOURCES APPRAISAL:

Surface water: Kannapolis is partly in southern Rowan County and partly in northern Cabarrus County. The immediate area is drained by tributaries of Cold Water Creek and Irish Buffalo Creek. The low-flow yield of streams generally exceeds 0.10 mgd per square mile. The average discharge of all streams is 0.65 mgd per square mile and the 7-day, 2-year low flow is 0.22 mgd per square mile. The planned expansions of the treatment plant and the new raw-water reservoir on Second Creek, if completed as scheduled, will insure a dependable water supply for Kannapolis for many years.

Ground-water: Kannapolis is predominately underlain by granite. Available records of well casing lengths indicate the overlying weathered material is as much as 100 feet thick in places. Several wells drilled in the area are over 500 feet deep but usually wells are drilled to depths of 100 to 200 feet. Reported well yields are as high as 150 gpm and average 24 gpm.

Ground water is usually soft and suitable for most uses without treatment.


CITY OF KANNAPOLIS
801
Back Creek
Creek
Creek
Sills
150
Sloans
North
85
152
Irish
Buffalo Cr.
LANDIS
29
A
N. Main St.
KANNAPOLIS
Under Const.
Water Cr.
Coddle Creek
85
0 1 2 3 4 5 MILES
Intake
Treatment plant
Sewage treatment plant
Sewage outfall

KANNAPOLIS, ROWAN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Kannapolis L. Raw	Finished	Kannapolis L. Raw	Finished
Date of collection.....	7-26-66	7-26-66	5-9-72	5-9-72
Copper (Cu).....	----------	----------	0.320	0.012
Cobalt (Co).....	----------	----------	.054	.000
Zinc (Zn).....	----------	----------	.020	.097
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.010	.000
Strontium (Sr).....	----------	----------	.150	.150
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.002	.000
Lithium (Li).....	----------	----------	.002	.001
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	3.5	7.4	6.5	8.4
Manganese (Mn).....	.00	.01	.112	.013
Iron (Fe).....	.00	.04	.800	.000
Calcium (Ca).....	7.1	6.7	----------	----------
Magnesium (Mg).....	1.5	2.0	----------	----------
Sodium (Na).....	5.1	13	----------	----------
Potassium (K).....	2.3	2.1	----------	----------
Fluoride (F).....	.2	.3	----------	----------
Silica (SiO2).....	14	15	----------	----------
Bicarbonate (HCO3).....	35	43	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	5.2	10	----------	----------
Nitrate (NO3).....	.3	.2	----------	----------
Dissolved Solids.....	56	78	----------	----------
Hardness as CaCO3:				
Total.....	24	26	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	29	35	----------	----------
Specific conductance (micromhos at 25° C)....	76	116	----------	----------
pH.....	7.3	7.5	----------	----------
Temperature (°C).....	25.5	25.5	17.5	19

LANDIS, ROWAN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,150 in 1972 (985 metered customers, 150 of which are in suburban areas).

SOURCE:

Grants Creek tributary impounded in Lake Wright: The intakes are about 3 miles NW of Landis at lat 35°35'06", long 80°38'05". The drainage area at the dam is 1.9 square miles, approximately. Flat Rock Branch impounded in Lake Corriher: Water is pumped from Lake Wright to Lake Corriher. Water flows from Lake Corriher to a storage reservoir from where it is pumped to the treatment plant. The reservoir intakes are about 1 mile north of Landis at lat 35°33'43", long 80°36'10". The drainage area at Lake Corriher Dam is 2.0 square miles, approximately.

RAW-WATER STORAGE:

Lake Wright, 36.8 million gallons
Lake Corriher, 47.2 million gallons
Reservoir, 14.2 million gallons

ALLOWABLE DRAFT:

Estimated allowable draft is 1.2 mgd with a combined adjusted storage of 94 million gallons.

TOTAL USE:

Average (1971) 0.88 mgd, metered; maximum daily (5-1-72), 1.23 million gallons.

INDUSTRIAL USE:

0.65 mgd, estimated. Principal users include Corlin Processing Company, Linn Mills Company, and Corriher Mills Company.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd.

PUMPING CAPACITY:

From Lake Wright to Lake Corriher, 3.0 mgd; from raw water reservoir, 2.2 mgd; finished water 1.6 mgd.

FINISHED-WATER STORAGE:

Two clear wells, 42,000 and 250,000 gallons; two elevated tanks, 100,000 gallons each; one ground storage tank 1,000,000 gallons.

FUTURE PLANS:

Future plans include a 2 mgd (readily expandable to 3 mgd) addition to

LANDIS, ROWAN COUNTY

the treatment plant, increasing capacity of both lakes, and construction of a 500,000 gallon clear well.

WATER-RESOURCES APPRAISAL:

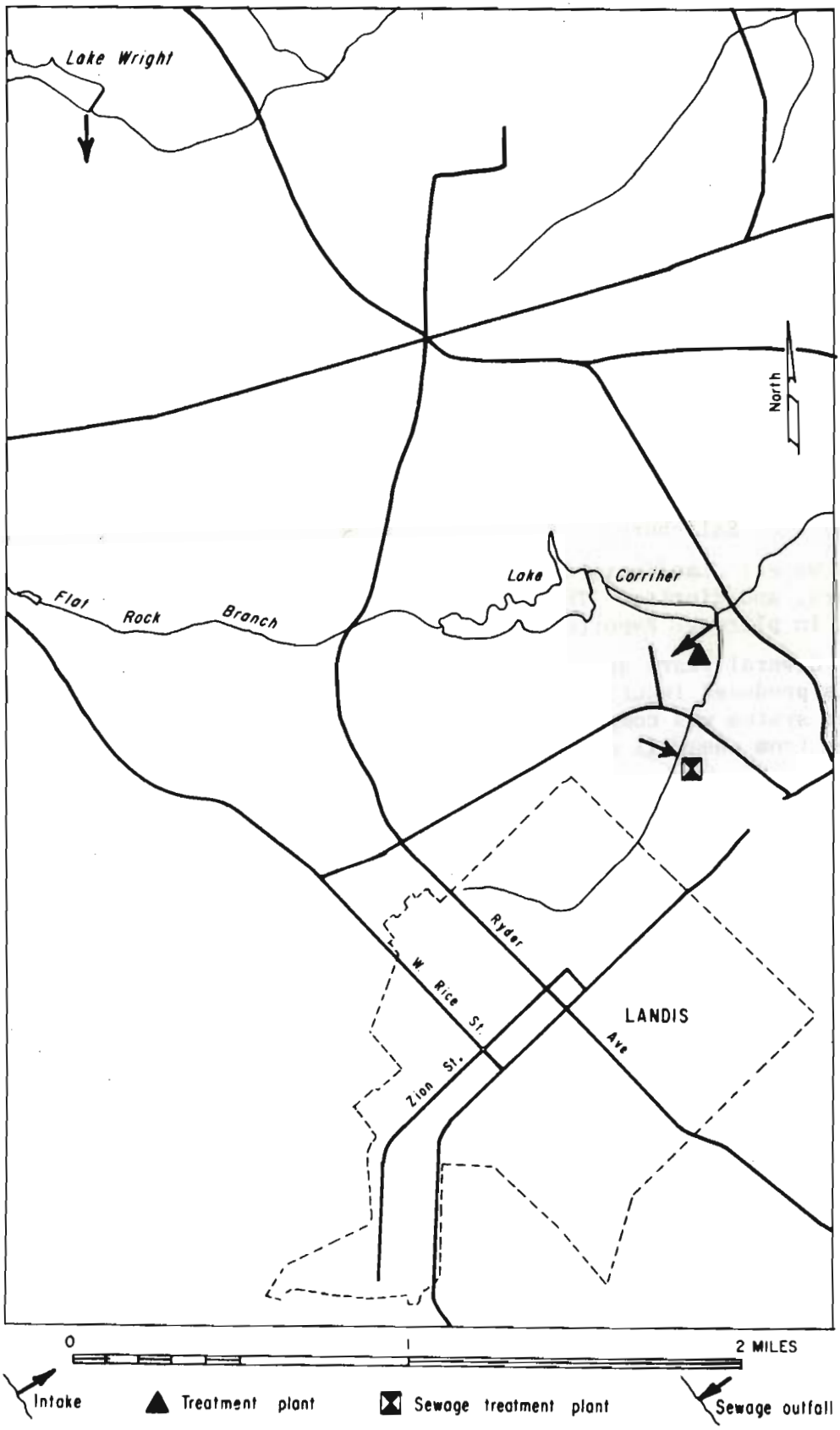
Surface water: Landis is in an upland area in southern Rowan County. The area is drained by small streams radiating in different directions. Thus is not ideally situated for a surface-water supply. The largest nearby streams, including Coddle Creek, Second Creek, and Cold Water Creek, are used as a source of water by other nearby cities. For sfreams draining the immediate vicinity, the low-flow yield is 0.10 mgd per square mile, the average discharge is 0.65 mgd per square mile, and the 7-day, 2-year low flow averages 0.22 mgd per square mile.

The reservoirs currently in use have a capacity large enough to meet the needs of the immediate future when the proposed expansion is completed. However, potential raw-water sources to meet long range needs are limited. If long-range needs beyond present supply capabilites develop, Landis might consider acquiring supplemental water from Kannapolis or Salisbury.

Ground water: Landis is underlain by igneous rocks including granite, gabbro, and diorite. These rocks have weathered to depths of at least 90 feet in places. Reported well yields are as high as 60 gpm.

Several years ago Landis used wells as a source of supply. The wells produced insufficient water and were abandoned when the surface-water system was completed. Reportedly, the water was hard and corrosive. Water from one well contained a fluoride content of 2.2 mg/1.

CITY OF LANDIS



LANDIS, ROWAN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Lakes a/ Raw	Finished	Lakes a/ Raw	Finished
Date of collection.....	11-29-65	11-29-65	5-9-72	5-9-72
Copper (Cu).....	----------	----------	0.150	0.070
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.018	.098
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.021	.018
Strontium (Sr).....	----------	----------	.100	.100
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.002	.002
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	4.2	7.5	13	11
Manganese (Mn).....	.01	.00	.200	.027
Iron (Fe).....	.25	.00	.506	.037
Calcium (Ca).....	4.3	3.9	----------	----------
Magnesium (Mg).....	.6	1.0	----------	----------
Sodium (Na).....	4.0	11	----------	----------
Potassium (K).....	2.0	2.1	----------	----------
Fluoride (F).....	.0	.2	----------	----------
Silica (SiO2).....	11	11	----------	----------
Bicarbonate (HCO3).....	20	24	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	3.4	12	----------	----------
Nitrate (NO3).....	.7	.3	----------	----------
Dissolved Solids.....	47	63	----------	----------
Hardness as CaCO3:				
Total.....	14	14	----------	----------
Noncarbonate.....	0	0	----------	----------
Alkalinity as CaCO3.....	16	20	----------	----------
Specific conductance (micromhos at 25° C)....	52	92	----------	----------
pH.....	6.7	7.0	----------	----------
Temperature (°C).....	11		22.5	22

a/ Mixture from Lakes Wright and Corriher.

SALISBURY, ROWAN COUNTY

OWNERSHIP:

Municipal. Also supplies East Spencer, part of Granite Quarry, and supplements Spencer. Total population supplied, about 33,500 (6,954 metered customers, 274 of which are in suburban areas).

SOURCE:

Yadkin River: The intakes are approximately 600 feet upstream from the mouth of the South Yadkin River at lat 35°44'49", long 80°27'36". The drainage area at the intakes is 2,460 square miles, approximately. Water is pumped to two reservoirs at Ellis Crossroads. From these reservoirs, water flows by gravity supplemented by pumping to the treatment plant.

RAW-WATER STORAGE:

Two reservoirs with a total capacity of 28 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 400 mgd with no storage.

TOTAL USE:

Average (1971) 7.31 mgd, metered; maximum daily (6-7-71), 9.09 million gallons.

INDUSTRIAL USE:

4.0 mgd, estimated. Principal users include Fiber Industries, Cone Mills Corporation, Delta Thread Company, and Republic Foil Division of National Aluminum Corporation.

TREATMENT:

Aeration, prechlorination, coagulation with alum and caustic soda, sedimentation, addition of carbon for control of taste and odor, Anthra-filt filtration, addition of phosphate compounds for corrosion control, adjustment of pH with caustic soda, postchlorination when necessary, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

12.0 mgd.

PUMPING CAPACITY:

Raw water, 12.0 mgd; finished water, 18 mgd.

FINISHED-WATER STORAGE:

Three clear wells, 250,000, 750,000 and 1,000,000 gallons; three elevated tanks, 250,000, 750,000 and 1,000,000 gallons; one standpipe, 1,000,000 gallons.

FUTURE PLANS:

Additional facilities to increase treatment plant capacity to 18 mgd are under construction and are scheduled for completion in mid 1973. Raw-water pumping capacity from the Yadkin River will be increased to 24 mgd.

SALISBURY, ROWAN COUNTY

A new 0.75 to 1.0 million gallon elevated tank is tentatively planned to be built in next 3 to 5 years.

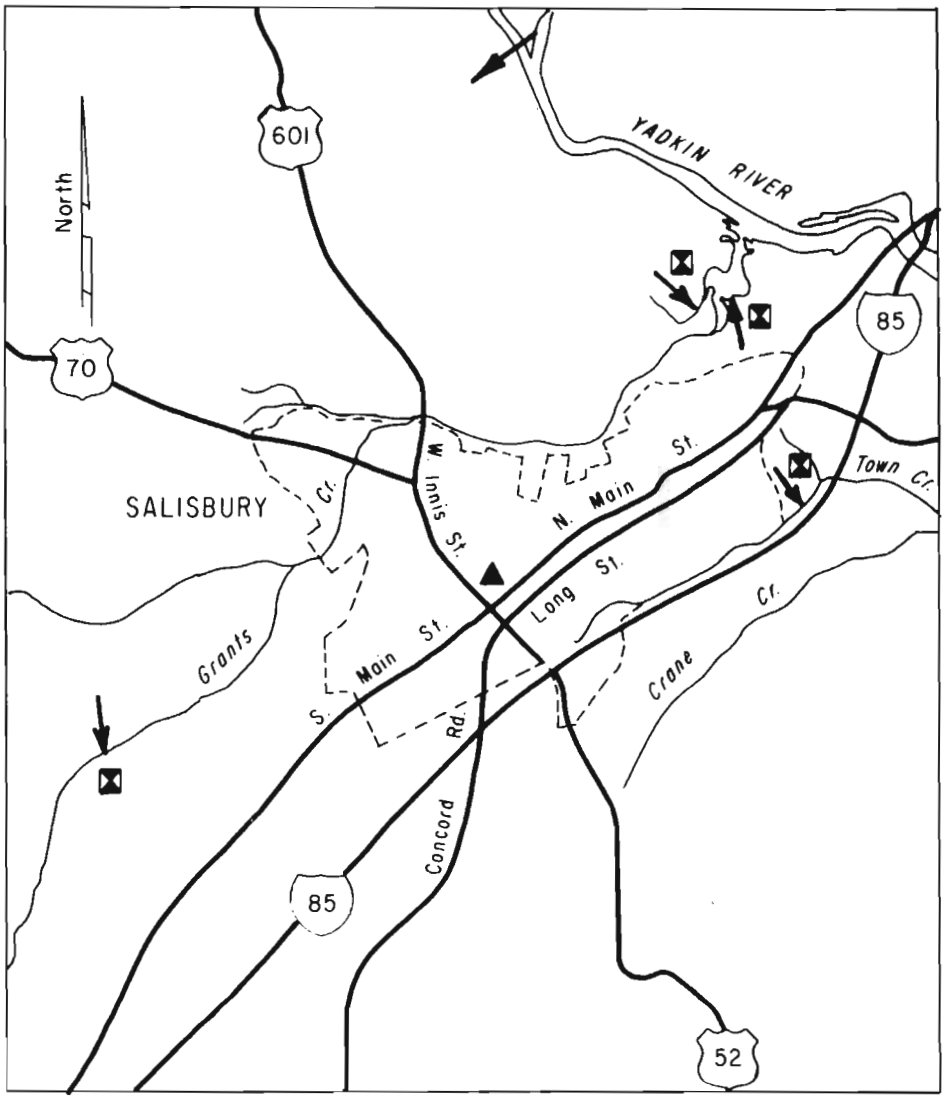
WATER-RESOURCES APPRAISAL:

Surface water: There is ample water in the Yadkin River to supply Salisbury for the foreseeable future. The minimum flow is more than 50 times greater than current use. The raw water pumping station is on the bank of the South Yadkin River and water is also available from this source.

Ground water: Granite and diorite predominate in the Salisbury area. In areas where the overlying layer of weathered rock is thick, several successful wells have been drilled. Yields as high as 50 gpm have been reported and yields of 30-35 gpm are not unusual. With the abundance of surface water available, it is not likely that Salisbury will use ground water for the municipal supply.

The chemical quality of ground water is generally good and suitable for most uses without treatment.

CITY OF SALISBURY



SALISBURY, ROWAN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Yadkin R. Raw	Finished	Yadkin R. Raw a/	Finished
Date of collection.....	9-10-65	9-10-65	5-8-72	5-8-72
Copper (Cu).....	----------	----------	0.120	0.018
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.015	.098
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.015	.000
Strontium (Sr).....	----------	----------	.020	.020
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.003	.004
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	4.5	7.7	4.0	6.4
Manganese (Mn).....	.8	1.1	.079	.017
Iron (Fe).....	.77	.03	.528	.000
Calcium (Ca).....	5.3	9.5	----------	----------
Magnesium (Mg).....	.8	1.1	----------	----------
Sodium (Na).....	5.2	5.9	----------	----------
Potassium (K).....	1.9	1.5	----------	----------
Fluoride (F).....	.1	.9	----------	----------
Silica (SiO2).....	12	12	----------	----------
Bicarbonate (HCO3).....	26	27	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	4.6	10	----------	----------
Nitrate (NO3).....	.3	.1	----------	----------
Dissolved Solids.....	48	65	----------	----------
Hardness as CaCO3:				
Total.....	17	28	----------	----------
Noncarbonate.....	0	6	----------	----------
Alkalinity as CaCO3.....	21	22	----------	----------
Specific conductance (micromhos at 25° C)....	68	94	----------	----------
pH.....	6.4	6.9	----------	----------
Temperature (°C).....	23	23	19	20

a/ Sample aerated.

SPENCER, ROWAN COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 3,100 in 1972 (1,060 metered customers).

SOURCE:

City of Salisbury and four wells (Nos. 1-4).

Well No. 1, Ro-33a, located at lat 35°41'18", long 80°26'27". Driller: _____. Date drilled _____. Total depth: 189 ft. Diam: 8 in. Cased to: 60 ft. Type of finish: open hole. Topography: valley. Aquifer: granite-diorite. Static water level: 10 ft. Yield: 25 gpm. Pumping level _____. Pump setting _____. Type of pump: submersible.

Well No. 2, Ro-143, located at lat 35°42'10", long 80°25'05". Driller: _____. Date drilled: _____. Total depth: 200 ft. Diam: 6 in. Cased to: _____. Type of finish: open hole. Topography: hillside. Aquifer: granite-diorite. Static water level: _____. Yield: 25 gpm. Pumping level: _____. Pump setting: 162 ft. Type pump: submersible.

Well No. 3, Ro-144, located at lat 35°41'32", long 80°25'50". Driller: _____. Date drilled: _____. Total depth: 160 ft. Diam: 6 in. Cased to: _____. Type of finish: open hole. Topography: Valley. Aquifer: _____. Static water level: 5 ft. Yield: 25 gpm. Pumping level: _____. Pump setting: 90 ft. Type pump: submersible.

Well No. 4, Ro-145, located at lat 35°41'51", long 80°26'08". Driller: _____. Date drilled: _____. Total depth: 200 ft. Diam: 6 in. Cased to: _____. Type of finish: open hole. Topography: valley. Aquifer: _____. Static water level: 2 ft. Yield: _____. Pumping level: _____. Pump setting: _____. Type of pump: submersible.

TOTAL USE:

Average (1971) 0.4 mgd, estimated; maximum daily not known.

INDUSTRIAL USE:

Negligible.

TREATMENT:

None.

RATED CAPACITY OF TREATMENT PLANT:

None.

PUMPING CAPACITY:

Not determined.

FINISHED-WATER STORAGE:

Two elevated tanks, 100,000 and 75,000 gallons.

FUTURE PLANS:

None.

SPENCER, ROWAN COUNTY

WATER-RESOURCES APPRAISAL:

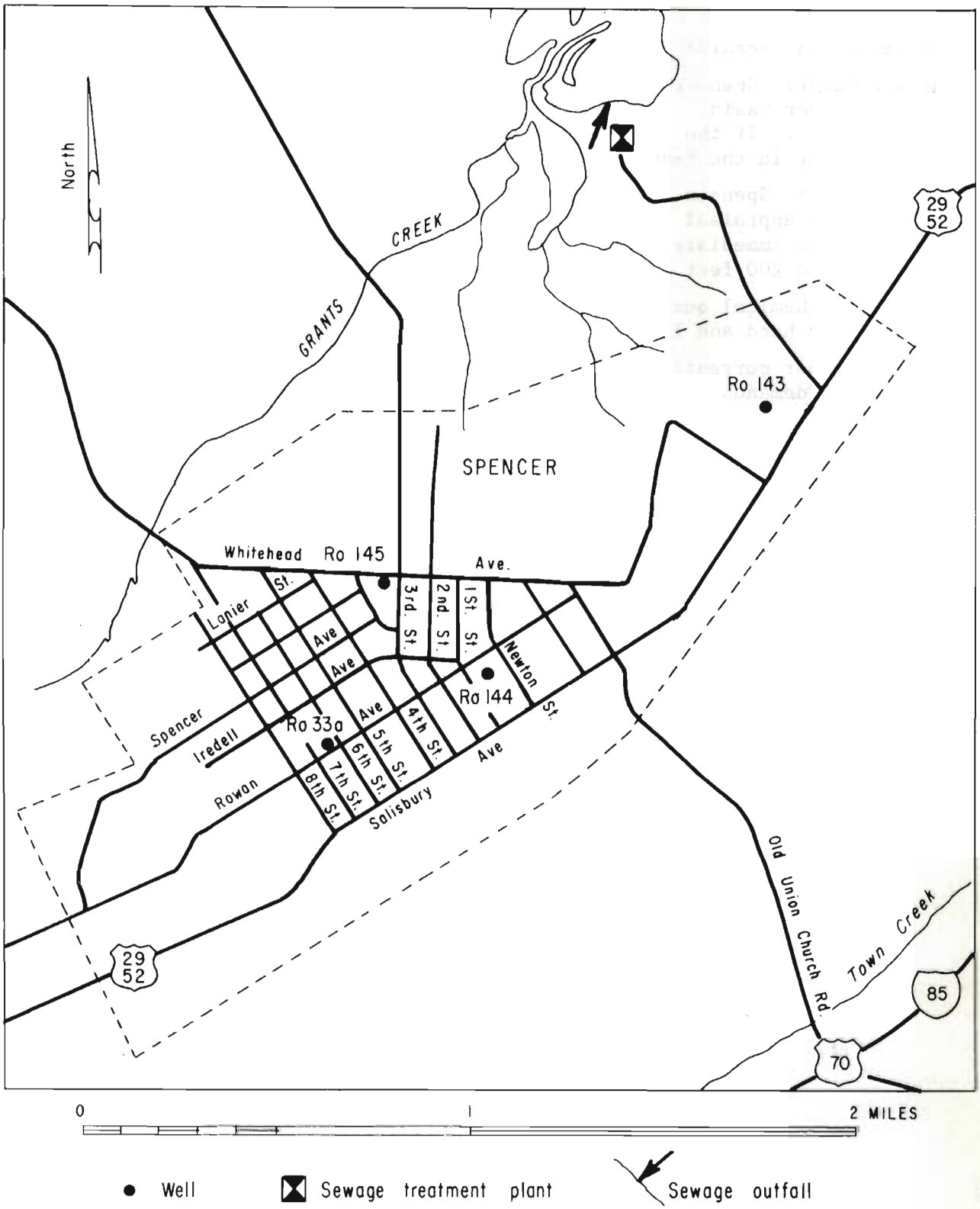
Surface water: Spencer is on a ridge between Grants and Town Creeks of the Yadkin River basin. The Yadkin River and High Rock Lake are within a mile of the City. If the city should decide to use surface water, there is ample water in the Yadkin River to meet the demand.

Ground water: Spencer is underlain by diorite and granite. It is difficult to make an appraisal of the ground-water potential due to a lack of well data in the immediate area. Reportedly, the existing wells range in depth from 160 to 200 feet and the average yield is about 25 gpm.

The chemical quality of ground water is generally good. The water is moderately hard and locally may contain iron in excess of 0.3 mg/l.

Spencer currently obtains about half of its water supply from Salisbury. If demands increase significantly this is probably the best source.

CITY OF SPENCER



SPENCER, ROWAN 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.....	5-19-64	5-19-64	5-19-64	5-19-64
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).....	24	6.8	14	14
Manganese (Mn).....	.00	.00	.00	.00
Iron (Fe).....	.02	.21	.06	.05
Calcium (Ca).....	37	2.7	46	33
Magnesium (Mg).....	13	1.6	13	17
Sodium (Na).....	13	8.2	12	14
Potassium (K).....	1.9	3.0	1.5	1.7
Fluoride (F).....	.1	.0	.2	.4
Silica (SiO2).....	46	29	37	42
Bicarbonate (HCO3).....	122	18	178	168
Carbonate (CO3).....	0	0	0	0
Sulfate (SO4).....	26	.8	24	21
Nitrate (NO3).....	14	14	7.2	8.0
Dissolved Solids.....	235	67	243	243
Hardness as CaCO3:				
Total.....	146	14	168	152
Noncarbonate.....	46	0	22	15
Alkalinity as CaCO3.....	100	15	146	138
Specific conductance (micromhos at 25° C)....	355	81	372	362
pH.....	6.8	6.2	7.3	7.2
Temperature (°C).....	15.5	17.0	17.0	17.0

Note: Additional analyses on the next page.

SPENCER, ROWAN COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 3			
Date of collection.....	5-8-72			
Copper (Cu).....	0.136			
Cobalt (Co).....	.000			
Zinc (Zn).....	.368			
Chromium (Cr).....	.000			
Boron (B).....	.011			
Strontium (Sr).....	.200			
Barium (Ba).....	.000			
Mercury (Hq).....	<.005			
Lead (Pb).....	.007			
Lithium (Li).....	.003			
Cadmium (Cd).....	.001			
Cyanide (CN).....	.00			
Chloride (Cl).....	7.6			
Manganese (Mn).....	.654			
Iron (Fe).....	4.71			
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 (°C).....	----------			

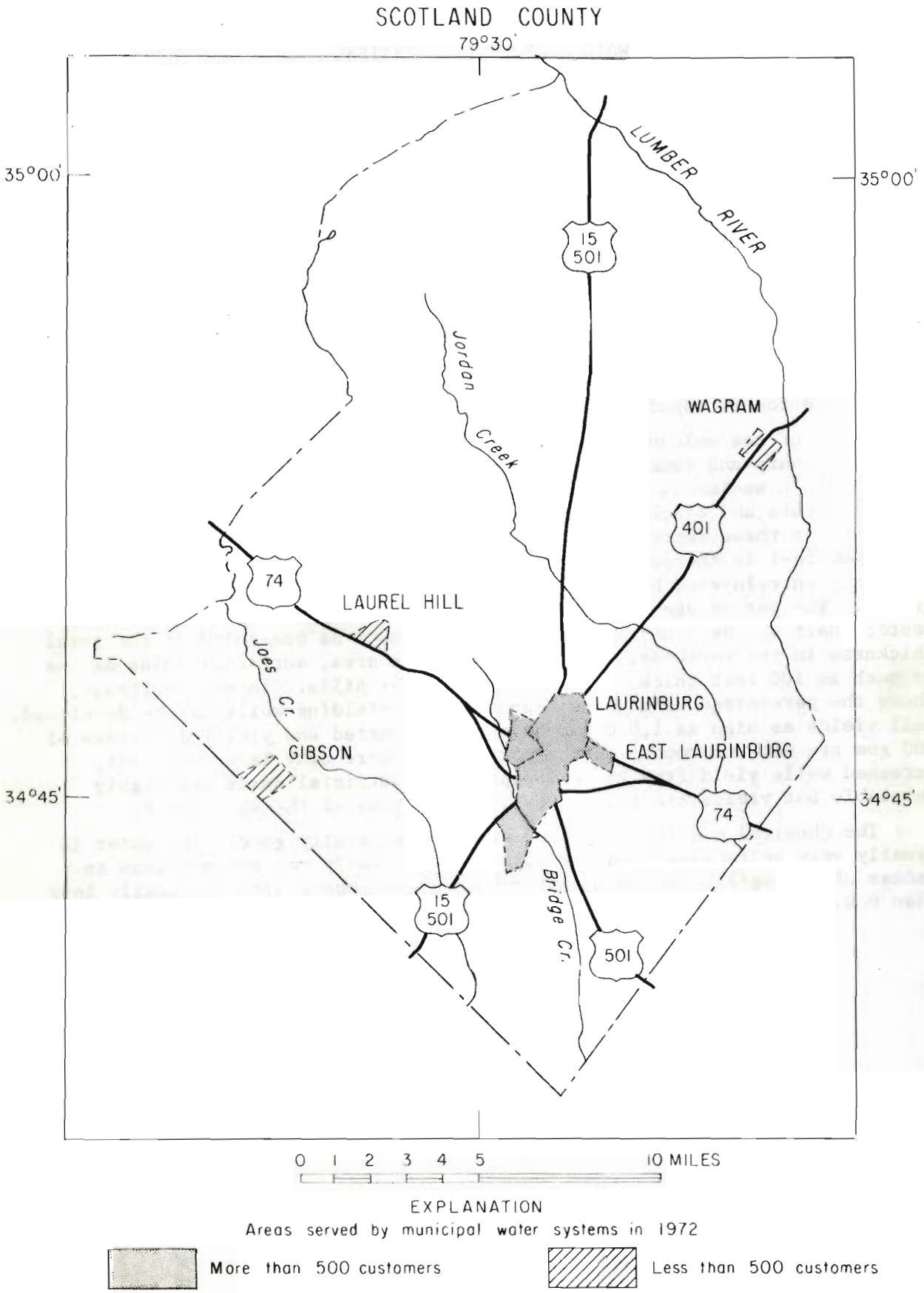
SCOTLAND COUNTY

WATER-RESOURCES APPRAISAL

Scotland County is on the North Carolina-South Carolina state line in the southwestern part of the Coastal Plain Province. The northwestern half of the county is in the Sand Hills section where the topography is characterized by relatively flat-topped sandy hills. The remainder of the county is in the Flatwoods section, which is fairly level but has a few sandy ridges. With the exception of Lumber River, Joes Creek, Bridge Creek and a few smaller streams, streams have their headwaters in the Sand Hills. The low-flow yield of streams is relatively high, ranging from 0.07 to 0.33 mgd per square mile and averaging 0.18 mgd per square mile. For all streams draining the county, the average discharge is 0.75 mgd per square mile, and the 7-day, 2-year low flow averages 0.33 mgd per square mile. Laurinburg obtains about 50 percent of its water supply from Jordan Creek and the remainder from ground water. Laurel Hill, Gibson, and Wagram obtain their municipal supplies from ground water. The county population in 1970 was 26,929.

Rocks of the volcanic slate series underlie Coastal Plain sediments in Scotland County and some Triassic rocks also may be present, but only the Coastal Plain sediments are exposed. The Coastal Plain deposits consist of the Tuscaloosa and Black Creek Formations and surficial sands. The total thickness of these deposits increases from about 200 feet in the northwest to about 400 feet in the southeast. These deposits consist principally of complexly interlayered beds of sand, clay, sandy clay, clayey sand, and gravel. The percentage of sand and gravel is relatively minor in the northwestern half of the county but may occupy as much as one-third of the total thickness in the southeast. In the Sand Hills area, surficial sands may be as much as 100 feet thick in some of the higher hills. In the southeast, where the percentage of sand is highest, high-yielding wells may be developed. Well yields as high as 1,000 gpm have been reported and yields in excess of 300 gpm are not uncommon. In the northwest, where clay is predominant, screened wells yield from 25 to 75 gpm. The surficial sands are highly permeable but yields are limited by the thickness of the sand layer.

The chemical quality of ground water is generally good. The water is usually very soft, acidic and corrosive, and locally may contain iron in excess of 0.3 mg/l. The pH of water in the Laurinburg area is usually less than 6.0.


SCOTLAND COUNTY
79°30'
35°00'
35°00'
34°45'
34°45'
LUMBER RIVER
15
501
Jordan Creek
WAGRAM
401
74
LAUREL HILL
Joes Cr.
LAURINBURG
EAST LAURINBURG
GIBSON
74
15
501
Bridge Cr.
501
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

LAURINBURG, SCOTLAND COUNTY

OWNERSHIP:

Municipal. Also supplies East Laurinburg. Total population supplied about 10,200 in 1972 (3,937 metered customers, 435 of which are in suburban areas).

SOURCE:

Jordan Creek: The intake is at the downstream side of the bridge on secondary road 1425, about 3.2 miles northeast of the treatment plant at lat 34°48'28", long 79°24'33". The drainage area at the intake is 51.6 square miles.

Four wells (Nos. 1-4).

Well No. 1 (Johnson School), Sc-37, located at lat 34°46'59", long 79°26'43". Driller: Butler Well Co. Date drilled: 1953. Total depth: 350 ft. Diameter: 8 in. Cased to: _____. Type of finish: gravel pack and slotted casing. Topography: flat. Aquifer: sand. Static water level: _____. Yield: 300 gpm. Pumping level: _____. Pump setting: 90 ft. Type pump: turbine.

Well No. 2 (U.S. 74 bypass), Sc-38, located at lat 34°45'23", long 79°28'17". Driller: Carolina Well and Pump Co. Date drilled: Feb. 1964. Total depth: 250 feet. Diam: 10 in. Cased to: _____. Type of finish: gravel packed and screened. Topography: flat. Aquifer: sand. Static water level: 17 ft. Yield: 450 gpm. Pumping level: _____. Pump setting: 90 ft. Type pump: turbine.

Well No. 3 (treatment plant), Sc-39, located at lat 34°46'57", long 79°27'54". Driller: Carolina Well and Pump Co. Date drilled: 1967. Total depth: 365 ft. Diam. 10 in. Cased to: _____. Type finish: gravel packed and screened. Topography: slope. Aquifer: sand. Static water level: 14 ft. Yield: 340 gpm. Pumping level: _____. Pump setting: 140 feet. Type pump: turbine.

Well No. 4 (U.S. 74 bypass), Sc-40, located at lat 34°45'20", long 79°28'10". Driller: Carolina Well and Pump Co. Date drilled: July 1969. Total depth: 240 ft. Cased to: 70 ft. Type of finish: gravel packed and screened. Topography: flat. Aquifer: sand. Static water level: 7 ft. Yield: 700 gpm. Pumping level: 58 ft. Pump setting: 100 ft. Type pump: turbine.

RAW-WATER STORAGE:

None.

ALLOWABLE DRAFT:

Estimated allowable draft of Jordan Creek is 1.7 mgd with no storage.

TOTAL USE:

Average (1971) 1.47 mgd, metered; maximum daily (June 1970), 2.350 million gallons.

INDUSTRIAL USE:

0.7 mgd, estimated. Principal users include Waverly Mills, Inc., Abbott

LAURINBURG, SCOTLAND COUNTY

Laboratories, Spring Mills, Inc., Rea Magnet Wire, Inc., and McGraw Edison Co.

TREATMENT:

Surface water: 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, postchlorination, and fluoridation.

Ground-water: Chlorination, adjustment of pH with caustic soda, addition of phosphate compounds for corrosion control, and fluoridation. Water from wells 2 and 4 is aerated.

RATED CAPACITY OF TREATMENT PLANT:

1.0 mgd. (Surface water only.)

PUMPING CAPACITY:

Surface water: Raw water, 1.0 mgd; finished water, 1.6 mgd. Water from well No. 3 is pumped to the clear well and is included in the finished water pumping capacity.

Ground water: Water from wells 1, 2, and 4 is pumped direct to the distribution system. Capacity approximately 2.1 mgd (equals the reported yield of the three wells).

FINISHED-WATER STORAGE:

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

FUTURE PLANS:

In February 1973, a consulting engineer was making a comprehensive analysis of the system and will make recommendations for expansion.

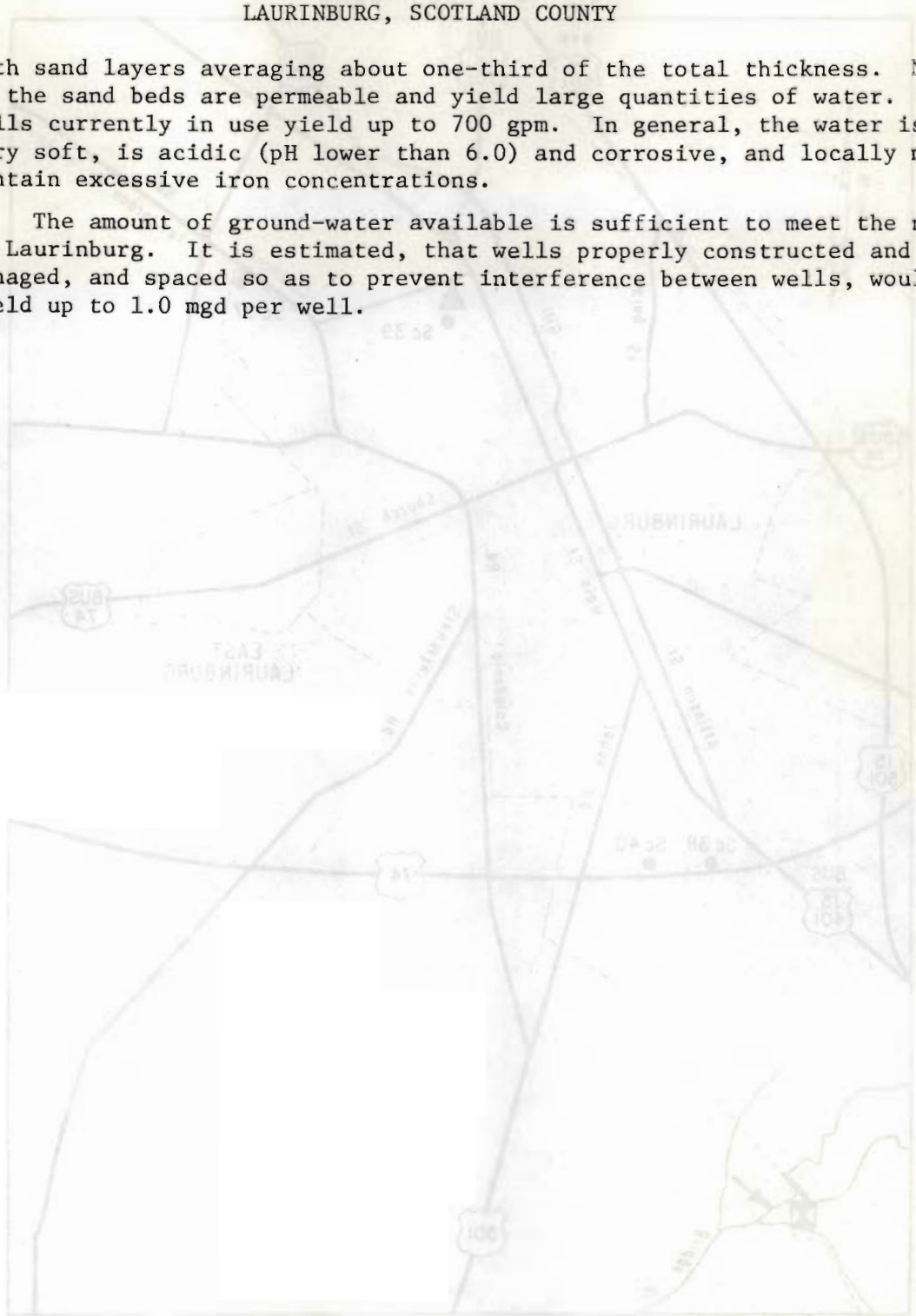
WATER-RESOURCES APPRAISAL:

Surface-water: Laurinburg is in the Flatwoods Section in south-central Scotland County. Most streams draining the area originate in the Sand Hills section. Swampy areas border most streams. The low-flow yield of streams is relatively high, ranging from 0.1 to 0.2 mgd per square mile. Occasionally, small streams draining less than 5 square miles go dry. The average discharge of streams is 0.70 to 0.85 mgd per square mile and the 7-day, 2-year low flow averages 0.3 mgd per square mile. Currently, about half of Laurinburg's water supply is obtained from surface water and the remainder from ground water. The total use exceeds the capacity of the surface-water treatment plant and is approaching the allowable draft of Jordan Creek. The allowable draft of Jordan Creek could be increased significantly by providing storage.

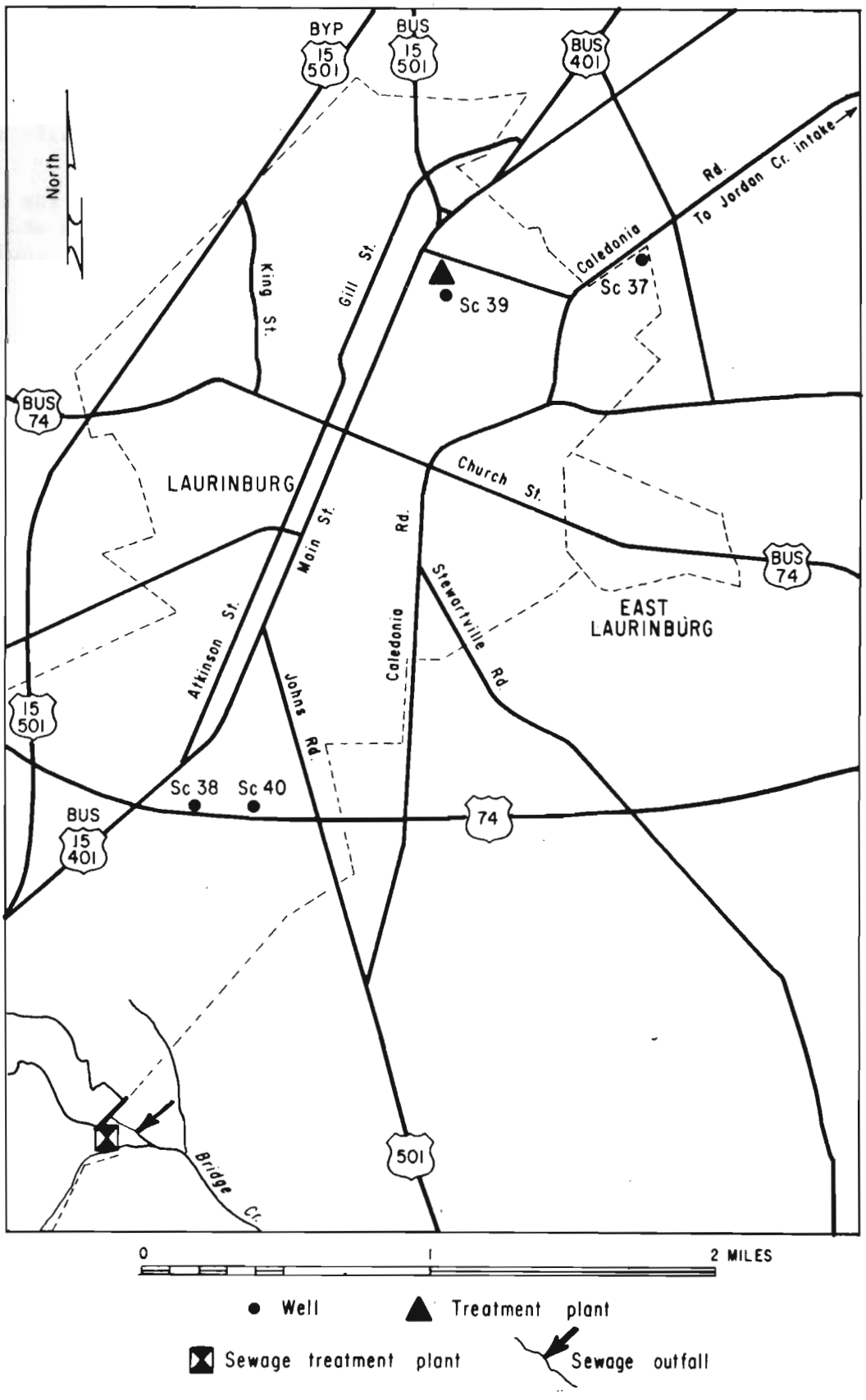
Ground water: The Cretaceous sand aquifer, consisting of alternating strata of sand and clay, underlies Laurinburg. This aquifer includes coastal plain sediments of the Black Creek and Tuscaloosa Formations. The total thickness of the sediments averages about 300 feet in the area

with sand layers averaging about one-third of the total thickness. Most of the sand beds are permeable and yield large quantities of water. The wells currently in use yield up to 700 gpm. In general, the water is very soft, is acidic (pH lower than 6.0) and corrosive, and locally may contain excessive iron concentrations.

The amount of ground-water available is sufficient to meet the needs of Laurinburg. It is estimated, that wells properly constructed and managed, and spaced so as to prevent interference between wells, would yield up to 1.0 mgd per well.



CITY OF LAURINBURG



LAURINBURG, SCOTLAND COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Juniper Cr. Raw	Well No. 1 Raw	Well No. 2 Raw	Mixed Finished
Date of collection.....	11-30-65	11-30-65	11-30-65	
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).....	3.2	4.7	3.7	10
Manganese (Mn).....	.02	.01	.01	.02
Iron (Fe).....	.25	.33	.59	.02
Calcium (Ca).....	.7	1.3	1.3	15
Magnesium (Mg).....	.3	.4	.2	.3
Sodium (Na).....	1.8	3.6	2.2	4.4
Potassium (K).....	.4	.8	.3	.4
Fluoride (F).....	.0	.1	.2	1.2
Silica (SiO2).....	6.8	9.6	8.2	6.9
Bicarbonate (HCO3).....	2	1	1	15
Carbonate (CO3).....	0	0	0	0
Sulfate (SO4).....	1.6	8.0	3.8	20
Nitrate (NO3).....	.4	.4	1.0	.4
Dissolved Solids.....	27	30	27	80
Hardness as CaCO3:				
Total.....	5	6	4	42
Noncarbonate.....	4	4	3	30
Alkalinity as CaCO3.....	2	1	1	12
Specific conductance (micromhos at 25° C)....	19	40	29	110
pH.....	5.2	5.0	4.9	7.1
Temperature (°C).....	11.5	17.0	17.0	--------

Note.--Additional analyses on next page.

LAURINBURG, SCOTLAND COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Well No. 4 Raw	Well No. 4 Finished		
Date of collection.....	2-15-73	2-15-73		
Copper (Cu).....	0.023	0.013		
Cobalt (Co).....	.000	.000		
Zinc (Zn).....	.090	.045		
Chromium (Cr).....	.000	.000		
Boron (B).....	.000	.000		
Strontium (Sr).....	.000	.000		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	----------	----------		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.000	.000		
Cadmium (Cd).....	.000	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	4.2	5.2		
Manganese (Mn).....	.032	.034		
Iron (Fe).....	.490	.391		
Calcium (Ca).....	.6	.7		
Magnesium (Mg).....	.8	1.2		
Sodium (Na).....	1.8	8.4		
Potassium (K).....	.5	.5		
Fluoride (F).....	.0	1.3		
Silica (Si02).....	10	10		
Bicarbonate (HCO3).....	0	2		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	6.6	6.2		
Nitrate (NO3).....	.00	.40		
Dissolved Solids.....	23	36		
Hardness as CaCO3:				
Total.....	5	7		
Noncarbonate.....	5	0		
Alkalinity as CaCO3.....	0	0		
Specific conductance (micromhos at 25° C)....	39	53		
pH.....	4.5	6.5		
Temperature (°C).....	----------	----------		

STANLY COUNTY

WATER-RESOURCES APPRAISAL

Stanly County is in the southeastern part of the Piedmont Province. The topography ranges from level to rolling to mountainous and is more rugged near the larger streams, particularly along the Pee Dee River. Tuckertown Lake, Badin Lake, Lake Tillery and the Pee Dee River are on the east boundary of the county and the Rocky River is the south boundary. Tributaries of these rivers drain the county. Minimum flows of the tributaries are low, ranging from 0 to 0.07 mgd per square mile. Their average discharge is 0.65 mgd per square mile and their 7-day, 2-year low flow averages 0.10 mgd per square mile. The Pee Dee and Rocky are major rivers draining approximately 6,120 square miles, at their confluence in Stanly County. The combined average discharge of these rivers is on the order of 4,300 mgd. Therefore, even though low flow of the tributary streams is small, there is an abundance of surface water available for public water supplies.

Albemarle, Badin, and Norwood obtain their municipal supplies from surface sources. Oakboro, other smaller communities, and most rural domestic water supplies use ground water. The county's population in 1970 was 42,822.

Rocks of the Carolina Slate Belt, principally laminated and tuffaceous volcanic slates containing lenses of fragmental and flow material, underlie Stanly County. The volcanics, chiefly tuffs, breccias and flows, overlie the slates in the northern and eastern parts. They form the caps of most of the higher hills in the eastern part. The depth of weathered material overlying all rock units ranges from a few inches to as much as 100 feet. The average depth of weathered material, as indicated by reported well casing lengths is 35 feet.

The average yield of 184 drilled wells is 15 gpm with a range of 0.5 to 200 gpm and an average depth of 112 feet. No one section of the county can be said to be a better ground-water producer than another, and local conditions should be given considerable attention in locating well sites. The topography influences ground-water availability. The following table of well yields and average depth of wells in various topographic settings can be used as a guide in selecting well sites.

Topographic location	Average depth (feet)	Yield (gpm)	
		Range	Average
Hill	101	1/2 - 30	9
Flat	105	1/2 - 95	11
Slope	143	1 - 180	24
Draw	88	9 - 90	35
Valley	194	5 - 200	46

The chemical quality of ground water is acceptable for most uses. In summary, the water ranges from hard to very hard, and locally may contain excessive concentrations of iron, calcium, and magnesium.

STANLY COUNTY

WATER-RESOURCES APPRAISAL

Potential supplies of ground water are adequate, with proper planning and management, for small industrial and small municipal needs. It is estimated that the quantity of ground water available is 0.15 to 0.25 mgd per square mile.

name and address
==========

ALBEMARLE WATER TREATMENT PLAN PO BOX 190 ALBEMARLE 28001 Stanly Co. 704-982-0131

Stanly county: 084 population served: 000017500 average production: 0008000000 No of connections: 0005200

name and address
==========

NORWOOD TOWN OF BX 721 NORWOOD 28128 704-474-5416

county: 084 population served: 000002500 average production: 0000384000 No of connections: 0000714

name and address
==========

OAKBORO TOWN OF PO BOX 610 OAKBORO 28129

county: 084 population served: 000001500 average production: 0000000000 No of connections: 0000483

name and address
==========

PFEIFFER N STANLY WATER ASSOC. PO BOX 375 RICHFIELD 28137

county: 084 population served: 000001600 average production: 0000000000 No of connections: 0000800

name and address
==========

STANLY CO UTILITY DEPT 201 S SECOND ST ROOM #303 ALBEMARLE 28001 704-983-7319

Purchase from Albemarle

county: 084 population served: 000005000 average production: 0000000000 No of connections: 0001663

name and address
==========

GREATER BADIN WATER DISTRICT 201 S SECOND ST-ROOM 303 ALBEMARLE 28001

Purchases from ALCOA

county: 084 population served: 000001900 average production: 0000000000 No of connections: 0000660

name and address
==========

PINEY POINT #1 WATER SYSTEM 949 OLD CHARLOTTE ROAD ALBERMARLE 28001

Norwood.

county: 084 population served: 000000240 average production: 0000000000 No of connections: 0000060

name and address
==========

TURNER-LEE SUBDIVISION 949 OLD CHARLOTTE ROAD ALBERMARLE 28001

Norwood ?

county: 084 population served: 000000280 average production: 0000000000 No of connections: 0000070

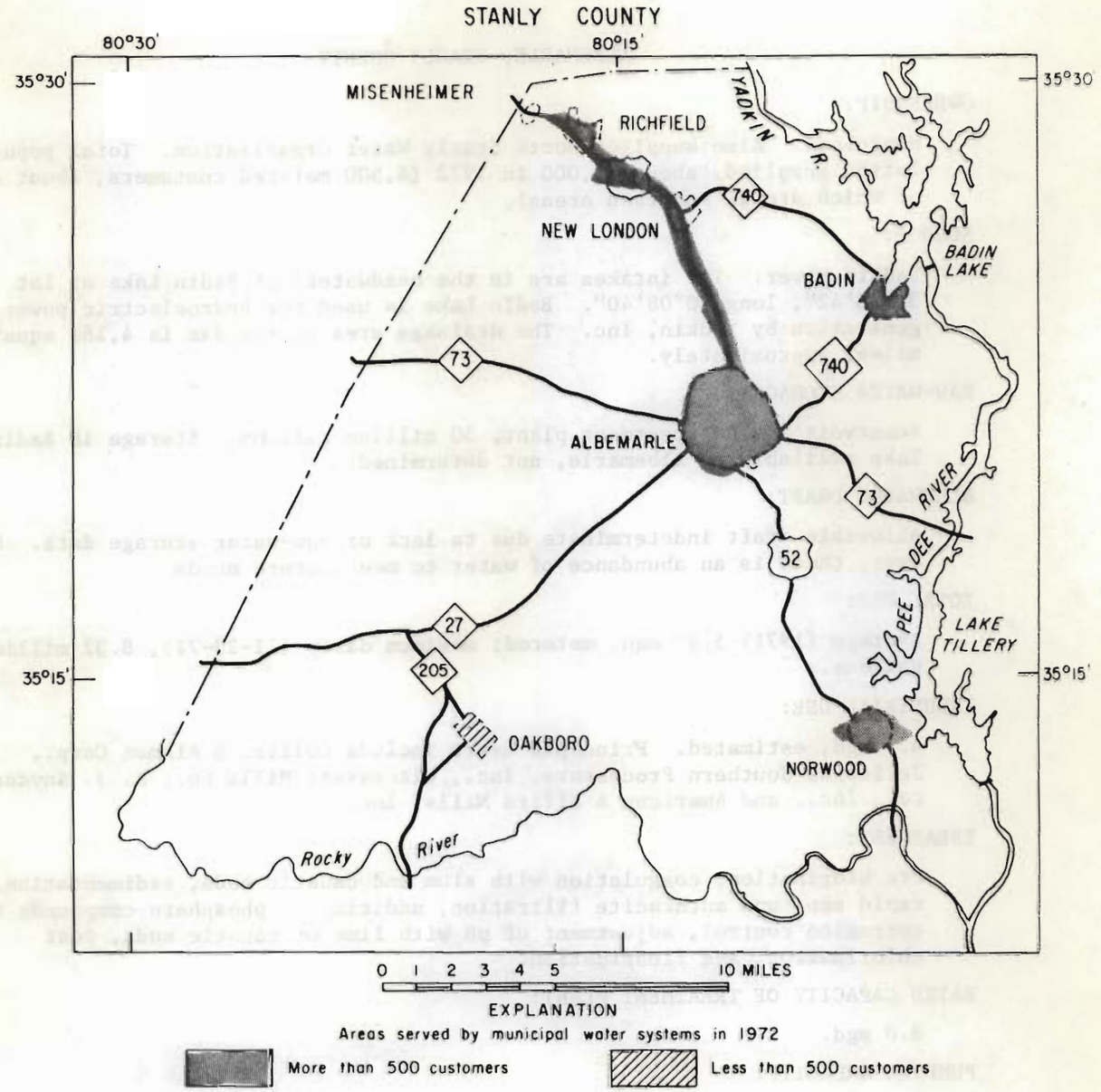
name and address
==========

NORWOOD CAMPING RESORT RT 3 BOX 335 NORWOOD next to Lake Tillery 28128 474-3800 Ray Brown Pir Town of Norwood

Burt Slater owner

county: 084 population served: 000000~~250~~ 400-500 average production: 0000000000 No of connections: 0000~~114~~ 120

name and address 3 wells 265'; 2hp 85' 125' ¾ hp
==========


STANLY COUNTY
80°30'
80°15'
35°30'
35°15'
MISENHEIMER
RICHFIELD
YADKIN R.
NEW LONDON
740
BADIN LAKE
BADIN
73
740
ALBEMARLE
73
RIVER
52
DEE
PEE
LAKE TILLERY
27
205
OAKBORO
NORWOOD
Rocky River
0 1 2 3 4 5 10 MILES
EXPLANATION
Areas served by municipal water systems in 1972
More than 500 customers
Less than 500 customers

ALBEMARLE, STANLY COUNTY

OWNERSHIP:

Municipal. Also supplies North Stanly Water Organization. Total population supplied, about 12,000 in 1972 (4,500 metered customers, about 250 of which are in suburban areas).

SOURCE:

Yadkin River: The intakes are in the headwaters of Badin Lake at lat 35°28'42", long 80°08'40". Badin Lake is used for hydroelectric power generation by Yadkin, Inc. The drainage area at the dam is 4,180 square miles, approximately.

RAW-WATER STORAGE:

Reservoir at the treatment plant, 30 million gallons. Storage in Badin Lake available to Albemarle, not determined.

ALLOWABLE DRAFT:

Allowable draft indeterminate due to lack of raw-water storage data. However, there is an abundance of water to meet future needs.

TOTAL USE:

Average (1971) 5.87 mgd, metered; maximum daily (11-23-71), 8.32 million gallons.

INDUSTRIAL USE:

4.1 mgd, estimated. Principal users include Collins & Aikman Corp., Jefferies Southern Processors, Inc., Wiscassett Mills Co., E. J. Snyder Co., Inc., and American & Effird Mills, Inc.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

8.0 mgd.

PUMPING CAPACITY:

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

FINISHED-WATER STORAGE:

Two clear wells, 1,500,000 gallons each; two elevated tanks, 200,000 and 1,700,000 gallons; one standpipe, 500,000 gallons.

FUTURE PLANS:

A general renovation and expansion of the system is planned, to include: conversion to liquid chemical feed; filter conversion to high rate (3 gallons per minute per square foot) to increase capacity of plant to 12.0 mgd; construction of another clear well and an elevated tank; and installation of additional pumping facilities.

ALBEMARLE, STANLY COUNTY

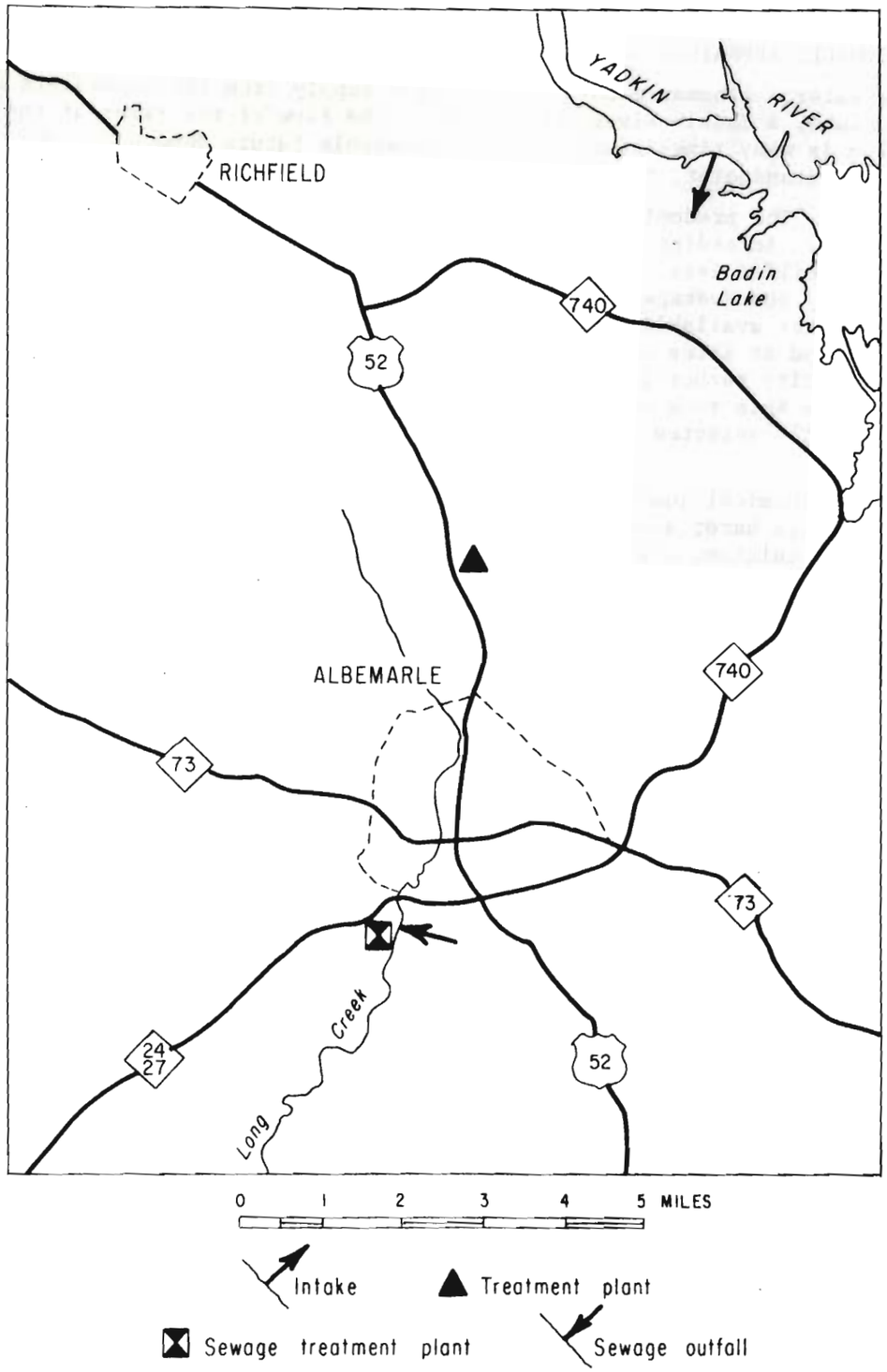
WATER-RESOURCES APPRAISAL:

Surface water: Albemarle obtains its water supply from the headwaters of Badin Lake, a Yadkin River impoundment. The flow of the river at the intakes is many times greater than foreseeable future demand. From a quantity standpoint, the Yadkin River is the best source available.

Ground-water: The predominant rock type underlying Albemarle is tuffaceous argillite. According to available records, wells in this rock unit are usually drilled less than 150 feet and the average yield is 13 gpm. This relatively low average yield is probably not indicative of the amount of ground water available. The average includes many domestic wells that are drilled at sites convenient to the point of use and often reflect pump capacity rather than true yield. In nearby Oakboro, municipal wells drilled in this rock unit yield from 54 to 100 gpm. If wells are drilled in carefully selected sites, yields up to 30 gpm might be reasonably expected.

The chemical quality of ground water is generally good. As a rule, the water is hard, and contains moderate amounts of iron. Locally, chloride, calcium, and magnesium concentrations may be higher than desirable.

CITY OF ALBEMARLE



ALBEMARLE, STANLY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Yadkin R. Raw	Finished		
Date of collection.....	6-7-72	6-7-72		
Copper (Cu).....	0.032	0.024		
Cobalt (Co).....	.000	.006		
Zinc (Zn).....	.008	.006		
Chromium (Cr).....	.00	.00		
Boron (B).....	.030	.000		
Strontium (Sr).....	.050	.050		
Barium (Ba).....	.000	.000		
Mercury (Hq).....	<.0005	<.0005		
Lead (Pb).....	.000	.000		
Lithium (Li).....	.016	.015		
Cadmium (Cd).....	.000	.000		
Cyanide (CN).....	.00	.00		
Chloride (Cl).....	4.4	8.0		
Manganese (Mn).....	.000	.003		
Iron (Fe).....	.000	.000		
Calcium (Ca).....	4.8	4.6		
Magnesium (Mg).....	1.9	2.2		
Sodium (Na).....	3.8	9.6		
Potassium (K).....	1.6	1.8		
Fluoride (F).....	.1	1.0		
Silica (SiO2).....	11	11		
Bicarbonate (HCO3).....	21	18		
Carbonate (CO3).....	0	0		
Sulfate (SO4).....	5.6	14		
Nitrate (NO3).....	.54	.50		
Dissolved Solids.....	52	61		
Hardness as CaCO3:				
Total.....	20	21		
Noncarbonate.....	3	6		
Alkalinity as CaCO3.....	17	15		
Specific conductance (micromhos at 25° C)....	62	90		
pH.....	6.5	6.4		
Temperature (°C).....	23	23		

BADIN, STANLY COUNTY

OWNERSHIP:

Aluminum Company of America. Total population supplied, about 2,200 in 1972 (644 metered customers).

SOURCE:

Yadkin River impounded in Badin Lake: The intakes are at the dam at lat 35°25'10", long 80°50'34". Badin Lake is used primarily for hydroelectric power generation by Yadkin, Inc. The drainage area at the dam is 4,180 square miles, approximately.

RAW-WATER STORAGE:

Badin Lake, 78.5 billion gallons.

ALLOWABLE DRAFT:

Allowable draft not determined. However, there is ample water to meet future needs.

TOTAL USE:

Average (1971) 1.04 mgd, metered; maximum daily (8-21-71), 1.5 million gallons.

INDUSTRIAL USE:

0.8 mgd, estimated.

TREATMENT:

Aeration, prechlorination, coagulation with alum, lime, and soda ash, sedimentation, rapid sand filtration, ammoniation, adjustment of pH with soda ash, postchlorination, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

1.5 mgd.

PUMPING CAPACITY:

Raw water, 2.7 mgd; finished water, gravity flow.

FINISHED-WATER STORAGE:

Two clear wells, 1,000,000 and 500,000 gallons.

FUTURE PLANS:

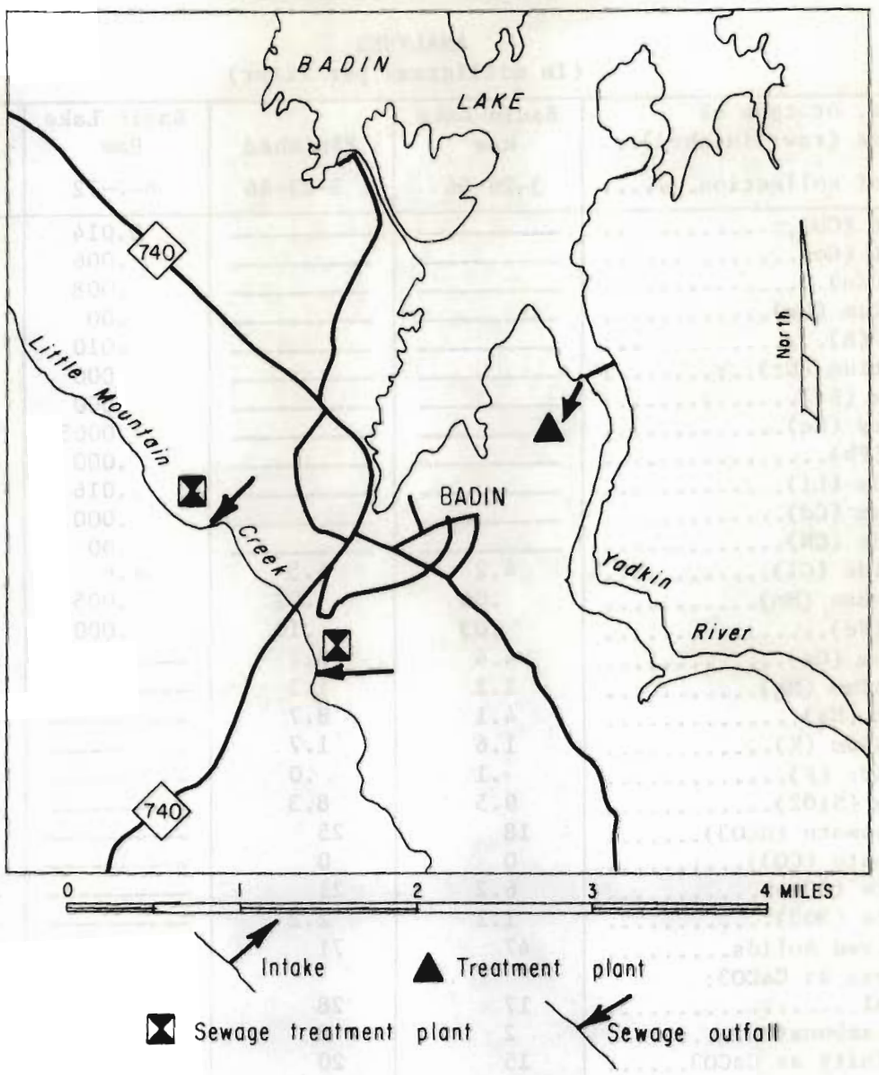
None.

WATER-RESOURCES APPRAISAL:

Surface water: Badin is on the shores of Badin Lake, a Yadkin River impoundment. There is more than enough water to meet Badin's water supply needs in the foreseeable future.

Ground water: The Badin area is underlain by laminated argillite. It is not likely that Badin will ever use ground-water for public supply. However, the potential exists for developing wells with yields of approximately 0.03 to 0.05 mgd per well.

CITY OF BADIN



BADIN, STANLEY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Badin Lake Raw	Finished	Badin Lake Raw	Finished
Date of collection.....	3-29-66	3-29-66	6-7-72	6-7-72
Copper (Cu).....	----------	----------	0.014	.030
Cobalt (Co).....	----------	----------	.006	.000
Zinc (Zn).....	----------	----------	.008	.008
Chromium (Cr).....	----------	----------	.00	.00
Boron (B).....	----------	----------	.010	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.0005	<.0005
Lead (Pb).....	----------	----------	.000	.005
Lithium (Li).....	----------	----------	.016	.016
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	4.2	6.5	4.6	6.6
Manganese (Mn).....	.00	.02	.005	.004
Iron (Fe).....	.03	.10	.000	.000
Calcium (Ca).....	4.4	9.1	----------	----------
Magnesium (Mg).....	1.2	1.2	----------	----------
Sodium (Na).....	4.1	8.7	----------	----------
Potassium (K).....	1.6	1.7	----------	----------
Fluoride (F).....	.1	.0	----------	----------
Silica (SiO_2).....	9.5	8.3	----------	----------
Bicarbonate (HCO_3).....	18	25	----------	----------
Carbonate (CO_3).....	0	0	----------	----------
Sulfate (SO_4).....	6.2	21	----------	----------
Nitrate (NO_3).....	1.1	2.2	----------	----------
Dissolved Solids.....	47	71	----------	----------
Hardness as $CaCO_3$:				
Total.....	17	28	----------	----------
Noncarbonate.....	2	8	----------	----------
Alkalinity as $CaCO_3$.....	15	20	----------	----------
Specific conductance (micromhos at 25° C)....	55	108	----------	----------
pH.....	6.2	6.9	----------	----------
Temperature (°C).....	11	--------	21	20

NORWOOD, STANLY COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,600 in 1972 (980 metered customers, 180 of which are in suburban areas).

SOURCE:

Pee Dee River impounded in Lake Tillery. The intake is approximately 0.7 mile northeast of Norwood at lat 35°14'04", long 80°05'54". Lake Tillery is used for hydroelectric power by Carolina Power & Light Company. The drainage area at the dam is 4,600 square miles, approximately.

RAW-WATER STORAGE:

Lake Tillery, 54.4 billion gallons.

ALLOWABLE DRAFT:

Not determined. The amount of water that can be withdrawn from Lake Tillery is unlimited provided the withdrawal does not interfere with the hydroelectric operation of the project.

TOTAL USE:

Average (1972), 0.285 mgd, metered; maximum daily (12-20-72), 0.366 million gallons.

INDUSTRIAL USE:

0.05 mgd, estimated. Principal users include Collins and Aikman Corporation, and Norwood Fertilizer Company, Inc.

TREATMENT:

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

RATED CAPACITY OF TREATMENT PLANT:

0.5 mgd.

PUMPING CAPACITY:

Raw water, 0.6 mgd; finished water 0.9 mgd.

FINISHED-WATER STORAGE:

One clear well, 28,000 gallons; one ground storage tank, 200,000 gallons; one elevated tank, 60,000 gallons.

FUTURE PLANS:

Plan to erect a 300,000 gallon elevated tank in 1973.

WATER-RESOURCES APPRAISAL:

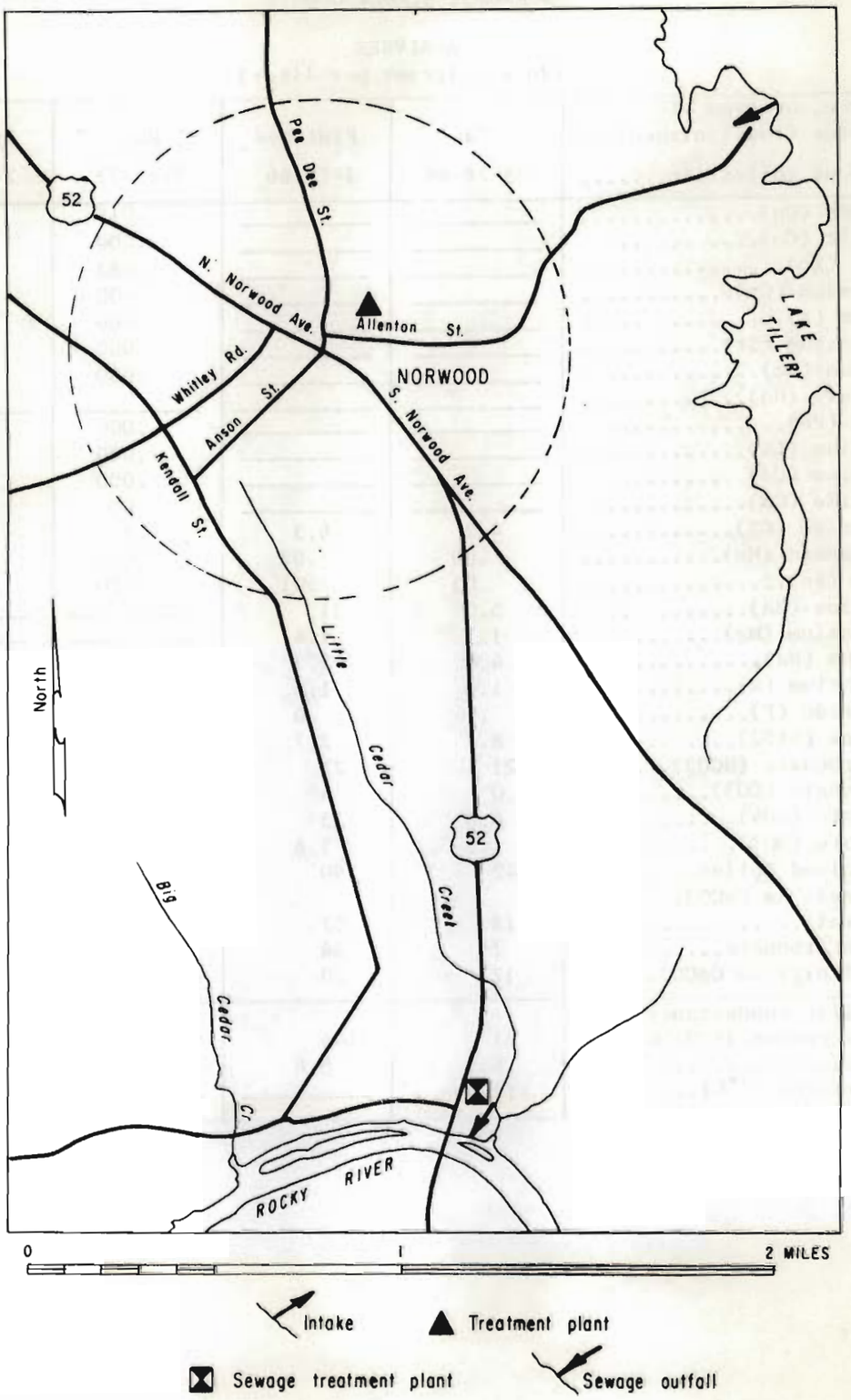
Surface water: The water available at Lake Tillery is ample to supply the future requirements of Norwood.

Ground water: Norwood is underlain by laminated argillite. The depth of overlying weathered rock ranges from a few inches to as much as 50 feet

or more in places. According to available data, wells in this rock unit in the Norwood vicinity are normally drilled from 50 to 200 feet deep and the average yield is about 15 gpm. One well is reported to yield 35 gpm.

In general, the chemical quality of ground water is good and the water is suitable for most uses with little or no treatment. The water is usually hard and contains low to moderate concentrations of iron.

CITY OF NORWOOD



NORWOOD, STANLY COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	3-28-66	3-28-66	2-15-73	2-15-73
Copper (Cu).....	----------	----------	0.016	0.021
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.083	.072
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	----------	----------
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.000	.000
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	4.2	6.3	6.6	7.2
Manganese (Mn).....	.00	.02	.045	.033
Iron (Fe).....	.01	.01	.520	.129
Calcium (Ca).....	5.0	21	----------	----------
Magnesium (Mg).....	1.3	1.4	----------	----------
Sodium (Na).....	4.0	3.7	----------	----------
Potassium (K).....	1.6	1.6	----------	----------
Fluoride (F).....	.1	.0	----------	----------
Silica (SiO2).....	8.2	7.7	----------	----------
Bicarbonate (HCO3).....	21	21	----------	----------
Carbonate (CO3).....	0	4	----------	----------
Sulfate (SO4).....	6.0	33	----------	----------
Nitrate (NO3).....	1.8	1.6	----------	----------
Dissolved Solids.....	42	90	----------	----------
Hardness as CaCO3:				
Total.....	18	57	----------	----------
Noncarbonate.....	2	34	----------	----------
Alkalinity as CaCO3.....	17	20	----------	----------
Specific conductance (micromhos at 25° C)....	61	145	----------	----------
pH.....	6.5	8.8	----------	----------
Temperature (°C).....	11.5	----------	----------	----------

UNION COUNTY

WATER-RESOURCES APPRAISAL

Union County is in the southeastern part of the Piedmont Province, with the North Carolina-South Carolina state line the southern border. The topography of the county is characterized by moderately level interstream areas which become more rolling and hilly near the larger streams. Rocky River, the northern border, and its tributaries drain about four-fifths of the county. The remainder, the southwest corner, is drained by tributaries of the Catawba River. The low-flow yield of streams is low, ranging from 0 to 0.004 mgd per square mile and averaging 0.001 mgd per square mile. Streams with as much as 70 square miles drainage area occasionally go dry. The average discharge is 0.6 mgd per square mile, and the 7-day, 2-year low flow averages 0.02 mgd per square mile.

Monroe, Indian Trail, Wingate and Marshville obtain their municipal water supplies from surface sources. Waxhaw and most rural domestic supplies use ground water. Monroe supplies water to Indian Trail, and Wingate. Marshville is connected to the Wingate and Anson County systems. As a result of these interconnections, municipal water is available in the area roughly paralleling U.S. 74 throughout the county. The county's population in 1970 was 54,714.

Rocks of the Carolina Slate Belt, principally tuffaceous and laminated argillite, predominate in Union County. These rocks underlie all but the extreme west edge, southwest corner, and a small area in the southeast corner of the county. Granite, mica-schist, diorite-gabbro and rocks of the lower volcanic unit (fine-grained tuffs and flows) cropout in the west and southwest corner and Triassic sediments underlie a small area in the southeast corner. 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 depths in the rocks underlying the west and southwest part. Rocks of the lower volcanic unit are significantly more deeply weathered than the other rock units. Records of well casing lengths indicate the depth of weathered material over the argillite rocks averages about 25 feet. The following table shows the average depth, and maximum and average well yields reported for drilled wells in the various rock units.

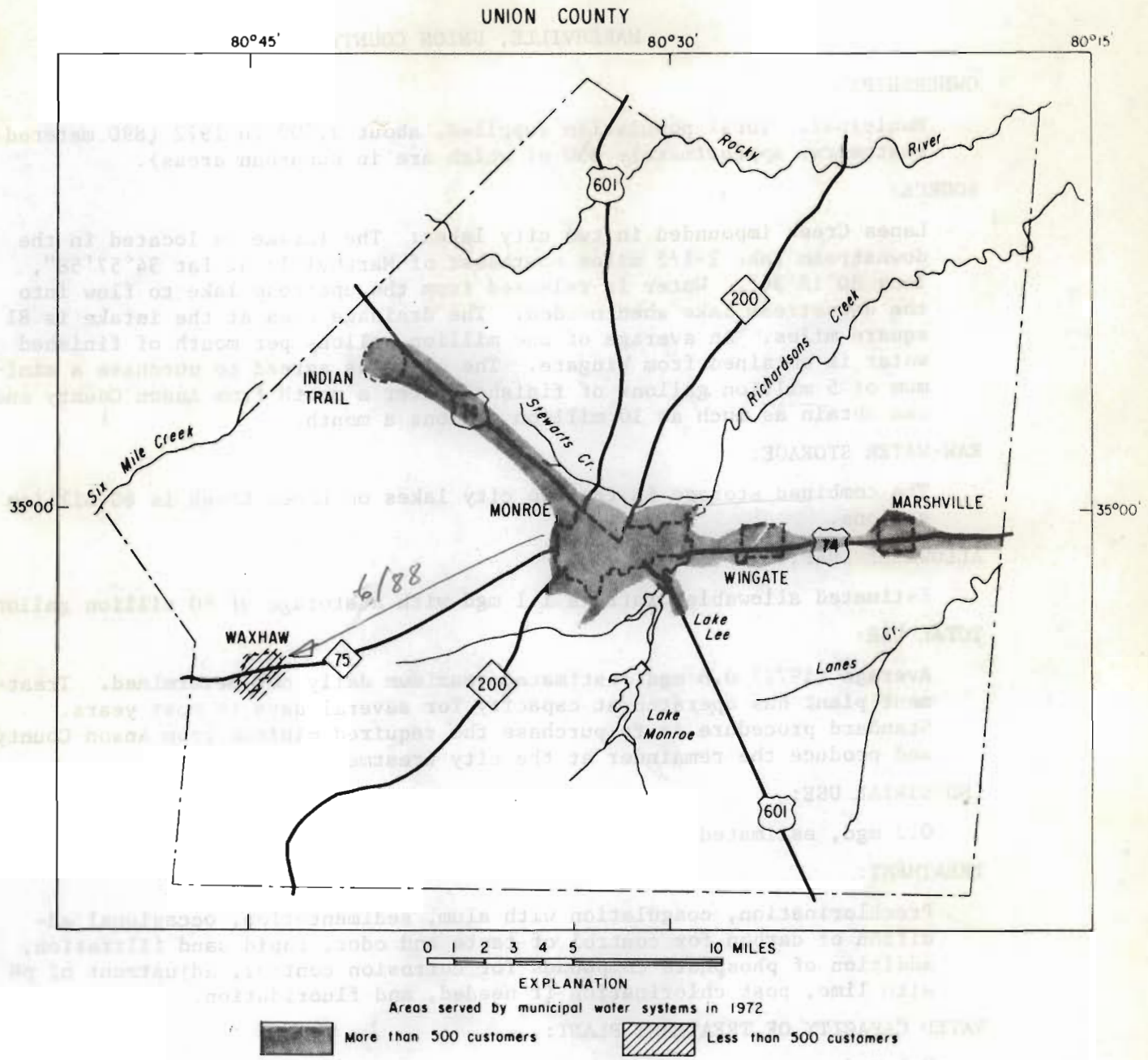
Rock unit	Yield (gpm)		Average depth (feet)
	Maximum	Average	
Granite*	100		134
Mica-schist	90	46	225
Argillite	75	12	133
Lower volcanic	60	12	128

*Record of one well

Available chemical analyses show that the chemical quality of ground water is generally good. Water from wells in granite is of excellent quality. Water from the mica-schist and lower volcanic units is moderately hard and

locally may contain undesirable concentrations of iron but is generally acceptable for most uses without treatment. As a rule, water from the argillite units is hard, is low in iron content, and locally may contain undesirable concentrations of chloride.

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, usually in low or flat areas. It is estimated, that in these areas, the quantity of ground water available ranges from 0.25 mgd per square mile in the west to 0.12 mgd per square mile in the east parts of the county.



Wilson Crook
289-8557

distribution

Restriction is Treatment

7/8

MARSHVILLE, UNION COUNTY

OWNERSHIP:

Municipal. Total population supplied, about 2,500 in 1972 (890 metered customers, approximately 350 of which are in suburban areas).

SOURCE:

Lanes Creek impounded in two city lakes: The intake is located in the downstream lake 2-1/2 miles southeast of Marshville at lat 34°57'58", long 80°18'36". Water is released from the upstream lake to flow into the downstream lake when needed. The drainage area at the intake is 81 square miles. An average of one million gallons per month of finished water is obtained from Wingate. The city has agreed to purchase a minimum of 5 million gallons of finished water a month from Anson County and can obtain as much as 10 million gallons a month.

RAW-WATER STORAGE:

The combined storage in the two city lakes on Lanes Creek is 60 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 1.1 mgd with a storage of 60 million gallons.

TOTAL USE:

Average (1972) 0.6 mgd, estimated; maximum daily not determined. Treatment plant has operated at capacity for several days in most years. Standard procedure is to purchase the required minimum from Anson County and produce the remainder at the city treatment plant.

INDUSTRIAL USE:

0.2 mgd, estimated.

TREATMENT:

Prechlorination, coagulation with alum, sedimentation, occasional 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 if needed, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

0.5 mgd.

PUMPING CAPACITY:

Raw water, 0.5 mgd; finished water, 0.7 mgd.

FINISHED-WATER STORAGE:

One clear well, 40,000 gallons; one elevated tank, 240,000 gallons; one ground-storage tank, 200,000 gallons.

FUTURE PLANS:

None.

county: 089 population served: 000000900 average production: 0000082000 No of connections: 0000425

name and address				
TYRRELL CO WATER SYSTEM	PO BOX 449	COLUMBIA		27925

county: 089 population served: 000002450 average production: 0000112000 No of connections: 0000825

name and address				
MONORE WATER TREATMENT PLANT	P O BOX 69	MONORE		28110

Union Co.
704-~~289-3511~~
704-283-3500

Union county: 090 population served: 000015500 average production: 0007000000 No of connections: 0005090

name and address				
MARSHVILLE WATER TREATMENT PLA	201 N ELM STREET	MARSHVILLE		28103

county: 090 population served: 000001910 average production: 0000035000 No of connections: 0001100

name and address				
WAXHAW, TOWN OF	BOX 6	WAXHAW		28173

county: 090 population served: 000001188 average production: 0000000000 No of connections: 0000460

name and address				
WINGATE, TOWN OF	BOX 367	WINGATE		28174

county: 090 population served: 000002647 average production: 0000000000 No of connections: 0000575

name and address				
UNION COUNTY WATER SYSTEM	PO BOX 218	MONROE		28110

county: 090 population served: 000013648 average production: 0000000000 No of connections: 0004265

name and address				
FAIRFIELD PLANTATION	1221 EAST MOREHEAD STREET	CHARLOTTE		28204

PH2-3292

county: 090 population served: 000000750 average production: 0000000000 No of connections: 0000201

name and address — community well system run by county to be discontinued. 2 wells 480', 920' but did have problems filling

HENDERSON-KERR LA REG WTR SYST	PO BOX 1434	HENDERSON		27536

county: 091 population served: 000020171 average production: 0006500000 No of connections: 0007204

name and address				
KITTRELL WATER ASSN	PO BOX 64	KITTRELL		27544

county: 091 population served: 000000665 average production: 0000043500 No of connections: 0000190

MARSHVILLE, UNION COUNTY

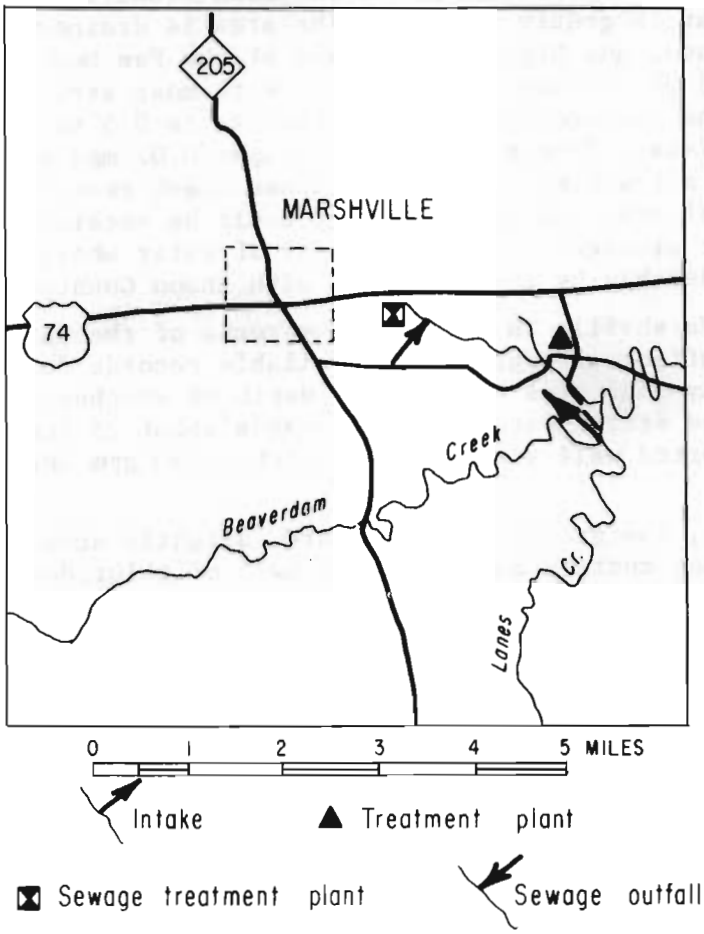
WATER-RESOURCES APPRAISAL:

Surface water: Marshville is in eastern Union County. The topography is relatively flat to gently rolling. The area is drained by tributaries of Beaverdam, Lanes, and Niggerhead Creeks of the Pee Dee River basin. The low-flow yield of streams is very small with most streams occasionally going dry. The average discharge of streams is 0.5 to 0.6 mgd per square mile and the 7-day, 2-year low flow averages 0.02 mgd per square mile. The estimated allowable draft of the Lanes Creek reservoirs is less than twice the total use. Additional draft could be obtained by providing more raw-water storage. The possibility of water shortages has been reduced considerably by the agreement with Anson County.

Ground water: Marshville is underlain by rocks of the Carolina Slate Belt, principally tuffaceous argillite. Available records for wells drilled in the vicinity indicates the average depth of weathered rock is about 30 feet and the static water level averages about 25 feet below land surface. Reported well yields are as high as 50 gpm and average about 15 gpm.

Typically, the ground water is hard, slightly acidic, low in iron content, and may contain as much as 80 mg/l of chloride.

CITY OF MARSHVILLE



MARSHVILLE, UNION COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw;finished)...	Raw	Finished	Raw	Finished
Date of collection.....	5-19-64	5-19-64	11-15-72	11-15-72
Copper (Cu).....	----------	----------	0.250	0.023
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.115	.027
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.015
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).....	7.0	14	11	20
Manganese (Mn).....	.00	.01	.192	.038
Iron (Fe).....	.09	.01	.647	.733
Calcium (Ca).....	4.8	16	----------	----------
Magnesium (Mg).....	2.4	2.6	----------	----------
Sodium (Na).....	4.5	4.5	----------	----------
Potassium (K).....	1.1	1.1	----------	----------
Fluoride (F).....	.1	.0	----------	----------
Silica (SiO2).....	6.4	6.3	----------	----------
Bicarbonate (HCO3).....	25	34	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	5.4	17	----------	----------
Nitrate (NO3).....	.2	.1	----------	----------
Dissolved Solids.....	61	102	----------	----------
Hardness as CaCO3:				
Total.....	24	52	----------	----------
Noncarbonate.....	3	0	----------	----------
Alkalinity as CaCO3.....	20	28	----------	----------
Specific conductance (micromhos at 25° C)....	74	138	----------	----------
pH.....	6.6	7.6	----------	----------
Temperature (°C).....	21	20	15	15

MONROE, UNION COUNTY

OWNERSHIP:

Municipal. Also supplies Wingate and Sun Valley Water Association (Indian Trail). Total population supplied, about 16,000 in 1972 (6,107 metered customers, 1,500 of which are in suburban areas).

SOURCE:

Richardson Creek impounded in Lake Lee and Lake Monroe. The intakes are at the dam in Lake Lee at lat 35°57'25", long 80°30'40". Water is released from Lake Monroe and it flows to Lake Lee.

Well No. 1 (Walkup Avenue Well), Un-143, located at: lat 34°58'33", long 80°30'22". Driller: McCall Brothers. Date drilled: July 10, 1969. Total depth: 214 feet. Diameter: 6 inch. Cased to: 41 feet. Type of finish: open hole. Topography: Hillside. Aquifer: blue slate. Static water level: 28 feet. Yield: 20 gpm. Pump setting 200 feet. Type of pump: submersible.

RAW-WATER STORAGE:

Lake Lee, 250 million gallons.
Lake Monroe, 475 million gallons.

ALLOWABLE DRAFT:

Estimated allowable draft is 6.5 mgd, with a storage of 725 million gallons.

TOTAL USE:

Average (1971) 3.2 mgd, metered; maximum daily (12-22-71), 3.8 million gallons. Average pumpage from the well is 0.025 mgd.

INDUSTRIAL USE:

2.5 mgd, estimated. Principal users include Holly Farm Poultry Processors, Springs Mills, Inc., and Central Soya of Monroe, Inc.

TREATMENT:

Prechlorination, coagulation with alum and lime, sedimentation, addition of carbon for control of taste and odor, rapid Anthra-filt filtration, addition of phosphate compounds for corrosion control, adjustment of pH with lime, iron and manganese removal with potassium permanganate, and fluoridation.

RATED CAPACITY OF TREATMENT PLANT:

3.0 mgd. City has temporary approval to operate at 4.0 mgd from the State Board of Health.

PUMPING CAPACITY:

Raw water, 5.0 mgd; finished water, 4.6 mgd.

FINISHED-WATER STORAGE:

One clear well, 1,000,000 gallons; four elevated tanks, 1,000,000, two of 500,000, and 150,000 gallons.

MONROE, UNION COUNTY

FUTURE PLANS:

A new 9 mgd treatment plant is presently under construction (November 1972) and scheduled for completion in March 1973. A new dam on Stewarts Creek to impound 1.9 billion gallons was completed in 1972.

WATER-RESOURCES APPRAISAL:

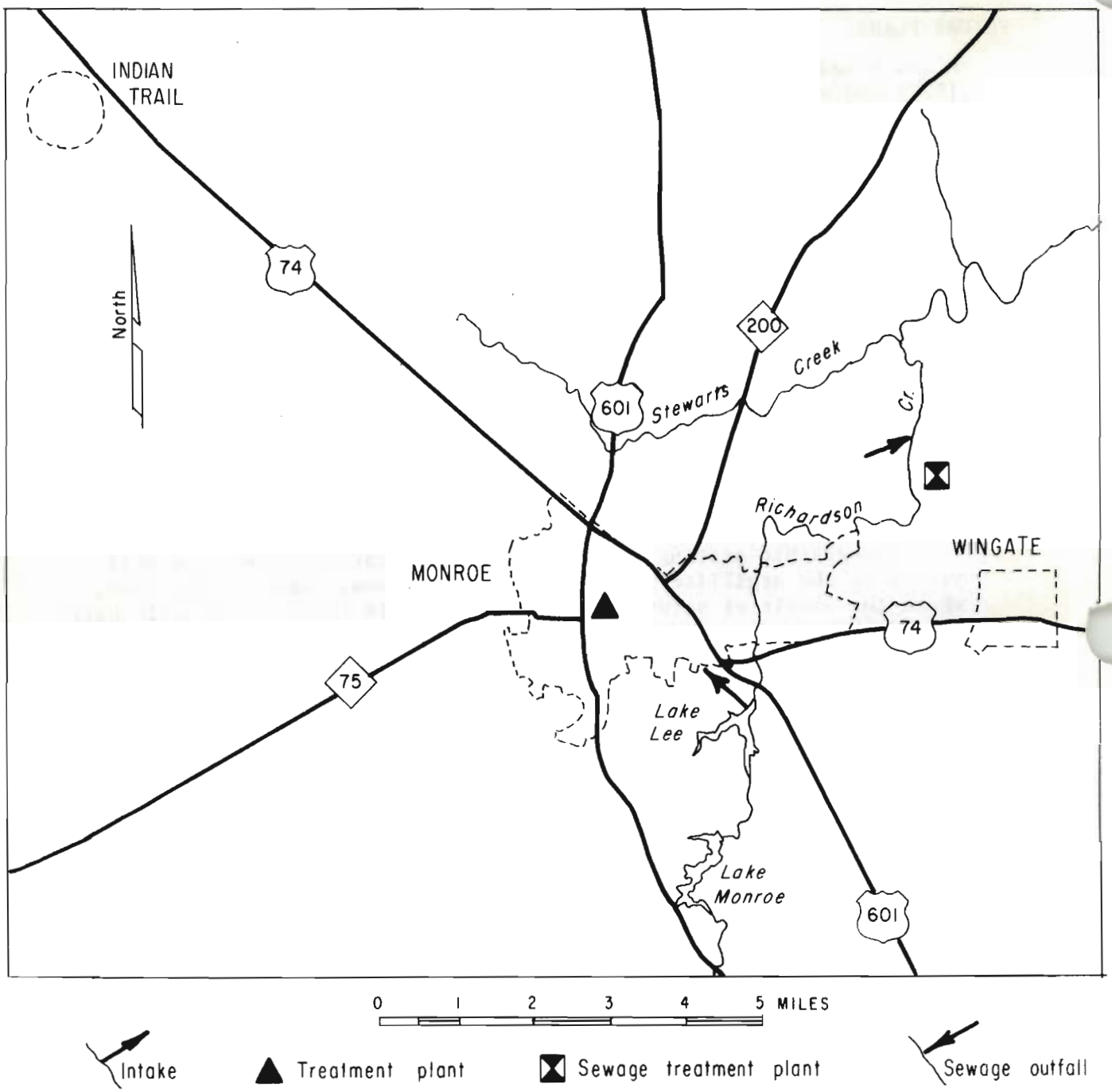
Surface water: Monroe is in central Union County where the topography is characterized by rolling hills with moderate land slopes. The immediate area is drained by tributaries of Richardson Creek of the Pee Dee River basin. The low-flow yield of streams is very small, averaging 0.002 mgd per square mile. For all streams, the average discharge is 0.6 mgd per square mile, and the 7-day, 2-year low-flow averages 0.15 mgd per square mile. When the new treatment plant and raw-water reservoir are completed, Monroe will have an ample water supply.

Ground water: Volcanic rocks, principally tuffaceous argillite, underlie Monroe. These rocks are weathered to an average depth of 30 feet in town. Wells in the argillite in the vicinity generally are drilled to depths of 65 to 200 feet and average 140 feet, and are reported to yield up to 60 gpm. The average well yield is 11 gpm.

Topographic setting is an important indicator of possible well yields in the argillite. Wells located in draws, sags, or low flat, where the mantle of saturated weathered rock is thickest, usually have the higher yields. It is estimated that wells drilled in these sites, and spaced about 2,500 feet apart, may reasonably be expected to yield about 0.02 to 0.03 mgd.

The chemical quality of ground water is usually good. The water is usually hard and may contain moderate amounts of iron.

CITY OF MONROE



MONROE, UNION COUNTY

ANALYSES
(In milligrams per liter)

Source, or type of water (raw; finished)...	Raw	Finished	Raw	Finished
Date of collection.....	11-30-65	11-30-65	11-15-72	11-15-72
Copper (Cu).....	----------	----------	0.046	0.032
Cobalt (Co).....	----------	----------	.000	.000
Zinc (Zn).....	----------	----------	.470	.100
Chromium (Cr).....	----------	----------	.000	.000
Boron (B).....	----------	----------	.000	.000
Strontium (Sr).....	----------	----------	.000	.000
Barium (Ba).....	----------	----------	.000	.000
Mercury (Hq).....	----------	----------	<.005	<.005
Lead (Pb).....	----------	----------	.000	.000
Lithium (Li).....	----------	----------	.000	.000
Cadmium (Cd).....	----------	----------	.000	.000
Cyanide (CN).....	----------	----------	.00	.00
Chloride (Cl).....	7.6	17	14	22
Manganese (Mn).....	.01	.04	.270	.046
Iron (Fe).....	.68	.01	.660	.119
Calcium (Ca).....	6.6	19	----------	----------
Magnesium (Mg).....	1.9	2.3	----------	----------
Sodium (Na).....	4.8	6.0	----------	----------
Potassium (K).....	2.7	2.7	----------	----------
Fluoride (F).....	0.1	0.8	----------	----------
Silica (SiO2).....	2.2	2.2	----------	----------
Bicarbonate (HCO3).....	25	37	----------	----------
Carbonate (CO3).....	0	0	----------	----------
Sulfate (SO4).....	5.0	18	----------	----------
Nitrate (NO3).....	1.6	.2	----------	----------
Dissolved Solids.....	48	98	----------	----------
Hardness as CaCO3:				
Total.....	26	58	----------	----------
Noncarbonate.....	5	28	----------	----------
Alkalinity as CaCO3.....	20	30	----------	----------
Specific conductance (micromhos at 25° C)....	82	161	----------	----------
pH.....	6.5	7.2	----------	----------
Temperature (°C).....	11	----------	15.5	15.5

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Region H - Pee Dee Council of Governments
Worth Chesson, Executive Director
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Region J - Triangle J Council of Governments
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